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Acceptance and Commitment Therapy

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Synonyms

ACT; Contextual therapy; Third generation of behavioral therapies; Third wave of behavioral therapies

Definition

Acceptance and Commitment Therapy (ACT) is a behavioral experiential psychotherapy which "reformulates and synthesizes previous generations of behavioral and cognitive therapy and carries them forward into questions, issues, and domains previously addressed primarily by other traditions, in hopes of improving both understanding and outcomes" (Hayes 2004). ACT takes a transdiagnostic and functional approach to psychological problems: it is the function of behavior that matters, not its shape. Consequently, different clinical diagnoses are, in essence, more similar than one would think from looking at their names in the DSM-V, as they involve dysfunction in the same dimensions. In this regard, many anxiety, depressive, or addictive disorders, among others, have in common that they involve experiential avoidance and cognitive fusion. These processes will be defined later. Also, as a consequence of ACT's focus on the context of psychopathology, it situates psychological problems in the "broader context" of people's lives. Hence, aspects such as purpose, meaning, personal values, or sense of coherence are germane to understanding psychological problems and to working out solutions to them.

Psychological Interventions with Older Adults

With the aging of the population there is expected to be a significant increase in the number of elderly people suffering psychological distress. Research has already shown that there are psychological interventions that work for helping distressed older adults, with most of the evidence coming from cognitive-behavioral interventions (Gatz 1997). Evidence has been put forward supporting the efficacy of Cognitive Behavioral Therapy (CBT) for treating depression and sleep problems in older adults, with effect sizes within the range of those found for younger adults (Satre et al. 2006).

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In spite of this, there is some justification for further research on alternative therapeutic approaches targeting the elderly population. One of them has to do with the nature of CBT, which may limit its efficacy for some older adults' psychological problems. The basic assumption in CBT is that individuals can be trained in strategies to understand the factors that maintain their problems, as well as in techniques for dealing with them, which usually involve changing thoughts and behaviors (e.g., cognitive restructuring, skills training, or relaxation). However, many problems older adults face include aspects that are not easily modifiable. Even though growth and gains in different domains can occur in old age, aging brings with it important and irremediable changes or losses in physical (e.g., health problems) and social resources (e.g., death of loved ones), as well as in the contexts or scenarios people live in (e.g., retirement, "empty nest"). Challenging the validity of thoughts, emotions, or behaviors associated with these changes may not be the best way to face the problems, given the realistic nature of the problems (Petkus and Wetherell 2013).

Older adults' psychological or emotional problems are frequently related to difficulties in adapting to their changing realities. Despite the fact that some studies find aging to be related to improvements in emotion and self-regulation strategies (Reed and Carstensen 2014), it is nevertheless true that when faced with losses and changes in important life domains, many older adults have problems accepting them. Consequently, they tend to avoid the situations, thoughts, and emotions associated with these events, which leads to maladaptive behavior patterns that can result in disengagement from life and affect their well-being.

In recent decades, the field of psychological intervention has witnessed the emergence of the so-called third generation of behavioral therapies (Hayes 2004), which place the emphasis of intervention on increasing people's ability to accept the "hassles" and problems inherent to life, as well as the aversive experiences associated with them (thoughts, sensations, and emotions), while acting in the direction of personal values. Acceptance and Commitment Therapy (ACT) is the standard-bearer of this third generation, and its characteristics make it especially suitable for older adults, as discussed later.

What Is Acceptance and Commitment Therapy?

A basic assumption in ACT is that psychological suffering is an inherent characteristic of human life (Hayes 2004). ACT makes a strong criticism of the "healthy normality" hypothesis that seems to underlie mainstream Western psychology, according to which humans are, by their nature, psychologically healthy, and well-being and happiness is the hallmark of psychological health. This assumption is a correlate of the welfare society prevalent in the West and in the richer countries in general, but sharply contrasts with people's everyday experience, which demonstrates that problems, losses and difficulties, and the associated suffering, are more the norm than the exception in human life. Experiences such as being worried, having intrusive thoughts or feeling sadness, anxiety, anger, or other uncomfortable emotions are normal psychological experiences that go hand in hand with human existence. Assuming that these aversive experiences are normal, and being able to accept them and tolerate them while acting in the direction of personal values, are essential requirements for adaptation and psychological health. According to ACT, the hallmark of human ability for adaptation and psychological health is psychological flexibility, defined as the ability to act in chosen directions, in line with one's personal values, regardless of the uncomfortable internal experiences (thoughts, emotions, or sensations) one is having at that moment, and while remaining in contact with the present (Hayes et al. 2011). Many different forms of psychopathology are manifestations of psychological rigidity, which consists of the following six processes (also called hexaflex): (a) experiential avoidance; (b) cognitive fusion; (c) attachment to the conceptualized self; (d) loss of contact with the present moment (inflexible attention); (e) disruption of values; and (f) inaction.

(a) Experiential avoidance is the opposite tendency to acceptance and has been described as the unwillingness to remain in contact with particular private events such as emotions, thoughts, or behavioral predispositions (Hayes et al. 2011). According to ACT, "many forms of psychopathology are not abnormal behavior, emotions or thoughts, but rather "bad solutions" that people apply to solve their distress or, in other words, "unhealthy efforts to escape and avoid emotions, thoughts, memories, and other private experiences" (Hayes et al. 1996). Research shows that avoidance can have undesired effects: trying to suppress a thought or an emotion may generate a boomerang effect, increasing the frequency and intensity of these experiences (Campbell-Sills et al. 2006; Hooper and McHugh 2013). Thoughts or emotions associated with relevant negative life events such as the death of a loved one are not easily changeable, and trying to fight them (suppress or reject them) may limit people's chances to continue living their lives in an adaptive way.

As already pointed out, ACT starts out from the belief that human suffering is a ubiquitous experience. It highlights the need to strengthen, in clinical practice, people's ability to accept this suffering and deal with it in appropriate ways. This does not involve resignation or helplessness, but rather acknowledgement and active embracement of the aversive experiences associated with problems and losses, in order to be able to integrate them and continue living rich and meaningful lives. In clinical practice, this involves helping people to "make room for" undesired emotions and thoughts, understanding the paradox of "control," (the harder we try to control these experiences, the more difficult it becomes) and both the futility and cost of avoidance.

Hence, ACT does not focus on the elimination or reduction of aversive experiences, but on people's personal values and goals. These motivational variables are the framework of intervention in ACT, which is aimed at helping people develop coherent and satisfactory lives, despite the presence of unavoidable suffering.

(b) Cognitive fusion is the tendency to be psychologically entangled with and dominated by the form or content of thoughts, believing in their literal content, or, in more general terms, the excessive or improper regulation of behavior by verbal processes, such as rules and derived relational networks (Hayes et al. 2011). When people rigidly believe (are fused with) the contents of their mind (e.g., "elderly people are unable to learn new things" or "I don't have anything interesting to say"), they will have trouble being aware of contextual or direct experience clues, and will act in a maladaptive way (e.g., not attending courses to learn new things, or not participating in debates or conversations with other people). Being fused with verbal or cognitive rules (e.g., "I am not interesting for other people. People do not like me") is maintained in part because compliance with verbal rules is rewarding. Cognitive fusion is also related to checking behavior of clues that may confirm or disconfirm the thought or verbal rule (e.g., "That expression on her face means that she's bored with my conversation"). This checking behavior limits people's behavioral repertoire and action opportunities for living in the present. An important manifestation of cognitive fusion is an excessive entanglement with "giving reasons," which leads some people to prefer "to be right" than to be happy (e.g., "I didn't go to the party because I am not good company and because I was feeling anxious"). ACT tries to change the way one relates to thoughts by undermining these maladaptive verbal contexts (literality and giving reasons), generating new scenarios in which maladaptive functions of thought are diminished. Specifically, cognitive defusion techniques include deliteralization (e.g., the "Milk, Milk, Milk" exercise; word repetition) (Titchener 1916), and physicalizing exercises (e.g., "Imagine that your thought is an object inside your head: what shape has it? What color is it?") among others (Snyder et al. 2011).

ACT also includes many interesting exercises for undermining reasons as causes of behavior (Hayes 2004; Hayes et al. 2011).

(c) Conceptualized self or cognitive fusion with self-concept occurs when a person is rigidly fused with his or her self-concept ("I'm an old and lonely man") or self-story, and finds great reward in telling coherent self-narratives. In this context, people are likely to attend to and process stimuli and information confirming their schemas and to behave consistently with them (e.g., not interacting with other people, not involving themselves in activities). This usually leads to a reduced likelihood of being open to new or flexible ways of thinking about and coping with problems, as well as to self-fulfilling prophesies (to behave like a lonely man can indeed generate more loneliness). ACT aims to train patients in skills for decentering from their self-concept-related thoughts, emotions and sensations, and taking perspective (experiencing "self-as-context"), that is, acting as observers of these experiences, in order to facilitate more flexible ways of analyzing their problems and provide possible alternatives of thinking and behavior.

(d) Lack of contact with the present moment. The tendency to focus on the past (e.g., rumination) or the future (e.g., worry) is another manifestation of psychological rigidity. This process involves loss of contact with the present moment (here and now) and a pattern of inflexible attention, which interferes with the ability to live in the present moment and fully perceive and experience the consequences of behavior. Such rigidity can prevent adaptive and flexible ways of coping with problems. ACT sets out to train people to attend to the present moment and enrich their experience of the "here and now" by fostering attentional control. For this purpose, ACT uses mindfulness techniques, which involve awareness of and focused attention on breathing and body sensations, among other experiences.

(e) Disruption of values. Another source of psychological distress is related to the lack of clarification of or disconnection from personal values. In ACT, a value is a personal choice, and not something based on a decision making process, nor the opinion of others. For example, a woman chooses to care for her husband with dementia at home, on the basis of her value "to love my husband and keep him safe and secure." ACT aims to help people clarify or reconnect with their personal values, which are the main source of meaning and sense of purpose, cornerstones of well-being.

(f) Behavior inconsistent with values. When people have not clarified their values or are disconnected from them, it is more likely that they will show passivity (lack of action), inconsistent behavior (acting in ways that are inconsistent with one's values), impulsivity, or persistent avoidance. In ACT, patients are encouraged to commit to their values, that is, to develop stable patterns of effective behavior consistent with their personal values. This involves helping them to initiate and maintain actions that are values-based, redirecting behavior towards the desired values, and maintaining the purposes in the face of barriers (Hayes et al. 2011). It also involves discovering and overcoming barriers to committed actions, which usually implies the use of traditional behavioral techniques such as skills training, exposure, or problem-solving, which are perfectly compatible with ACT.

Why Is ACT an Interesting Therapeutic Approach for Older Adults?

As already pointed out, a substantial proportion of elderly people suffering from different forms of psychopathology have a long history of efforts to reduce the distress associated with their psychological problems. This history of failures may be related to the fact that many of these problems involve difficulties for adapting to hard-to-change factors, such as irremediable losses (e.g., death of loved ones) and changes (e.g., retirement), and to the aversive experiences associated with them (e.g., sadness or self-devaluative thoughts). These hard-to-change events usually have a great impact on older adults' set of personal values, as some of

them may be more difficult to pursue and some goals and objectives may be no longer attainable. In these circumstances, flexible goal adjustment is required in order to keep the person engaged in life and committed to their personal values. This adjustment involves disengaging from inappropriate goals and replacing them with more feasible ones, processes that have been found to be associated with better emotional well-being (Wrosch et al. 2006).

However, the truth is that, when faced with these life events and the associated uncomfortable experiences (emotions, sensations, or thoughts), many older adults have considerable difficulty adjusting their set of goals, reformulating their affected values, or restructuring their values hierarchy, and end up experiencing a blockage or disconnection from important valued life domains. These types of problems frequently experienced by older adults make particularly interesting the use in this population of an alternative therapeutic approach such as ACT which, instead of promoting a control-oriented approach focused on change, fosters acceptance as the main way of coping with the difficulties and problems (Petkus and Wetherell 2013).

It is important to note here that ACT's focus on the importance of values clarification and the development of patterns of behavior consistent with personal values fits very well with two of the main theoretical models of human development across the lifespan: the Selective Optimization with Compensation Model of successful ageing (SOC) (Baltes and Baltes 1990) and the Motivational Theory of Life-Span Development (Heckhausen et al. 2010). A basic assumption of these approaches is that people are active and goal-oriented agents in their lifespan development, who strive for adaptation to losses and changes throughout the lifespan, displaying motivational processes such as goal selection, goal pursuit, and goal disengagement.

As suggested in the above paragraph, motivation, values-oriented action, and flexible goal adjustment are essential elements of adaptation throughout the lifespan and, particularly, in old age. The combination of theoretical models of human development with ACT provides a useful platform from which to develop psychological interventions aimed at helping older people adapt to changes, losses and life transitions, which are frequently involved in psychological problems in old age. This can be illustrated in the following clinical case: an elderly man gets depressed after retirement, because he has always had the value of "being a good professional" as a priority in his life, to the detriment of other areas of values (friendship, leisure time, etc.). As this value is no longer possible for him to follow and he has not clarified or committed to other areas of values, he is likely to experience an emptiness of values, and to become caught up in patterns of experiential avoidance that eventually lead to depression. Cognitive fusion with thoughts such as "I am no longer useful" or "I am finished" is also very likely in this case. Therapeutic work from ACT would focus on fostering acceptance of his current circumstances and the associated aversive experiences, and helping him to clarify and commit to personal values that bring meaning and purpose to his life. This may involve: (a) reformulating his former main value, identifying the underlying sources of meaning and satisfaction, in order to generate a related but attainable value, such as "being productive or useful for other people"; (b) helping him to retrieve and strengthen other values; and (c) undermining verbal dysfunctional processes (cognitive fusion and conceptualized self) through training in cognitive defusion techniques and strengthening the self-as-context perspective.

Other characteristics that make ACT a suitable therapeutic approach for older adults are the following:

(a) Transdiagnostic approach. The high prevalence of subsyndromal psychological problems and the frequent comorbidity between anxiety and depression in the elderly population may be related to the limitations of current diagnostic criteria for use with this population. The transdiagnostic nature of ACT makes this therapy particularly suitable for the elderly (Petkus and Wetherell 2013).
(b) Methodology. ACT departs from psychoeducational and verbal techniques, which are

central in CBT, and uses a methodology mainly involving metaphors, paradoxes, and experiential exercises. These techniques are particularly suitable for many older adults who, due to cohort differences (e.g., lower level of formal education) or other reasons (e.g., cognitive impairment), may show limitations in abstract thinking or verbal reasoning ability.

(c) Focus on eudaimonic well-being (values and goals). According to Socioemotional Selectivity Theory (Carstensen et al. 1999), the goals of older adults are focused on optimizing emotional meaning and well-being, and they usually invest more cognitive and behavioral resources than their younger counterparts in pursuing their emotionally meaningful goals. For its part, Erikson's theory of development (Erikson 1950) states that the major psychosocial crisis to be resolved in old age is ego integrity versus despair. This crisis is precipitated by the awareness of mortality. The achievement of ego integrity requires that people review their life-career to determine whether it was a success or a failure. Older adults who succeed in this crisis are those who are able to accept how things have turned out in their lives, and find order and meaning in it. There is some evidence suggesting the great importance of having achieved generativity in order to satisfactorily resolve the ego integrity crisis (James and Zarrett 2006).

On the other hand, generativity is a motivational tendency that can be defined as concern for and commitment to establishing and guiding the next generation (Erikson 1950). It has been found to increase in old age, in which many people are mainly interested in obtaining emotional meaning through the pursuit of values and goals related to the achievement of younger generations' well-being (Sheldon and Kasser 2001).

Finally, the gerotranscendence theory (Tornstam 1989) states that aging persons gradually develop "a shift in metaperspective, from a materialistic and rational vision to a more cosmic and transcendent one, normally followed by an increase in life satisfaction" (p. 60). This motivational change has some consequences, such as a reduction in self-centeredness and in interest in superfluous social interaction and material things, or a shift from egoism to altruism. Once again, older adults' tendency for self-transcendence is highlighted in gerontological theory.

These considerations point to the possibility that older adults' mental health and well-being involve more eudaimonic aspects, as they are related to the fulfillment of particular motivational tendencies. In this regard, an association has been found between wisdom and eudaimonic well-being, suggesting that wise persons' mental health is largely determined by their involvement in values-related meaningful activities (Webster et al. 2014).

A comparison between CBT and ACT suggests that, while cognitive-behavioral therapy is grounded in a somehow more individualistic and self-centered perspective, more focused on hedonic well-being since it aims at decreasing negative affect (anxiety and depression), ACT is more focused on eudaimonic well-being, being aimed at helping people to live their life in accordance with their personal and intrinsic values. As Petkus and Wetherell (Petkus and Wetherell 2013) suggest, this therapeutic objective "may resonate more with older adults" (p. 49). ACT seems to fit better with older adults' tendency for self-transcendence and generativity, to the extent that its main therapeutic objective is precisely to help people fulfill their motivational tendencies. Indeed, there is some evidence that attrition rates are lower among older adults treated with ACT when compared to those who received CBT (Wetherell et al. 2011).

(d) More focus on strengths. In relation to its focus on eudaimonic well-being, and as Petkus and Wetherell (Petkus and Wetherell 2013) suggest, ACT may also be particularly suitable for older adults because it is more focused on and takes more advantage of the person's strengths and resources. Gerontological research evidence reveals aging-related gains and growth in different domains, such

as those of resilience (Gooding et al. 2012) or emotion regulation (Scheibe and Carstensen 2010).

Research Studies on ACT and Aging

The empirical evidence in support of ACT as a helpful therapy for older adults is reviewed in the following paragraphs.

Wetherell et al. (2011) provide data on 12 adults aged 60 or more with a principal diagnosis of Generalized Anxiety Disorder (GAD). Participants were randomized to ACT or CBT individual treatment, consisting of 12 sessions. The authors conclude that an ACT intervention for older adults with GAD is feasible, with reductions in worry and depressive symptoms. They suggest that novice therapists may conduct this type of intervention. However, they reported that the effects on the 7 participants in the ACT intervention in this study were substantially lower than those observed in younger adult samples with GAD. They suggest that an adaptation of the intervention with fewer elements, but relevant to older adults, may increase the effects.

McCracken & Jones (2012) conducted an ACT intervention for 40 participants with chronic pain aged 60 and over. The main aim of the intervention was to increase psychological flexibility. There was no control group or randomization to different interventions. The intervention was delivered over a period of 3 or 4 weeks, 5 days a week, by an interdisciplinary team. Medium to large effects in the expected directions were observed in pain intensity, pain acceptance, physical disability, psychosocial disability, mindfulness, and depression.

Alonso, López et al. (2013) published a pilot study on an ACT intervention for nursing home residents with chronic pain, compared to a control group. Ten older adults participated in the intervention, which was based on a combination of ACT and the Selective Optimization with Compensation Model (Baltes and Baltes 1990), and consisted of ten 2-hour sessions. The results suggest that this intervention was successful for increasing participants' satisfaction with the time and effort devoted to living according to their own values. In addition, participants in the ACT intervention reported a reduction in the belief that medication is the sole or principal treatment for their pain.

Karlin and colleagues (2013) compared an ACT treatment for depression in veterans aged 18–64 and 65-plus who sought treatment for depression. ACT training consisted of up to 16 sessions, and there was no control group. The treatment protocol did not have specific content related to older adults. They found large effect sizes for their intervention, both for older adults and the under-65s. They also reported increases in quality of life and therapeutic alliance.

Other studies have been conducted with samples that included participants from different age groups, including older adults. For example, Wetherell and colleagues (in press), in a study comparing ACT and CBT for adults with chronic pain, found data suggesting that older adults are more likely to respond to ACT, as compared to younger adults, who are more likely to respond to CBT. In addition, they suggest that ACT is particularly appropriate and acceptable for older adults considering that "older adults may have experienced a greater number of failed efforts to reduce their pain; thus, an intervention that focuses on living well with pain, as opposed to pain reduction, may have more appeal to older individuals." McCracken, Sato and Taylor (2013) carried out a study analyzing the effect of an ACT intervention for people with chronic pain. In that study, a significant proportion of the sample was aged 65 or older. The findings showed that the intervention was associated with a decrease in depression, lower disability, higher pain acceptance, and other ratings of overall improvement. Acceptance and Commitment Therapy has also been proposed as a promising therapeutic approach for helping family caregivers of people with dementia. (Márquez-González et al. 2010), through a pilot study of an eight-session ACT intervention for dementia caregivers delivered in group format, found preliminary data suggesting the potential interest of this therapy for helping dementia family caregivers. These promising results have been confirmed in a recent randomized controlled trial

in which the differential efficacy of an ACT intervention and a Cognitive Behavioral Therapy for dementia family caregivers' was analyzed (Losada et al. 2015). Both interventions were delivered in an individual format, and a significant statistical and clinical effect of the ACT intervention was found for the reduction of caregivers' anxiety and depressive symptoms.

Conclusions and Suggestions for the Future

The revised studies point in the direction of supporting ACT as a treatment option that may contribute to helping elderly people suffering distress. However, there is a gap in the availability of outcomes from randomized controlled trials, and there is also a clear need for new research studies aimed at analyzing and identifying the specific processes and action mechanisms involved in ACT interventions (e.g., increase of acceptance, cognitive defusion, clarification of values, increase in values-consistent behavior), which are considered from this approach to be key factors in the explanation of older adults' mental and physical health. In this regard, there are studies showing that mindfulness with older adults is successful for improving mental and physical outcomes (Morone et al. 2008).

Furthermore, there is an important need for further studies developing ACT-based interventions for disorders and psychological problems that are particularly prevalent or disturbing in the aging population, such as depression, anxiety, or grief. Likewise, such interventions should be developed to be implemented in different contexts, including the community, primary care, nursing homes, home care, and so on.

Finally, considering that ACT and CBT are not incompatible, but rather share some components (e.g., skills training, problem-solving, exposure), the development of interventions combining the two approaches, such as that developed by Lunde and Nordhus, may be a good way of providing answers to specific needs presented by older people with psychological problems.

In conclusion, ACT seems to be a promising approach for understanding and treating many psychological problems in the elderly, helping them to: (a) accept and be open to their uncomfortable experiences in the here and now; (b) choose valued life-directions that provide them with meaning and purpose; and (c) take action, engaging in stable patterns of values-consistent behavior.

Cross-References

- ▶ Aging and Psychological Well-being
- ▶ Clinical Issues in Working with Older Adults
- ▶ Cognitive Behavioural Therapy
- ▶ Contextual Adult Life Span Theory for Adapting Psychotherapy (CALTAP) and Clinical Geropsychology
- ▶ Life Management Through Selection, Optimization, and Compensation
- ▶ Motivational Theory of Lifespan Development

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Active Aging

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Synonyms

Aging well; Optimal aging; Positive aging; Productive aging; Successful aging

Definition

The World Health Organization (WHO) defines active aging as "*. . .the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age*" (WHO 2002, p. 12). For many years, the WHO has emphasized healthy aging, primarily defined as aging without major pathologies. In the early 1990s, it has begun developing the concept of active aging, jointly with other governmental and nongovernmental organizations initiatives, offering a policy framework that emphasizes the link between activity, health, independence, and aging well. Active aging emerged as a more comprehensive concept than healthy aging, as it considers not only health indicators but also psychological, social, and economic aspects, which are to be looked at the community level, within gender and cultural perspectives.

Currently the WHO's active aging concept leads the global policy strategy in Europe (Walker 2009). The document produced by the WHO (2002), although not exempt of criticism, was adopted as a guide in many health and social inclusion national plans all over the world and it has definitely changed the dominant approach to old age that for many decades had been grounded in the deficit theories. Some go further considering that it opened the way to a new model of governance of aging (Boudiny and Mortelmans 2011).

History of the Concept

The model of active aging emerged in the aftermath of the demographic changes experienced across most of the western world from the 1950s onward. Its roots date back to the 1960s and to the influential work of Havighurst (1963) in the United States and his activity theory. This author supported the idea that "successful ageing means the maintenance as far and as long as possible of activities and attitudes of middle age" (Havighurst 1963, p. 8), stressing that the maintenance of such activities in later stages of life are associated with higher levels of wellbeing and quality of life. According to the formulation, people should keep active and replace professional activities by others when they have to retire from the labor market, or replace friends by others when the former have died. This activity theory brought an alternative approach to aging in opposition to the theory of disengagement of Cumming and Henry (1961), which considered the mutual withdrawal between old people and society. Eager of a more positive approach to old age, a stage in life that more and more people were achieving, academics and professionals working in the field have welcomed this activity theory and from inception it gathered wide enthusiasm. Later Neugarten (1964) would stress the relevance of being socially engaged and active to age successfully. This became one of the most influential theories to inform aging policies up to the emergence in the late 1980s of the concept of successful aging by Rowe and Kahn (1987, 1997, 1998) in the United States. Slightly more moderate approaches are found in work inspired by the theory of continuity of Atchley (1989) who claims that, despite the importance of maintaining activities of middle age in later life to achieve higher levels of wellbeing in old age, it is not so much the amount of activities that matters but instead the meaning activities carry for the individual. Moreover, alongside the maintenance of meaningful activities, Atchley stresses that processes of adjustment and adaptation also mark later stages of life. Also more moderate is the proposal of Caradec (2007) that offers a conceptual framework to discuss active aging that puts the process

of aging in the crossroads of two opposing forces, the pressure toward disengagement and the pressure toward remaining connected to the world. Managing the tension between these two forces is the challenge of aging (*l'épreuve*). Active aging, in that sense, involves the process but also the outcome of the reorganization of activities that allow us to manage the tension between disengagement and continuity. Caradec further adds that individuals will experience this process differently according to the resources they control, both personal and social (Caradec 2010).

The overarching use of the concept of active aging though was not so much the result of the conceptual developments headed by the academia but rather the outcome of the inclusion of the term in the agenda of some supranational institutions, the one holding the highest impact being the World Health Organization (WHO). The first references to the term active aging can be traced back to some documents issued by the European Union (1999a, b, 2002) and the OECD (2000). In all cases, the term appears alongside the discussion on the challenges of demographic aging. More specifically, active aging is portrayed as the way out from the pressures on welfare systems stemming from the increasing number of older people with some form of dependence or as the way out from the pressures on pension systems.

But the final kick that boosted the concept of active aging to the global arena comes with the WHO declaration on the principles of policy that nations should adopt to promote active aging (WHO 2002). From then onward, there has been a proliferation of policy initiatives at both global, regional, and local levels that follow closely the guidelines put forward by the WHO and that constitute the framework that is taken as a reference across most countries not only for organizations operating in aging-related issues but also for individuals and for the way they experience the aging process.

The Active Aging Model and Its Applications

The concept of active ageing (WHO 2002) is based on three pillars that are mentioned in the definition itself: participation, health, and security. Recently, the International Longevity Centre of Brazil (2015) whose president is Alexandre Kalache, the previous responsible for the active aging approach launched by WHO, released a report titled *Active Ageing: A policy framework in response to the longevity revolution.* In this piece of work, Kalache revises the concept of active aging to incorporate more recent and new developments in life course perspectives. To the original pillars a new one was added – lifelong learning – that supports all the other pillars and puts information as vital to active aging. Besides formal education, and work-related knowledge acquisition, it presents a more inclusive approach to lifelong learning to diminish vulnerability, namely, among older persons.

The proposed model encompasses six groups of determinants of active aging, each one including several aspects: (1) health and social services (promoting health and preventing disease, health services, continuous care, mental health care); (2) behavioral (smoking, physical activity, food intake, oral health, alcohol, medication); (3) personal (biology and genetics and psychological factors); (4) physical environment (friendly environment, safe houses, falls, absence of pollution); (5) social (social support, violence and abuse, education); and (6) economic (wage, social security, work). These determinants of active aging are embedded in cultural and gender contexts. These so-called determinants, appearing in the model are not mutually exclusive and there are overlaps between them, mixing individual as well as societal aspects and transient and life course issues. The WHO (2002) report recommended that health policy for old people be implemented through Health Plans at global regional, national, and local levels.

According to the WHO document on active aging (WHO 2002), the key aspects of active aging are (1) autonomy which is the perceived ability to control, cope with, and make personal decisions about how one lives on a day-to-day basis, according to one's own rules and preferences; (2) independence, the ability to perform functions related to daily living – i.e., the capacity of living independently in the community with no

and/or little help from others; (3) quality of life that "*is an individual's perception of his or her position in life in the context of the culture and value system where they live, and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept, incorporating in a complex way person's physical health, psychological state, level of independence, social relationships, personal beliefs and relationship to salient features in the environment*"(Harper and Power 1998). As people age, quality of life is largely determined by the ability to maintain autonomy and independence and healthy life expectancy, which is how long people can expect to live without disabilities.

There are some distinctive elements in how the WHO defines active aging in terms of its implications for policy design and for all sorts of interventions in aging-related issues. Firstly, the WHO sees active aging as a domain of collective responsibility. Although one could argue that there is also an orientation to individual responsibility phrased in the statement that individuals must participate in certain types of activities and adopt certain types of behavior, ultimately this is conditioned by the opportunities individuals have to fulfill their potential. Optimizing these opportunities is clearly a domain for societal action and opens the space for a discourse on rights and on state obligations. This is further reinforced by the emphasis the WHO puts on the resources that need to be made available to individuals to maximize their opportunities to age with quality of life.

Secondly, the WHO sees active aging as a process that is materialized in a vast array of multidimensional activities and not exclusively in productive labor-market-related activities. This is very relevant as it clearly distinguishes the WHO approach to active aging from the one of other supranational organizations such as the OECD which focuses on labor market productivity issues associated with population aging. Active aging therefore is not just about creating the conditions to postpone the exit from the labor market of older workers (which has been the dominant topic in many national debates on how to face the challenges of demographic aging for social protection systems) but also about considering the economic and the social value added by other activities not directly related to the labor market (e.g., voluntary work, family care). Furthermore, the WHO concept of active aging includes clearly nonproductive activities as examples of activities with which individuals can engage to achieve quality of life as they age (e.g., spiritual activities).

Thirdly, the concept of active aging of the WHO embeds what one could label as an inclusive approach to the process of aging. It acknowledges that processes are formed along the life course and that the way one lives in old age is largely conditioned by prior phases of life and inscribed in individual life trajectories. It also emphasizes that active aging is a bottom-up process where people participate in building the appropriate conditions to age with quality of life. This is quite important as it grounds active aging in the recognition of differences in how people age and in the need to respect and accommodate the specificities of everybody. Finally, it notes that there are individuals that accumulate disadvantages and as such are at higher risk of being deprived from the chances of aging actively. That is the case of those who have physical and/or cognitive impairments or who are disadvantaged economically.

The objective of the WHO model is to guide policies on aging in order to avoid incapacity and its high financial costs for societies that are facing a deep demographic change toward aging. But in doing so, the concept of active aging looks for ways to reconcile the need to contain social and financial costs of aging with the recognition of rights of older people as well as the recognition of the potential to add value to societies along the life course and also in old age.

Operationalization and Evaluation of Policies Versus Evaluation of Individual Outcomes

The concept of active aging is nevertheless a very complex one, and researchers soon began trying to understand what it means to laypeople as well

as finding ways to operationalize and evaluate its applications (e.g., Fernandez-Ballesteros et al. 2010). Bowling reported that the most common perceptions of active aging were having/maintaining physical health and functioning (43%), leisure and social activities (34%), mental functioning and activity (18%), and social relationships and contacts (15%) (Bowling 2008). The predictors of positive self-rated active aging were optimum health and quality of life. More recently, Stenner et al. (2011) described the subjective aspects of active aging by inquiring people about the meaning of the expression "active aging." The authors have shown that most people mention physical activity but also autonomy, interest in life, coping with challenges, and keeping up with the world. Frequently people mix physical, mental, and social factors and stressed *agentic capacities* and living by one's own norms. Stenner et al. (2011) have used this evidence to critically question the deterministic view of the WHO model and have emphasized the need for a "challenge and response" framework, a psychosocial approach to the conflict between facts and expectations and the proactive attitude of people.

In an attempt to test empirically the WHO active aging determinants model, Paúl et al. (2012) arrive to the conclusion that the most important determinants of active aging appears organized in a factor that can be defined as perceived and objective health and independent functioning and a factor where personal determinants like psychological distress, loneliness, personality characteristics, happiness, and optimism emerge as highly relevant to individual active adaptation to the aging process.

In sum, active aging and other similar terms, such as successful aging, positive aging, or aging well, are viewed as scientific concepts operationally portrayed by a broad set of bio-psycho-social factors assessed through objective and subjective indicators as well as being closely related to lay concepts reported cross-culturally by older persons (Fernandez-Ballesteros 2011).

Objective as well as subjective health and functionality seem to be major components of active aging in line with Pruchno et al.'s (2010a, b) findings. By keeping active in the broader sense of the concept, old people can overcome difficulties and keep highly motivated to participate in the social world, and engage in healthy behavior, which in turn has a positive impact in quality of life during the aging process. In line with this, actions targeting active aging have to take into account the prevention of health problems across the life span and the promotion of psychological resilience, avoiding loneliness or increasing happiness and subjective wellbeing. These actions can occur at both the individual and social policy level. Examples of actions at the social policy level are mechanisms that guarantee adequate income and policies to plan retirement and to guarantee the sustainability of pension systems.

Critical Perspectives for the Future

The balance between individual and social responsibility in aging well is probably the key aspect of the active aging model as both contribute to aging outcomes that means people should adopt a healthy life style and stay engaged with society but this can only be achieved in friendly and supportive contexts that guarantee access to a diversity of services and value individual options and dignity.

One major implication of the active aging model as it has been spreading among policy makers is the emphasis it puts on a productivist perspective that focuses mostly on the extension of working life ignoring other forms of nonpaid work (Foster and Walker 2014). The foundational rhetoric of active aging is the recognition of autonomy and capacity of older citizens to engage in meaningful social action, as opposed to disengagement. Therefore it is focused on eliminating age barriers to the participation of older workers in the labor market and it is very hostile to the culture of early exit from the labor market. As a result, it paves the way to a new legitimacy to what is considered successful aging, one that is largely dependent on an almost endless participation in the productive sphere of society (or in some sort of equivalent). In terms of public policies, this translates into pressures toward postponing retirement, into investments in training of older workers,

among others. Authors such as Foster and Walker consider that there are other forms of creation of social value that are outside the realm of the labor market and that need to be included in the public policies forum, such as nonpaid family care and voluntary work. Although these are included in the concept of active aging as dimensions of participation, they have a very shy expression in the policy domain.

Other authors go even further in their criticism of the concept of active aging and emphasize its normative dimension (Boudiny 2013). They argue in that respect that the concept encapsulates a standardized approach to aging as strong as the past approaches that would equate aging to frailty and disengagement. In that sense, today as before, it is about prescribing appropriate and socially desirable modes of aging and as such it is about a model of governance of aging bodies. Remaining active and willing to be active become social norms. Those who do not conform, sometimes for reasons they cannot control, to these social norms of aging are "aging badly."

Despite the criticisms, the model of active aging as a framework to implement individual and societal strategies that foster an aging process marked by quality of life seems to have gathered wide consensus. If those strategies are thought of as multidimensional in their nature, articulating individual and societal responsibilities and focusing on inclusion and participation of all irrespective of age-related constraints or any other constraints, they can pave the way to aging well for the growing generations of people who have higher expectations in terms of the number of years of life they will enjoy but also higher expectations about the quality of life they desire to those years.

Cross-References

- ▶ Activity Theory, Disengagement Theory, and Successful Aging
- ▶ Aging and Psychological Well-Being
- ▶ Aging and Quality of Life
- ▶ Health Promotion
- ▶ Psychological Theories of Successful Aging
- ▶ Psychological Theories on Health and Aging
- ▶ Psychology of Longevity
- ▶ Psychosocial Well-Being

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A

Activity Theory, Disengagement Theory, and Successful Aging

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Synonyms

Activity theory of aging; Disengagement theory of aging; Successful aging

Definitions

Interdisciplinary gerontological perspectives that attempt to explain why some individuals are better able to adapt to the challenges of aging than others.

Activity and disengagement theories of aging were the first to use social science data to explain why some individuals, or groups, are more adaptive or "successful" in meeting the multiple and inevitable challenges of aging than other persons. These theories for the first time focused on social, psychological, and interpersonal factors in addition to more observable physiological and medical conditions of aging. They also called attention to the positive and healthy aspects of aging rather than frailty, decline, and decrement – which was the focus at the time, not only of the medical establishment in geriatrics but also within social services and public policy for the aged. The debates following activity and disengagement theories changed scientific discourse, service delivery and policy in the decades following 1960, providing evidence of the power of theories to alter research and practice in gerontology.

Activity and disengagement theories were based on a developmental perspective applied to later life, a view that aging involved a progression from one stage to another rather than a decline from middle age to an end state. These theories also involved an interdisciplinary perspective on aging – based on medical/physiological data on age-related conditions, but also psychology, sociology, and later social work perspectives on functioning. These were immense contributions to the developing field of gerontology in the 1950s and 1960s.

Activity Theory of Aging

Activity is any "regulated or patterned action beyond routine physical or personal maintenance" (Lemon et al. 1972; Havighurst 1961). Types of activity include interaction with family and friends, participation in organizations, and more solitary recreational activities like reading, watching television, and doing household chores. The basic premise of activity theory of aging is that individuals should maintain the activities and orientations of middle age for as long as possible, and then find substitutes for those activities which

they must give up as they age in order to maintain high life satisfaction in retirement (Havighurst 1961). According to the theory, active engagement in various new roles (e.g., taking up volunteer activities following retirement) is "successful adaptation" to aging.

Activity theory goes something like this: As people age they experience life events such as widowhood, failing health, and retirement that reduce participation in normative mid-life social roles. If uncompensated, these "role losses" lead to lower activity, which may result in lower life satisfaction and functional decline, particularly when the event, such as retirement, is not the individual's choice. According to activity theory, people should find substitute roles for the work and parenting roles they left behind in mid-life in order to maintain their sense of self-worth. Active engagement in new social roles appropriate for older adults – volunteering, grandparenting – is further reinforced by cultural norms, fostering personal feelings of self-worth and higher life satisfaction in older age (Lemon et al. 1972; Havighurst 1961).

Activity theory was first proposed based on empirical evidence by Havighurst and Albrecht in their 1954 book, *Older People* (Havighurst and Albrecht 1953). Their data, drawn from the first large-scale American social survey of the elderly, showed that older adults who participated in appropriate social roles for the aged, like spending time with grandchildren and attending church, were happier and more adjusted in later life than those who were not similarly engaged in social roles. Thus, social engagement was seen as a causal factor in maintaining high levels of "adjustment," or life satisfaction, in the later years.

Activity theory was labeled an "implicit" theory of aging (Havighurst 1961) because it naturally guided most medical and social work practice in the Post World War II era – and still does, to some extent, since it so well reflects American values of productivity and the desire to remain youthful (Bengtson and Kuypers 1971). Activity theory offered a conceptual justification underlying many programs for the elderly, influencing the passage of the Older Americans Act in 1965.

It was not until much later that a systematic empirical test of the theory was provided by Lemon, Bengtson and Peterson in 1972. They amplified the concepts and mechanisms of the theory and developed a set of axiomatic statements based on social theorist George Herbert Mead's symbolic interactionist theory. These axioms articulated how activities provide role supports that help sustain positive self-concepts leading to higher life satisfaction. They postulated that the greater the activity level – formal social activities like participating in organizations, informal activities such as getting together with friends, or solitary activities such as reading – the greater the role support one will receive. The more role support one receives, the greater the contribution to a positive self-concept, leading, in turn, to higher life satisfaction in later life. Six hypotheses were derived from these axioms and tested with data. Only one – high levels of informal social activity such as with friends, family, and neighbors – was positively related to life satisfaction for elderly persons. Other activity types – high formal activity in organizations, for example; or high solitary mental activity such as reading – were not significantly related to life satisfaction (Lemon et al. 1972).

In 1982, Longino and Kart replicated the Lemon et al. (1972) study using a more socioeconomically diverse sample (to avoid its possible middle-class bias) and included more in-depth measures of activity (asking respondents to reconstruct the previous day's activities from morning through bedtime). They found, again, that informal social activities with friends and family had a positive effect on life satisfaction in all socioeconomic groups, but that formal activities such as attending group meetings were *negatively* associated with life satisfaction. Solitary activities, like reading, writing and watching television, had no effect (Longino and Kart 1982).

Reitzes, Mutran, and Verrill extended activity theory using more direct measures of role support and examined whether certain activity types increase self-esteem in later life (Reitzes et al. 1995). Only leisure activities were positively associated with self-esteem. There were considerable gender differences mediating

the relationships; that is, for men, solitary activities were significantly related to positive self-esteem, and for women, activities with relatives and work friends were significant as were other types of activities when commitment to the role was high.

Further support for Lemon et al.'s (1972) study of activity theory was found in an English context. Knapp (1977) found a significant relationship between informal activity (the hours per week spent with friends and family) and life satisfaction, but the association between formal activities and solitary activities with life satisfaction was weak (Knapp 1977). More recently Zaraneck and Chapeleski (2005) reported some support for the theory in a study of casino gambling as a social activity among urban elderly, although participants who visited the casino most frequently (monthly or more) reported poorer social support and less participation in other social activities than the infrequent gamblers (Zaranek and Chapleski 2005).

In short, it is surprising that so few empirical studies to date have tested the principal assertion of activity theory – that maintaining levels of socio-emotional engagement is associated with a sense of life satisfaction among older individuals. This is the basis of the activity theory of aging, yet only engagement in informal activities has received sufficient empirical support, suggesting that different forms of activity have a different impact on life satisfaction. Despite lack of robust evidence for all types of activity participation, this perspective is still the predominant view of how to age successfully in the United States. Activity theory fits well with American cultural values (Keep active! Be productive!) and has received new life in recent years within the much-publicized "successful aging" paradigm reviewed at the end of this chapter.

Disengagement Theory

In *Growing Old* (1961), Elaine Cumming and William E. Henry described disengagement as, "An inevitable mutual withdrawal or disengagement, resulting in decreased interaction between the aging person and others in the social systems he belongs to" (Cumming and Henry 1961). This was the first formal attempt to explain normal or "successful" late life development from a perspective that combined psychodynamics with social systems analysis in the tradition of Durkheim and Talcott Parsons. Adults who disengaged were viewed as well adjusted; those who did not were social "impingers" (Cumming 1963).

The ideas of disengagement theory were first articulated by Cumming and Henry in 1959, a few years after they had joined Havighurst's University of Chicago team. Cumming, a sociologist, and Henry, a psychoanalyst, developed their concepts while analyzing data from Havighurst's Kansas City Study of Adult Life, an interdisciplinary community-based investigation to examine health, employment, leisure, and civic participation activities of older adults (Achenbaum and Bengtson 1994).

The concept of disengagement reflected Durkheimian functionalist theory by way of Talcott Parsons, which was the reigning theoretical paradigm in American sociology in the 1950s and 1960s. According to disengagement theory, as individuals age there is a gradual but inevitable constriction in "social life space," evidenced by declines in the number of social partners and frequency of social interactions. At the same time there is withdrawal from social institutions (transition from work to retirement). Disengagement, therefore, is functional for both the social system and for the individual: It prepares society for the loss of the individual through the disengagements of retirement and then death; it prepares the individual for death through progressive disengagement from society (role loss). Thus, through this process of mutual withdrawal there is no disruption to the social equilibrium (Cumming and Henry 1961; Cumming 1963; Achenbaum and Bengtson 1994).

According to Cumming and Henry, disengagement is partially explained by older adults' internalization of Western cultural values that esteem youth over age – primarily vitality, productivity, and efficiency. Withdrawal is thus regarded as an obligation to the functional maintenance of the social system because it allows younger generations to replace older adults in positions of

increasing power and importance. Disengagement is also caused by increasing physical frailty and by psychological changes involving a greater interiority of experiencing – a psychic turning inward. According to *Growing Old*, the process is inevitable, irreversible, and universal – it happens to older people in all cultures and throughout all time periods (Cumming and Henry 1961).

The reception disengagement theory received from the gerontological community was immediate – and negative, particularly among sociologists. Maddox (1964) criticized Cumming and Henry's claim that disengagement theory is intrinsic and inevitable, noting the considerable variability between study participants in the indicators of psychological and social disengagement once age was held constant (Maddox 1964). Rose (1964) was concerned with the ethnocentric assumption that disengagement is universal across societies and across time. He contended that disengagement emerged as a function of American culture, arising from Western trends in longevity and institutions like Social Security that created a new and special role for the aged (Rose 1964). Neugarten (1969) herself a part of the University of Chicago research team but who was critical of her colleagues' psychoanalytic focus, suggested that disengagement theory ignored the heterogeneity of older people noting that the Kansas City panel was comprised largely of White, upper-middle class adults. She also claimed that disengagement theory discounted the impact of social status and social structure on the aging experience (Neugarten 1969). Bengtson (1969) questioned the functionalist assumptions of the universalistic processes of disengagement. Using data from a subsequent University of Chicago cross-national study of aging directed by Havighurst and Neugarten, Bengtson showed that disengagement was not universal across societies nor across occupational groups of retirees. Instead, there were a variety of socio-emotional activity patterns – some high, some low – that linked to high levels life satisfaction (Bengtson 1969).

Fifteen years after its initial statement, the debate over disengagement theory was still going strong. Hochschild (1975) presented a conceptual critique, arguing that disengagement theory was non-falsifiable – individuals who didn't disengage were simply labeled "unsuccessful" and maladjusted, rather than considered as counter evidence to the theory. In addition, disengagement theory presents a deterministic view of successful aging. It assumes that if older adults willingly disengage, that this is advantageous to both them and to society (Hochschild 1975).

This barrage of criticism left disengagement theory with few researchers who appeared motivated to test or modify the theory further, and the term disengagement theory appears very seldom in current gerontological research literature. However, its development represented an important historic milestone in gerontology. As a theory, as an explanation for normal human aging, it was parsimonious, data driven, and logically explicit – in short, scientific. The upshot of the disengagement theory is that it set the stage for the formulation of other gerontological theories (Achenbaum and Bengtson 1994), most notably Socioemotional Selectivity Theory (Carstensen 1995), which represents in some respects a logical extension of disengagement theory. Carstensen (1995) noted that the declines and withdrawals were not universal across all realms of engagement, but rather selective as older people decided where to place their emotional bets and where to cut their losses. This involved *socioemotional* selectivity, a process by which older people optimize coping strategies (Carstensen 1995).

Successful Aging as a Concept or Theory

In 1961, Robert Havighurst published a journal article that introduced the term "successful aging" to the gerontological literature (Havighurst 1961); 28 years later, John Rowe and Robert Kahn published their immensely-successful book by the same title, *Successful Aging* (Rowe and Kahn 1998). Havighurst's conception of successful aging is reflected in the "activity theory" summarized above (Lemon et al. 1972; Havighurst 1961). Many of these same ideas are reflected in Rowe and Kahn's formulations for successful aging (Rowe and Kahn 1987, 1998).

Rowe and Kahn (1998) argued that most research on aging normalizes the disease process as a natural part of growing old but does not sufficiently account for differences in lifestyle, nutrition, exercise, social support, and social structure that moderate the effects of aging and determine the extent to which a person becomes disabled or ill. They classified normal aging as either *usual* or *successful*. In usual aging, extrinsic factors such as poor diet, lack of exercise, and poverty accelerate the effects of aging alone; whereas in successful aging, extrinsic factors play a neutral or positive role. These two pathways are differentiated by extrinsic factors only; Rowe and Kahn argue that there are no intrinsic factors innately linked to chronological age. In other words, disease and disability are age related, not age dependent.

Rowe and Kahn (1998) suggest that the three components of successful aging are (1) avoiding disease, (2) engagement with life, and (3) maintaining high physical and mental functioning. A person can meet these three criteria by eating healthy foods, exercising regularly, and remaining socially and intellectually active through close interpersonal relationships and productive activities that provide meaning to the older person. A major tenet of the successful aging paradigm is that aging is plastic; that is, individuals have the capacity to modify their aging trajectory through changes in lifestyle, nutrition, and other behaviors.

While Rowe and Kahn (1998) emphasize activity and social engagement as components of successful aging, they do not acknowledge Havighurst's prior theoretical work in activity theory nor the empirical work that failed to support activity theory. They also fail to explicitly discuss the contributions of disengagement theory, or how social structures and economic forces act to expand or constrict an individual's ability to age successfully according to their three principles. These are agendas for future work on the "successful aging" paradigm.

Rowe and Kahn's work transcended the academic community and was immensely popular among general audiences. A major contribution of their ideas is that they explicitly linked sociological and psychological processes to biological outcomes: an expansion of Havighurst's early conception of "successful aging." Also, Rowe and Kahn's ideas reflect the growing focus on life course theories of aging, including cumulative advantage/disadvantage theories that guide much of the research on individual aging today.

Conclusion

Activity theory, disengagement theory, and successful aging advanced the field of gerontology in important ways. First, all three perspectives focus attention on normative and positive aging, rather than aging as a disease. In the 1960s, disengagement and activity theories shifted the medical/physiological focus on human aging to research exploring the social and emotional lives of older adults. Decades later, Rowe and Kahn's successful aging paradigm combined the biological aspects of aging with psychosocial factors, thereby advancing interdisciplinary perspectives on aging and promoting the application of life course and developmental theories to gerontology.

Whereas the scientific community quickly dismissed disengagement theory, the principles of activity theory – mainly that older adults should stay active to remain satisfied with life – gained momentum and influence much of the research on aging today. Activity and successful aging theories profoundly influenced public policy and the development of health and social services for the aged. The ideas also guide popular discourse on how people can "successfully" adapt to the changes associated with aging, reflected in our culture's persistent desire to remain fit, productive, and mentally sharp. In addition to shaping policy, disengagement, activity, and successful aging theories helped establish gerontology as a discipline and older age as a unique stage of life.

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Adaptive Resources of the Aging Self, Assimilative and Accommodative Modes of Coping

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Synonyms

Adaptation to disability and loss; Benefit finding; Flexibility; Goal adjustment; Goal pursuit; Resilience; Sources of meaning; Tenacity

Definition

Resilience and well-being across the life-span hinge on the balanced interplay between two adaptive processes: On activities through which individuals try to achieve goals and maintain a desired course of personal development (assimilative activities), as well as on the adjustment of personal goals to changing action resources (accommodative processes). The concepts of assimilative persistence (or tenacious goal pursuit) and accommodative flexibility (or flexible goal adjustment) refer to individual differences in these two modes of coping.

A person's life course is generally a mixture of intended action outcomes and unintended events, of gains and losses; the balance of these factors varies on historical as well as in individual-ontogenetic dimensions of time. Given this general fact about personal development, notions of positive development and successful aging cannot be simply defined in terms of efficient goal pursuit and avoidance of loss. Rather, a comprehensive theoretical explication of these concepts also needs to consider how people cope with divergences between desired and factual developmental outcomes, how they adjust goals and ambitions to changing developmental resources and constraints, and how they can disengage without

lasting grief or regret from desired life paths that have remained unaccomplished.

Among older adults, personal potentials of action and development are often constrained by functional losses, by a shrinking of social and material resources, and not to the least by the fading of time yet-to-be-lived. Contrary to expectations, however, longitudinal and metaanalytic studies have found considerable stability in measures of well-being and subjective life quality in the transition to old age (Brandtstädter et al. 1993; Diener et al. 1999). The apparent resiliency of the aging self against experiences of loss and constraint may be considered as a further example of the so-called paradoxes of satisfaction that have often been reported in research on well-being and happiness; it becomes less paradoxical when paying heed to the dynamics of changing and adjusting ambitions and to the interplay between goal pursuit and goal adjustment.

To integrate these aspects, the dual-process model of assimilative and accommodative coping (DPM) has been proposed (Brandtstädter 2006; Brandtstädter 2007; Brandtstädter and Greve 1994; Brandtstädter and Renner 1990; Brandtstädter et al. 1998). Both modes of coping reduce goal discrepancies and divergences between actual and desired conditions of personal development, but do so in different ways. In the assimilative mode, the individual tries to avoid or diminish goal discrepancies and developmental losses by instrumental, self-corrective, or compensatory activities. A second way of neutralizing discrepancies between actual and desired states consists in adjusting goals and ambitions to given situational conditions and constraints. These latter accommodative processes involve disengagement from blocked goals and the lowering of aspirations; they come into play when active-assimilative efforts become difficult or remain futile.

The frame of personal goals and ambitions on which people base their evaluation of self and personal development changes over the life course; according to the DPM, it tends to change in ways that help to maintain a positive outlook on self and personal development. In developmental settings and phases of life that involve changes in personal resources of control, the balanced interplay between assimilative and accommodative processes becomes a key criterion of resilience; old age is a prototypical example.

Outline of the Dual-Process Model

The model of assimilative and accommodative coping braids together action-theoretical and developmental perspectives. Both processes are basic to the life-long process of intentional self-development (Brandtstädter and Lerner 1999; Greve et al. 2005). In contrast to assimilative activities, however, accommodative processes need not, and often cannot, be intentionally activated. Although one may eventually be able to change personal preferences, ambitions, or beliefs by strategies of self-management (which would already count as assimilative activities), one cannot bring about such changes by a simple act of will. This draws attention to the automatic mechanisms that subserve accommodative processes.

Assimilative activities: Assimilative activities comprise all types of intentional behavior through which people try to achieve or maintain a desired course of personal development; in later life, maintenance of resources and valued competences through prevention or compensation of loss become increasingly important as targets of assimilative effort. In the assimilative mode, attention is focused on information that seems relevant for effective goal pursuit, and cognitions that support or help to maintain an intended course of action become more available: Attractive aspects of the goal as well as beliefs related to personal efficacy and the attainability of goals are emphasized, whereas stimuli or enticements that could distract from a chosen course of action are blunted out. When obstacles impede goal attainment, cognitive resources and action reserves are mobilized, which is often supported by a reactant increase in the valence of goals.

A key feature of assimilative modes of coping is the tenacious adherence to goals. Assimilative efforts will have beneficial effects as long as personal goals are commensurate with action resources; in cases of mismatch, the intentional focus of assimilation may shift toward expanding action resources and acquiring new skills or knowledge that may be relevant to efficient goal pursuit, and eventually to activities of optimization or compensation. Optimizing and compensatory activities mark a late state of assimilative effort; they often draw on resources that are themselves subject to age-graded loss. Under conditions of progredient loss and constraint, assimilative efforts may first increase, but then drop gradually when the costs of further goal pursuit outweigh the benefits (Brandtstädter and Rothermund 2003; Brandtstädter and Wentura 1995).

According to prevailing clinical notions, feelings of helplessness and depression arise when goals and desired self-representations drift out of the feasible range; from the perspective of the dual-process model, however, this is the critical point where the system shifts toward accommodation.

Accommodative processes: The attractive valence of goals largely derives from their relation to other goals and values; eventually goals may remain attractive even when the individual sees no way to attain them. Maintaining a commitment to barren goals, however, becomes maladaptive when it impedes reorientation toward other more promising goals. Accommodative processes counteract such states of escalated commitment. While assimilative activities are driven by the hedonic difference between current situations and intended goal-states, the adaptive function of accommodative mode essentially consists in deconstructing this difference. Facets of accommodative coping include the downgrading of, and eventually disengagement from, blocked goals, as well as a rescaling of ambitions and self-evaluative standards – processes that promote the readiness to accept given circumstances and redirect action resources toward new goals. In sum, the key characteristic of the accommodative mode is the flexible adjustment of goals and ambitions to losses and constraints as they arise from age-graded as well as from historical changes, but likewise from critical life events that affect physical, social, and material resources.

As regards cognitive mechanisms, the accommodative mode involves an increased availability of cognitions that shed doubt on the attractiveness and attainability of the blocked goal, thus enhancing a positive reappraisal of the given situation. A heuristic-divergent, bottom-up mode of information processing supersedes the more top-down, convergent mindset that characterizes assimilation; the attentional field widens and becomes responsive again to stimuli and action tendencies that have been warded off in the assimilative phase.

Moderating conditions: Problems of depression and rumination indicate that the shift from assimilative to accommodative modes of coping is not always a smooth one. The DPM specifies personal and situational conditions that may selectively enhance or impede the two modes of coping. Generally, people find it more difficult to give up goals that are central to their identity and not easily substitutable by equivalent alternatives. A high degree of self-complexity, i.e. a diversified and multifocal structure of personal projects, can thus enhance accommodation. Furthermore, availability of cognitions that supports a positive reappraisal of initially aversive circumstances, as well as low beliefs of control over the critical situation, facilitate the accommodative process, but weaken the motivation to invest assimilative effort. People harboring strong self-beliefs of control are typically more enduring to reach a goal and to overcome obstacles; at the same time, however, they are more prone to unproductive persistence and more likely to miss alternative options. While partly converging with theoretical positions that emphasize the benefits of strong self-beliefs of control, the DPM also highlights potential negative effects. Such side-effects may also account for counterintuitive findings of positive correlations between measures of perceived control and depression (e.g., Coyne 1992).

Implications for Successful Aging

Although assimilative and accommodative processes are antagonistically related, they can synergistically complement each other in concrete episodes of coping: Problems such as bodily impairment, chronic illness, or bereavement constitute a multifaceted complex of problems that often call for different ways of coping. Under limited action resources, disengagement from some goals can also facilitate the maintenance of other, more central ones. Conflicts between assimilative and accommodative tendencies may occur when goal-related efforts reach capacity limits. Such critical constellations often arise in late life, when questions of how, and into which projects, scarce action resources and life-time reserves should be invested become an acute concern. When important goals are at stake, the wavering between holding on and letting go is experienced as stressful. The accommodative process, however, engages cognitive mechanisms that eventually dissolve such conflicts.

Dispositional differences: Individuals differ in the degree to which they prefer, or tend to use, assimilative or accommodative ways of coping and life-management. To assess such interindividual differences, two scales are used: Tenacious Goal Pursuit (TGP) as a measure of assimilative persistence and Flexible Goal Adjustment (FGA) as a measure of accommodative flexibility. TGP and FGA constitute largely independent facets of coping competence, showing slightly negative or close to zero intercorrelations in most studies. Across all age levels, however, both scales show substantial positive correlations with measures of subjective life quality such as satisfaction, optimism, self-esteem, or emotional stability (Brandtstädter 2006; Brandtstädter and Renner 1990). Assimilative persistence and accommodative flexibility apparently improve the affect balance in different ways; while TGP seems to enhance positive affect, FGA dampens negative affect (Coffey et al. 2014; Heyl et al. 2007).

At the same time, however, TGP and FGA show opposed regressions on the age variable, which points to an increasing dominance of accommodative over assimilative modes of coping in late adulthood. Considering the fading of action resources and the cumulation of irreversible losses in later life, this pattern conforms to theoretical predictions. A broad array of findings attests to the particular importance of accommodative flexibility for coping with age-typical problems. In moderated regression analyses, FGA has been found to dampen the negative emotional impact of losses and constraints; such buffering effects have emerged with regard to bodily impairments, health problems, losses in sensory functions, chronic pain, and problems of bereavement (e.g., Boerner 2004; Darlington et al. 2007; Kranz et al. 2010; Seltzer et al. 2004; Van Damme et al. 2008). Flexible individuals adjust their desired self more stringently to their actual self, and negative experiences in specific areas of life compromise the overall sense of well-being to a lesser degree among individuals scoring high in FGA.

A tendency to find benefits in adversity has been reported for cancer patients, accident victims, and other disadvantaged groups (Affleck and Tennen 1996). The DPM, however, does not imply a general tendency toward benefit finding. Positive reappraisals of an aversive situation would inhibit active problem-solving efforts; accordingly, the DPM proposes that palliative cognitions are more strongly expressed in the accommodative mode when aversive circumstances seem irreversible. In line with these assumptions, higher scores in the FGA were found to predict an increased availability of uplifting thoughts when subjects are confronted with threatening scenarios. Furthermore, flexible individuals are less negatively affected by the prospect of fading life-time reserves, and connotations of being old become more positive with advancing age (Rothermund et al. 1995; Wentura et al. 1995).

Although accommodative processes are triggered by a loss of control over particular goals, they can contribute to maintaining self-beliefs of control in later life. Notions of self-efficacy and control imply confidence in the attainability of

personally important goals; when such goals are no longer attainable, reducing their importance can thus help to preserve a general sense of efficacy. Considering the age-related increase of accommodative tendencies, this rationale can account in part for the stability of self-percepts of control in later life, which has repeatedly been reported (e.g., Grob et al. 1999).

Over the life span, flexible goal adjustment also enhances developmental transitions and role changes, which often require a restructuring of goals and life plans. For example, people scoring high in FGA have fewer difficulties to adjust their goals and maintain personal well-being after retirement; this holds in particular when goal changes are in accordance with the demands of the new situation (cf. Nurmi and Salmela-Aro 2002; Trépanier et al. 2001).

Further implications of the DPM for positive development and successful aging concern issues of depression, rumination, and regret.

Depression and rumination: People harboring strong self-beliefs of personal control and efficacy are more persistent in their efforts to cope with stressful events, and are less vulnerable to depression; the positive relationship of the TGP scale with measures of well-being converges with this well-established assumption. The DPM suggests that another important risk factor that contributes to strength and duration of depressive episodes is the inability or reluctance to let go of barren goals and life projects. At the same time, however, the model highlights possible adaptive functions of depressive mood states: The behavioral inhibition that typically accompanies them can weaken unproductive persistence and the escalating of commitment. Furthermore, a mindset of depressive realism tones down positively biased assessments of personal efficacy and of the benefits of goal attainment, biases which support assimilative persistence. From this theoretical perspective, depressive reactions not only indicate problems of shifting from assimilative to accommodative modes of coping, but at the same time can mediate this shift.

Similar arguments apply to processes of rumination, which often are part of the depressive syndrome. Ruminative thinking eventually helps to find solutions to given problems; when it yields no results, however, attainability beliefs should be weakened and accommodative tendencies be activated. The TGP and FGA scales predict corresponding differences in ruminative styles; among people disposed toward assimilative persistence, ruminative thought primarily revolves around possible problem solutions, whereas it seems more strongly oriented toward positive reappraisal and benefit finding among flexible individuals (see Brandtstädter 2007; Brandtstädter and Rothermund 2002).

Counterfactual emotions, regret: Feelings of anger, disappointment, or regret typically occur when one believes that a given undesired course of events was avoidable; thus, they can help to avoid similar mistakes in the future. Moreover, anticipated regret can shield goal pursuit against situational enticements; such anticipations typically tend to overpredict the strength and duration of regret (Gilbert and Wilson 2000). From the perspective of the DPM, this bias can be explained as a joint result of the tendency to accentuate the aversiveness of failure during goal pursuit, and of processes that reduce attractiveness of goals after such failure.

Feelings of disappointment and regret indicate a persisting attachment to opportunities and goals that have remained unachieved; they tend to lose their adaptive value in late life when repairing past mistakes becomes more difficult. In the process of life-review, accommodative flexibility can thus help coming to terms with untoward biographical outcomes. In line with this assumption, the FGA scale has been found to dampen ruminative regret; this effect is particularly strong when mistakes seem irreversible (cf. Brandtstädter 2006; Brandtstädter and Rothermund 2002).

Accommodating Meaning Perspectives and Final Decentration

Our activities gain motivating meaning from future-related projects; we generally assume that we will experience the outcomes of our actions and decisions. When this basic assumption becomes questionable, personal goals and

existential orientations should be profoundly affected. Loss of future meaning can breed feelings of depression and void; accommodating personal goals and life-plans to fading life-time reserves prevents such consequences. More specifically, the experience of a shrinking personal future should induce tendencies to de-emphasize, and eventually disengage from, goals centering primarily on future benefits. At the same time, it can promote an orientation towards more intrinsic, time-transcendent sources of meaning; moral or religious ideals, as well as altruistic and socio-emotional strivings, may be considered as examples.

Questionnaire studies in fact suggest that in the transition to old age, strivings of power, achievement, and competence are increasingly outranked by goals related to spirituality, altruism, and intimacy. Accommodation-theoretical perspectives suggest that the shift toward intrinsic, value-related goals primarily depend on an increasing awareness of life's finitude. This is substantiated by experiments with younger samples where mortality was made salient by a questionnaire that addressed issues of death and dying (e.g., how one would deal with a serious illness). Effects on subsequently assessed value orientations were largely similar to age-related effects, suggesting a weakening of individualistic and egocentric strivings; at the same time, tendencies of assimilative-offensive coping were significantly reduced (cf. Brandtstädter 2007; Brandtstädter et al. 2010). It is of note that clinical studies with patients suffering a terminal illness have reported a similar change toward unselfish, altruistic goals (e.g., Coward 2000).

A growing awareness of life's finitude in later life thus seems to enhance an orientation toward timeless, self-transcendent values; this particular accommodative process has been denoted as "final decentration" (Brandtstädter et al. 2010). An orientation toward time-transcendent contexts of meaning and the dampening of a sense of self-importance are often considered to be hallmarks of wisdom. Philosophical as well as psychological definitions have emphasized sensitivity for the limitations of knowledge and its importance for finding the right balance between engagement and disengagement (e.g., Baltes and Staudinger 2000; Wink and Helson 1997) – or, as one could also put it, between assimilative and accommodative modes of life-management and coping.

Conclusion

The model of assimilative and accommodative coping suggests that resiliency and well-being in later adulthood basically depend on the interplay of two adaptive processes: On activities that aim at preventing losses and maintaining a desired course of personal development, as well as on the flexible adjustment of personal goals and ambitions to situational constraints. These adaptive processes are functionally antagonistic, but not mutually exclusive; rather, they constitute complementary modes of maintaining self-continuity and self-esteem. The model applies to the entire life span; it specifies moderating conditions affecting the two basic processes of coping and the balance between them, thus providing a basis for explaining individual differences in coping with developmental transitions, functional losses, and critical life events. The explanatory range of the model extends to phenomena of benefit finding, rumination, regret, as well as to issues of wisdom and self-transcendence.

Cross-References

- ▶ Aging and Psychological Well-Being
- ▶ Life Span Developmental Psychology
- ▶ Psychology of Wisdom
- ▶ Self-Theories of the Aging Person

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Advocacy with Older Adults

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Synonyms

Advocacy; Influencing policy; Political action; Political engagement

Psychologists have significant training in science and/or clinical practice but often have less formal preparation and hands-on experience in policy and advocacy. While most psychologists have not received formal training in policy and advocacy, an understanding of and involvement in policy and advocacy activities can have a positive impact on their professional identities and on the lives of the older adults whom they serve. Such policy and advocacy engagement can also help to raise awareness of the contributions of psychological research and clinical practice in meeting the needs of older adults and marshal much needed resources for this growing segment of the population in the USA and around the world.

The Role of Policy and Advocacy in Geropsychology

Professional psychology and geropsychology, in particular, have identified an important role for policy and advocacy efforts across the professional lifespan. In fact, several recent professional guidance documents have included specific reference to policy and advocacy as important components of competency in geropsychology. First, Guideline 2.0 of the American Psychological Association (APA) Guidelines for Psychological Practice with Older Adults (2013) states "Psychologists strive to be knowledgeable about public policy, state and federal laws and regulations related to the provision of and reimbursement for psychological services to older adults and the business of practice. The health care landscape continues to change. Psychologists who serve older adults are encouraged to be alert to changes in health care policy and practice that will impact their professional work including practice establishment, state laws that govern practice, potential for litigation, and reimbursement for services" (American Psychological Association 2014). Next, the Pikes Peak Model for Training in Professional Geropsychology includes language that urges geropsychologists to "apply scientific knowledge to geropsychology practice and policy advocacy" which is viewed as a leadership skill to be encouraged through training, mentoring, and career development (Knight et al. 2009). Increasingly, the geropsychology community is incorporating policy engagement and advocacy as a key component of professional identity and competence.

How Can Geropsychologists Engage in Advocacy?

There are several key elements of getting involved in advocacy, including identifying policy issues of interest, communicating and developing relationships with policymakers, providing scientific and clinical expertise to inform the policymaking process, and participating in political activities (American Psychological Association 2012). Policy engagement and advocacy may occur at the local, state, national, and international levels.

Many geropsychologists work individually and with colleagues to advocate for improvements in health and aging policies in their states and

localities. At the local level, geropsychologists serve on advisory boards of organizations such as the Alzheimer's Association, senior centers, and Area Agencies on Aging and connect with their legislators in their communities. APA's Science Directorate is building upon this focus of developing local connections with its "Stand for Science" campaign in which advocacy-trained scientists meet face-to-face with their legislators in their local offices or bring legislators and staff in to tour their campus research labs. It is hoped that the real-world value of the research that policymakers are exposed to during such interactions will help them better understand psychological science's contributions to improving health and vitality.

Geropsychologists also work alongside national organizations to impact aging policy at the national level. They have and continue to play an important role in informing and influencing the development and implementation of federal laws and initiatives related to the provision of health and aging services and support for aging research. They urge policymakers to modify existing law or enact new laws to support psychologists in addressing the needs of the older adults whom they serve. The geropsychology community has also been active in commenting on draft strategic plans of government agencies and institutes to direct greater attention to, and funding of, aging-related programming and behavioral and social science research. Examples of such advocacy include efforts to improve psychologist reimbursement rates under Medicare, amend the Older Americans Act to include a greater mental health services authority, expand the focus of the first National Plan to Address Alzheimer's Disease to include greater attention to the critical behavioral and social aspects of this disease, and authorize a comprehensive federal approach to combating elder abuse and neglect. In addition, over the last four decades, psychologists have worked to inform and influence White House Conferences on Aging (WHCoA), an important forum designed to develop recommendations for research and actions related to aging. Organizations that play a leadership role in national aging policy and advocacy in the USA include APA and its aging divisions and sections, other professional organizations such as Psychologists in Long-Term Care and the Gerontological Society of America, and national coalitions such as the Elder Justice Coalition, the Eldercare Workforce Alliance, and the National Coalition on Mental Health and Aging.

Next, engagement from the geropsychology community on critical legal issues being considered before the courts or by judicial and legal reform task forces has also served as an important form of advocacy. These efforts often occur in collaboration with professional organizations or other stakeholder groups with common interests. Geropsychologists can participate in the preparation and submission of amicus briefs, which are "friend of the court" briefs that an individual or group who has an interest in the matter (but who is not a party to a lawsuit) can petition with the intent of influencing the court's decision. In addition, psychologists can utilize psychological science to inform policy change in elder law at the state and local levels. For example, psychologists representing APA collaborated with the American Bar Association and the National College of Probate Judges to develop a series of handbooks, including *Judicial Determination of Capacity of Older Adults in Guardianship Proceedings* (American Bar Association Commission on Aging et al. 2008). This document in turn helped to inform development of a more detailed medical certificate (guardianship and conservatorship evaluation form) in the state of Massachusetts effective in 2009, which requires information relative to the clinical diagnosis, decision-making impairment, and functional impairment of the individual, as well as the individual's values and social and risk factors and the interaction of the individual with his or her environment. Templates and processes from the *handbook* are now being utilized in other states as well as probate courts in Canada and Australia to assist in the determination of whether older adults retain their rights to self-determination.

The psychology and aging community also engages in policy development and advocacy at the global level. These opportunities include participation in efforts of the United Nations

(UN) and its Committee on Ageing, the International Association of Gerontology and Geriatrics, and HelpAge International. Professional organizations, such as the APA and others, are accredited nongovernmental organizations (NGO) at the UN. This designation affords such groups special consultative status with the UN Economic and Social Council (ECOSOC), among other benefits. APA appoints psychologists to represent the organization within the NGO community at the UN headquarters in New York. These representatives work to identify issues, organize programs and draft statements that bring psychological science and a psychological perspective to bear on global policies and programs, foster dialog and information exchange between psychologists/APA and UN diplomats/UN agencies, and serve as APA's conduit for information about the UN (American Psychological Association 2015a). Both APA and the International Council of Psychologists are members of the NGO Committee on Ageing that works to raise world awareness of the opportunities and challenges of global aging. Its advocacy efforts have included support for adoption of the UN Principles for Older Persons, input to the development of the Madrid International Plan of Action on Ageing (2002), and a focus on the development of a UN Convention on the Rights of Older Persons. Proponents of this convention, which is a multilateral agreement binding under international law second only to a treaty in formality (United Nations 2015), believe that older adults should be explicitly recognized under international human rights laws, which is not the case at present. The UN Committee on Ageing is also instrumental in planning educational events, including the annual Psychology Day at the UN as well as the International Day of Older Persons.

Educating and Informing Policymakers About Aging and Geropsychology

The health and requisite long-term services and support needs of older adults and their caregivers are receiving ever-increasing attention from policymakers. While many policymakers are aware of these issues, others are just beginning to learn about the important role of psychologists as clinicians, researchers, and educators. Other health professionals such as physicians and nurses are well known to policymakers and are often considered primary experts on health care for older persons. Significant work remains to educate and inform policymakers about the valuable expertise offered by psychologists and the range of services they provide to older adults and their families, both independently and as members of interprofessional clinical care and research teams. This work can best be carried out by psychologists who are uniquely qualified to serve as effective advocates for the field and the populations whom they serve. In order to gain necessary recognition and support, psychologists must actively engage in education and advocacy with policymakers as a core component of their professional identity.

Whether the policy issue is research funding, access to clinical services, or addressing issues of special significance to the aging population (e.g., cognitive aging, suicide prevention), it is critical that policymakers hear directly from their constituents. A common expression in US politics states that "all politics is local." This phrase refers to the significant value that policymakers must place on the basic needs of those whom they directly represent. Psychologists can play a critical role as both experts and constituents, by communicating with the policymakers who represent them both in their home districts and national offices through in-person visits, letters and e-mails, telephone calls, participation in town hall meetings, volunteering for campaigns, and exercising other rights to participate in the democratic process (American Psychological Association 2012). Policymakers are especially responsive to education and advocacy efforts that incorporate both data and anecdotal information (e.g., local or personal stories) about how particular policies and resources impact their families, community, and institutions. Such advocacy efforts by psychologists can have a significant impact on a policymaker's decision to support or oppose existing or proposed initiatives and policies.

While psychologists can inform policymakers on a broad range of issues, there are some specific

aging policy concerns for which psychologists could serve as particularly helpful educators and advocates. First, psychologists can help policymakers understand that mental health is a critical component of overall health and an important part of healthy aging. In addition, psychologists can help dispel common myths and stereotypes about aging, including dissemination of facts that explain that depression and dementia are not inevitabilities of aging and have risk factors that are amenable to intervention across the lifespan.

Both ageism and stigma continue to surround issues related to health and aging, across cultures and nations. Mental disorders are often overlooked among older adults because they may coincide with, and are attributed to, other medical illnesses or life events that commonly occur as people age (such as loss of loved ones). Misinformation and stigma often prevent those in need from seeking treatment and inhibit the development and implementation of appropriate policies to address the mental health needs of older adults.

Another issue ripe for advocacy is the lack of a sufficient health-care workforce capable of meeting the health needs of older adults. The Institute of Medicine (IOM) estimated that each year 5.6–8.0 million older adults in the USA experienced one or more of the 27 behavioral health conditions that occurred in this population (Institute of Medicine 2012). Concerns about the size and preparation of the workforce qualified to care for older adults are highly applicable to psychology, as a small number of psychologists specialize in geropsychology and there has been limited growth in their numbers (Hoge et al. 2015). Psychologists have been very engaged in advocacy on this issue individually and as part of organizational and coalition efforts.

Aging Policy and Advocacy at the American Psychological Association

Advocacy efforts within APA have been guided by the philosophy that public policy should be based on available scientific knowledge and that psychological research can contribute to the formulation of sound public policy to address specific social problems and improve human welfare (American Psychological Association 2015b).

Within APA, the Office on Aging and the Committee on Aging (CONA) have ongoing initiatives to actively advocate for the application of psychological research and clinical practice to issues affecting the health and well-being of older adults. CONA's mission statement includes this goal: "Contribute to the formulation and support of public policies and associated regulations that promote optimal development of older adults, facilitate psychological practice with older persons, and expand scientific understanding of adult development and aging" (American Psychological Association 2013). Areas of APA aging advocacy, which span the association's directorates of education, practice, public interest, and science, include building a competent workforce to serve older adults by expanding education and professional development opportunities for practitioners and researchers, increasing funding for aging research that contributes to understanding and addressing the challenges and opportunities presented by an aging society, and increasing the availability and reimbursement of publicly funded health and mental health services and integrated models of health care. Further, APA's aging efforts have focused on promoting the application of psychological knowledge to the well-being of older people, with special attention to the influences of gender, ethnicity, culture, sexual orientation, and family in science, practice, and policy relating to older adults. Such attention to diversity and culture in aging policy and advocacy is essential in meeting the needs of the global aging population, which is increasingly diverse. APA and the psychology and aging community have developed relationships with policymakers at the national and international levels focused on aging issues, including key US congressional committees (e.g., Senate Special Committee on Aging), federal agencies and departments (e.g., Administration for Community Living, Department of Veterans Affairs), and stakeholder organizations (e.g., Partnership for Health in Aging, National Alliance for Caregiving, UN Committee

on Ageing, and the World Federation of Mental Health).

Psychologists can also expand their knowledge and skills in aging policy by participating in hands-on policy education and training opportunities for psychologists and trainees, offered by APA such as the Congressional Fellowship Program, the Executive Branch Science Fellowship, and the Public Interest Policy Internship for Graduate Students. Similar programs are also open to psychologists and aging experts from other professions, including the Health and Aging Policy Fellows Program sponsored by the Atlantic Philanthropies and the John A. Hartford Foundation.

The Value of Collaborative and Interdisciplinary Aging Advocacy

Much attention in recent years has focused on the value of interdisciplinary teams and collaborative models in clinical practice and research. Such models are particularly well suited for those working with older adults and on aging issues that are often complex and multidimensional. Similar value can be found in the use of collaborative and interdisciplinary approaches to aging policy development and advocacy.

In fact, many of the most successful, recent, aging policy initiatives have been collaborative in nature. Multi-organizational efforts, particularly efforts involving older adults and their families and caregivers, are viewed more favorably among policymakers than single-focused, discipline-specific efforts. Psychologists have proven to be valued partners working alongside other health, social service, and aging professionals as well as with consumers, families, and caregivers to advocate for needed aging policies. Two case examples of policy collaboration between the psychology community and aging policy allies are presented below.

Example 1: The Eldercare Workforce Alliance and the Affordable Care Act

Geropsychologists worked individually and in collaboration with the Eldercare Workforce Alliance (EWA), of which APA is a member, on key aging-related provisions in the Affordable Care Act. EWA is an interdisciplinary coalition of nearly 30 national organizations representing physicians, nurses, psychologists, social workers, pharmacists, physical therapists, direct care workers, eldercare employers, family caregivers, and consumers committed to addressing the geriatric health-care workforce shortages. EWA and its partners worked throughout the US health reform legislative process and secured critical language related to geriatric health professions education and training in the new US health reform law. Specifically, these provisions (1) expanded Geriatric Academic Career Awards to include faculty in psychology and other disciplines, (2) authorized a new Geriatric Career Incentive Awards program to include students of psychology and other disciplines, and (3) expanded Geriatric Education Centers to include schools with programs in psychology and other disciplines. Psychologists were involved in this interdisciplinary advocacy effort in a number of ways. APA staff served in leadership roles in EWA, and psychologists participated in interdisciplinary National Advocacy Days, were highlighted in an educational video, "Advocating for Team Care for Older Adults," and presented on interdisciplinary panels at congressional briefings on its importance. The organizations continue to work collaboratively to ensure appropriate implementation and sufficient funding of this new law.

Example 2: The National Coalition on Mental Health and Aging (NCMHA) and the 2005 White House Conference on Aging (WHCoA)

The WHCoA was first held in 1961, with subsequent conferences in 1971, 1981, 1995, 2005, and 2015. The conferences generate ideas and momentum prompting the establishment of and/or key improvements in many of the programs that represent America's commitment to older Americans (American Psychological Association 2015c). At the 2005 White House Conference on Aging, three-quarters of the 1,200 national delegates voted to improve "recognition, assessment, and treatment of

mental illness and depression among older Americans." This resulted in mental health being ranked in the top ten of the 50 WHCoA policy resolutions resulting from the conference. A major factor in this success was the concerted effort by the mental health and aging community, facilitated by the National Coalition on Mental Health and Aging (NCMHA). NCMHA is comprised of over 50 professional, consumer, and government member organizations that work together towards improving the availability and quality of mental health preventive and treatment services to older Americans and their families. NCMHA's 2005 advocacy efforts were well organized, collaborative, and interdisciplinary in nature. The collective challenge of the group was how to take the available empirical evidence regarding the importance of mental health and present it to the WHCoA Policy Committee, staff, and delegates in a compelling, usable format. The NCMHA did this by developing one clear message supported by empirical evidence: "It's not just health – it is mental health." That is, mental health is an integral component of general health and personal well-being. This collective, yet basic, message was disseminated by the NCMHA and its member organizations over an eighteen-month period leading up to the WHCoA and carried to the conference, and that message was heard. For the first time, in the history of the WHCoA, mental and behavioral health emerged as a priority. Of note, in preparation for the 2015 WHCoA, the White House recently issued a policy brief on healthy aging, which restates the importance of optimizing behavioral health.

Conclusion

Policy and advocacy are essential elements of a psychologist's professional identity. The geropsychology community has a great deal to add to the health and aging policy debate locally, nationally, and globally. The seminal APA publication, "What Practitioners Should Know About Working with Older Adults," reminds us that psychologists can maximize their efforts to assist this large and diverse segment of our society by being "armed with facts about the myths and realities of aging, knowledgeable about the problems older adults face, cognizant of how to assess and treat older persons and familiar with the broader professional issues in aging." (American Psychological Association 1997). As the older adult population continues to increase in size and diversity in the USA and around the world, psychologists have a professional and moral imperative to actively engage in aging policy development and advocacy.

Cross-References

- ▶ Age Stereotyping and Discrimination
- ▶ Attitudes and Self-Perceptions of Aging
- ▶ Mental Health and Aging

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Affect and Emotion Regulation in Aging Workers

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Synonyms

Affect regulation; Core affect; Emotion management; Emotional intelligence; Emotional labor; Mood

Definition

Affect (mood, emotions) denotes a person's neurophysiological state characterized by a particular valence and activation level, such as pleasure or displeasure, arousal, or relaxation. Affect can be influenced by emotion regulation, describing the process by which a person shapes the nature, intensity, or duration of emotional experience and/or expression.

Affect and Emotion Regulation in Aging Workers

Affect and emotion regulation are centrally involved in effective functioning in work settings, shaping a wide variety of organizational behaviors and outcomes (Barsade and Gibson 2007). Affect and emotion regulation also undergo substantial systematic (and mostly positive) changes as employees age (Scheibe and Carstensen 2010). Knowledge about age differences in affect and emotion regulation is therefore critical for researchers, managers, and employees.

Basics of Affect and Emotion Regulation

Affect is a term denoting person's neurophysiological feeling state characterized by a particular valence and activation level, such as pleasure or displeasure, arousal, or relaxation (Russell 2003). Among affective states, moods are usually distinguished from emotions, although the difference between moods and emotions is gradual rather than categorical. Moods are relatively long lasting, lack a discernable cause, and bias cognitions more than actions. Emotions, in contrast, are more short-term reactions, arise in response to discernable events, and are more closely tied to behavior. Emotions arise when persons encounter situations that they appraise to facilitate or hamper the achievement of current concerns, goals, or tasks. Because the achievement of tasks lies at the core of behavior in organizations, emotions are highly relevant to the organizational context. The focus of the current chapter therefore will be on emotions more than moods, although moods will be considered when relevant.

Emotions have many important functions. Some of these functions are more social in nature (i.e., emotions may be used to communicate with and influence others), while others are more consequential for the person who experiences the emotion (i.e., tuning attention, providing feedback about goal progress, and facilitating action). However, emotions are not always functional or appreciated. In many work settings, employees are well advised to modulate or hide their emotions, in order to safeguard their own well-being and effectiveness or to adhere to emotional display norms. *Emotion regulation* refers to the process by which persons shape the nature, intensity,

or duration of an emotional experience and/or its expression (Gross 2015).

Emotion regulation always starts with a *goal* to change the emotion-generative process, which means that the ambition to alter the way in which a person feels is triggered (Gross 2015). This goal can be conscious or unconscious and concern own emotions or those of others, such as clients, supervisors, colleagues, or subordinates. Moreover, emotion-regulatory goals can be driven by hedonic considerations (wanting to feel pleasant emotions) or instrumental considerations (wanting to feel useful emotions; Tamir 2009). Instrumental considerations arise from the notion that affect can be a means to an end. For example, anger facilitates confrontation, happiness facilitates collaboration, joy facilitates creativity, and fear facilitates threat avoidance.

Following the activation of an emotion-regulatory goal, a *process* (or strategy) is activated to reach this goal. People usually have at their disposal many different strategies to regulate emotions, and several classification systems have been developed to organize these into more coherent families of strategies. Parkinson and Totterdell (1999) distinguish strategies based on how they are implemented – cognitively or behaviorally – and whether the intention is to engage with or disengage from the emotional event. Gross (2015) distinguishes whether the action of strategies is early (antecedent focused) or late (response focused) in the emotion-generative process. For example, reappraising an unpleasant customer interaction as a learning opportunity would be a cognitive, engagement, antecedent-focused strategy, whereas suppressing an angry look on one's face would be a behavioral, disengagement, response-focused strategy. Importantly, the various regulatory strategies rely on different capabilities (including emotional expertise, cognitive control, and physiological flexibility), and some of those are more cognitively effortful to implement than others (Consedine and Mauss 2014; Richards and Gross 2000). For instance, the antecedent-focused strategy of reappraisal has been shown to be less cognitively effortful than the response-focused strategy of suppression.

Emotion regulation strategies differ in their *outcomes* or how they impact on the unfolding emotional response and associated cognitions and behaviors. For instance, positive reappraisal of a negative event tends to reduce the extent to which negative emotions are expressed *and* experienced. In contrast, using suppression tends to reduce negative emotion expression but leaves the experience unchanged (and may even enhance physiological activation; John and Gross 2004). Because of this differential impact, the habitual use of certain strategies has downstream consequences for more distal outcomes, including social behavior, the quality of social relationships, and general well-being. In general, antecedent-focused strategies tend to have more positive social and well-being consequences than response-focused strategies and are therefore considered more adaptive in the long run.

Age-Related Differences in Emotion Regulation

Theories of Emotion Regulation in Adulthood

Several lifespan theories propose that aging has a substantial impact on emotion-regulation goals, processes, and outcomes. Socioemotional selectivity theory (Carstensen 2006) predicts age-related changes in emotion-regulatory goals as a function of shifts in future time perspective. As individuals grow older, they perceive their remaining time on this earth as increasingly limited, which in turn elicits a stronger focus on current well-being relative to future-oriented pursuits. With aging, goals related to knowledge acquisition, expanding one's social network, or taking risks presumably give way to goals related to nurturing existing relationships, helping others, and pursuing emotionally satisfying activities. Applied to emotion-regulation processes, this implies that emotion-regulatory goals are driven by hedonic considerations more than by instrumental ones (Tamir 2009). This will be especially apparent in situations where negative emotions can help to reach instrumental goals. When disagreeing with a coworker, for instance, younger workers may want to feel angry to more

effectively convey their point, whereas older workers may want to reduce their anger to sustain their positive mood. Preferences for specific types of affective states are also assumed to shift. As a consequence of changes in physiological flexibility, older adults increasingly prefer low-arousal affect (calm or bored) over high-arousal affect (excited or angry; Scheibe et al. 2013).

Lifespan theories also predict that age impacts on the processes and outcomes of emotion regulation. The general prediction is that capabilities needed for different emotion-regulation strategies are subject to age-related changes, leading to shifts in strategy use and effectiveness (Morgan and Scheibe 2014; Urry and Gross 2010). On the one hand, long-term experience and practice in dealing with emotional situations over time should enhance emotional expertise, making older adults generally more effective in handling their emotions (Blanchard-Fields 2007). Indeed, older people have been found to use more adaptive strategies (such as reappraisal) and less maladaptive strategies (such as suppression) in daily life (John and Gross 2004). In addition, it takes them less cognitive effort to successfully reach emotion-regulation goals (Scheibe and Blanchard-Fields 2009). Similarly, the strength and vulnerability integration theory (Charles and Luong 2013) maintains that older adults benefit from their higher emotional expertise when it comes to using emotion-regulation strategies that help to avoid or mitigate negative emotions. Older adults presumably use antecedent-focused strategies such as situation selection (avoiding conflict situations), situation modification (problem-solving), and cognitive or behavioral disengagement (distracting away from negative situations) more often and more effectively than young adults. One particularly well-supported proposition is the "positivity effect" in older adults' information processing (Reed and Carstensen 2012). The positivity effect entails that, compared to young adults, older adults pay more attention to, and show better memory for, positive over negative information. They also pick up positive social cues more accurately than negative ones (Kellough and Knight 2012).

On the other hand, declining cognitive and physiological capabilities should diminish older adults' advantage in using strategies that rely heavily on these capabilities. For instance, declines in physiological flexibility with age make regulation of emotional arousal more difficult (Charles and Luong 2013). Response-focused strategies, such as expressive suppression, are applied only after emotional arousal has been fully developed. Such strategies are among the most cognitively effortful (Richards and Gross 2000). Consequently, older adults are assumed to use such strategies less often than younger adults and to have no advantage over younger adults when it comes to strategy effectiveness. In sum, lifespan theories converge in the prediction that antecedent-focused emotion-regulation strategies that avoid or mitigate negative emotions are used more often and implemented more effectively with age, whereas response-focused emotion-regulation strategies are used less often and not implemented more effectively.

Evidence from Worker Samples

While age differences in affect and emotion regulation have been extensively studied in the general aging literature, organizational researchers have only recently begun to test the generalizability of these findings to work settings. Notably, the work setting has several characteristics that have to be taken into account when studying effects of age differences. For one, the working lifespan represents only a segment of the overall period of adulthood. Given an average retirement age around 60–65 years across most industrialized countries, the label "older workers" correspond to "middle-aged adults" in the aging literature. Therefore, age differences in future time perspective and in capabilities relevant to emotion regulation are likely smaller in worker samples than in samples spanning all of adulthood. Moreover, a "healthy worker effect" must be taken into account, denoting a trend for ill-functioning older workers to leave the workforce, which makes the active workforce a positively selected group. Finally, work settings are often associated with a reduced repertoire of available emotion-regulation strategies; the choice of social partners

may be relatively restricted, and emotional display rules and work role obligations may override behavioral preferences (Davis et al. 2009).

These differences notwithstanding initial cross-sectional studies in a working population are consistent with assumptions of aging effects in emotion-regulation goals, processes, and outcomes. Most studies have been conducted in the service industry. For instance, research in the work domain seems to confirm the proposition that hedonic emotion-regulatory goals get stronger with age: When being in uncomfortable customer situations, older workers were found to report trying to control their emotions more than their younger colleagues (Johnson et al. 2013). Other studies have investigated age differences in use of emotional labor strategies, which are emotion-regulation strategies that are employed in order to align emotional experience with emotional display demands (Dahling and Perez 2010; Cheung and Tang 2010; Sliter et al. 2013). Consistent with theories of emotional aging, a converging finding is that older workers show a more adaptive profile of emotional labor strategies than younger workers do. Specifically, older workers display a more frequent use of deep acting (trying to experience the required emotion; an antecedent-focused strategy) and/or a less frequent use of surface acting (displaying the required emotion but leaving the emotional experience unchanged; a response-focused strategy). The notion that aging facilitates the use of antecedent-focused emotion-regulation strategies is further supported by the finding that older workers' required emotions align more often with naturally felt emotions than those of younger workers. Consistent with developmental theories of affect and emotion regulation, age-related differences in emotional labor strategy use were partially mediated by higher trait positive affect and self-reported emotional expertise (Dahling and Perez 2010; Sliter et al. 2013).

Studies going beyond the service industry produced less consistent findings regarding age differences in strategy use. Congruent with lifespan theories of affect and emotion regulation, a study with executives from different sectors found that older workers engage in behavioral disengagement when facing workplace conflict (e.g., yielding, delaying responding) more than younger workers, based on behavior ratings by their coworkers (Davis et al. 2009). Young and older workers were equally likely to use active problem-solving (see also Johnson et al. 2013). However, another study with employees from different occupational sectors failed to replicate enhanced behavioral disengagement and instead found older workers to report more active problem-solving (Hertel et al. 2015). Two studies investigated self-reported use of reappraisal and suppression; one found a positive age trend for reappraisal use (Yeung et al. 2011), but the other found age to be unrelated to reappraisal use (Bal and Smit 2012). Both studies converge in finding no age difference in use of suppression.

Aside from strategy use, there is limited evidence that age may confer benefits for effective implementation of antecedent-focused emotion-regulation strategies. Use of both emotion control and problem-solving were more strongly linked with low burnout symptoms in older service workers, compared with their young colleagues (Johnson et al. 2013). In contrast, suppression has been found to be particularly ineffective for older workers (Bal and Smit 2012). Specifically, suppression mitigated the detrimental effect of psychological contract breach on positive affect in young workers but enhanced it in older workers. However, a 5-day diary study among Chinese insurance workers revealed that suppression was associated with better affect in older workers while it was unrelated to affect in young workers (Yeung and Fung 2012), thus suggesting that cultural differences may also play a role in determining age-contingent strategy effectiveness. Importantly, to the extent that older adults can effectively use antecedent-focused emotion-regulation strategies, and thereby circumvent negative situations, their effectiveness in using suppression would matter little for their well-being.

In sum, there is growing evidence in the work domain that antecedent-focused strategies (problem-solving, behavioral disengagement, deep acting) are more often and more effectively used with advanced age, whereas

response-focused strategies (suppression, surface acting) are less often and less effectively used. Yet, there are some inconsistencies in the literature, especially regarding non-service workers samples. In order to clarify the somewhat muddled picture that has emerged on the effects of aging and emotion regulation in the workplace, it will be useful to broaden the perspective. Namely, if employee aging indeed has an impact on emotion regulation, this should be reflected in age-related differences in affect-driven work outcomes. Below, three of those outcomes are considered: occupational stress and well-being, organizational behavior, and leadership.

Consequences for Work Outcomes

Occupational Stress and Well-Being

Given the central role of emotion regulation in shaping well-being, one may assume that the age-related changes described above have downstream positive consequences for occupational stress and well-being (Scheibe and Zacher 2013). Indeed, a meta-analysis on age differences in job attitudes revealed that older workers have higher job satisfaction, lower levels of burnout, and generally more favorable and less unfavorable job attitudes (Ng and Feldman 2010). Although age differences were only weak to moderate, they were surprisingly consistent for task-, people-, and organizational-related aspects of well-being. For example, older workers seem to have fewer signs of burnout (task based), are more satisfied with their supervisors (people based), and show stronger organizational commitment (organization based).

Age-related enhancements in occupational well-being are further implied by studies showing higher positive or lower negative affect with increasing worker age (Dahling and Perez 2010; Sliter et al. 2013; Yeung et al. 2011). Nevertheless, several cross-sectional and experience-sampling studies were unable to find significant associations between age and affect in worker samples (Bal and Smit 2012; Yeung and Fung 2012; Amabile et al. 2005; Lee and Allen 2002; Sonnentag et al. 2008). Thus, while positive age trends in job-related attitudes and well-being appear consistently, evidence on age differences in experienced affect at work is much less convincing. An intriguing possibility that would reconcile these seemingly inconsistent findings is that older workers have as many positive affective experiences as younger workers but attend to them more and weigh them more heavily. This, in turn, may explain their higher ratings on job attitude scales. Such an explanation would be consistent with the age-related positivity effect in information processing (Luchman et al. 2012). Another possibility is that age differences are apparent in low-arousal positive affect, but not high-arousal positive affect, consistent with the shifting affective preferences with age described above. Unfortunately, prior studies have not systematically considered arousal.

Most studies investigated linear relationships between age and occupational well-being; however, some researchers have proposed that age and well-being may be related in a curvilinear manner (Clark et al. 1996). They argue that because middle-aged workers face an accumulation of demands in the work and family domain, aging benefits for occupational attitudes and well-being may not emerge until the late career. Indeed, in some studies age and occupational attitudes and well-being (i.e., job satisfaction and emotional exhaustion) were found to be related in an inverted U-shaped manner (Clark et al. 1996; Rauschenbach and Hertel 2011; Zacher et al. 2014). Note that findings like these underscore the importance of taking into account the fact that the work setting may differ in important ways across occupations.

To date, only few studies directly tested affective processes underlying the positive effects of age on well-being. In one study, older service workers' higher use of deep acting was found to mediate the positive relationship between age and job satisfaction (Cheung and Tang 2010). Another study found older workers' higher use of reappraisal to partially mediate the positive relationship between age and positive affect (Yeung et al. 2011). A third study found older workers' higher use of problem-focused coping to be associated with a reduction in self-reported strain eight

months later (Hertel et al. 2015). These initial findings are consistent with developmental theories proposing stronger emotion-regulation goals and effectiveness with age, which in turn, lead to improved well-being.

In sum, consequences of age-related changes in emotion regulation seem to have a positive effect on occupational stress and well-being. Generally, older workers are more satisfied with their jobs as they are more motivated to maintain positivity in comparison to young workers. However, as most studies investigated direct links between age and well-being outcomes, more rigorous research is needed to test emotion regulation as the underlying mechanism of this effect.

Organizational Behavior

Besides occupational attitudes and well-being, affect and emotion regulation also shape organizational behavior. According to the affective events theory (Weiss and Cropanzano 1996), emotional reactions to affective work events trickle down to influence discrete work behaviors. In their emotion-centered model of voluntary work behavior, Spector and Fox (2002) posit that positive emotions will increase the likelihood that employees show organizational citizenship behaviors (e.g., assisting others, showing loyalty), whereas negative emotions will increase the likelihood of counterproductive work behaviors (e.g., coming late, neglecting instructions). Indeed, daily affective work events were shown to be linked with daily citizenship and counterproductive behaviors through emotions (attentiveness, anger, and anxiety; Rodell and Judge 2009).

Given improvements in affect and emotion regulation with age, one may expect that older workers, compared to their younger counterparts, are generally more likely to show citizenship behavior and less likely to show counterproductive behavior. There is robust evidence that this is indeed the case. A meta-analysis linking age with different aspects of job performance yielded age-related increases in citizenship behaviors and age-related reductions in counterproductive work behaviors in general, as well as age-related reductions in workplace aggression, on-the-job substance abuse, tardiness, and voluntary absence (Ng and Feldman 2008). Given the importance of such behaviors for organizational effectiveness, these positive age trends demonstrate that older workers contribute effectively to organizational goals. Again, while it is likely that age differences in organizational behavior may at least partly be driven by aging-related changes in affective processes, empirical tests of mediating relationships are lacking to date.

Leadership

Leadership is the ability of a person to influence, motivate, and enable others to contribute toward the effectiveness and success of the organization of which they are members. It has become clear that moods and emotions are deeply intertwined with this ability (Van Kleef et al. 2011): The affective states, emotion-regulation strategies, and emotional competencies of leaders affect leader behaviors and follower affective states and outcomes (Gooty et al. 2010; Rajah et al. 2011). The issue of how age may affect leadership via affective processes is particularly interesting given the fact that those in leadership positions usually have a more advanced age than those they lead. This, coupled with the observation that the average age of the workforce in many countries is increasing, suggests that the share of older individuals in leadership positions will continue to grow.

Studies that have combined leader age, affective processes, and one of the potential outcomes of leadership are largely lacking, but some interesting findings have appeared. The existing research illustrates a trend toward less change-oriented behavior among older compared to young leaders (see Walter and Scheibe 2013). Young leaders tend to feel more comfortable in fast-changing environments and to be more willing to take risks and consider new approaches than older leaders do (Oshagbemi 2004). Moreover, it has been found that older leaders show more passive leadership behaviors than younger leaders: They are more likely to display laissez-faire leadership or management by exception (see Walter and Scheibe 2013).

Older leaders' relative lack of agency and change orientation and their more passive leadership behaviors seem to be in line with the above-described lifespan theoretical propositions of age-related changes in goals and strategies of emotion regulation. Specifically, they fit the premises of the socioemotional selectivity theory (Carstensen 2006) that the older people get, the more they shift in focus from future-oriented pursuits to current well-being. Such a shift in focus would arguably be reflected in people's efforts to alter the status quo, because such behaviors are usually conducted in the hope that they may pay off in the future. Likewise, older adults' tendency to prioritize positive over negative information (Reed and Carstensen 2012), and their greater attention to positive social cues than to negative ones (Kellough and Knight 2012) would diminish the perceived necessity of older leaders to act on or to interfere with the ongoing state of affairs. Additionally, older leaders' more passive leadership behaviors fit well with earlier described findings of emotion-regulation strategy shifts with age toward antecedent-focused strategies of conflict avoidance and behavioral disengagement.

Importantly, these more passive styles are not always considered to be more negative in nature. It has been argued that they are rooted in older leaders' willingness to cooperate and delegate more and that they are manifestations of older leaders' general tendency to behave themselves in a more calm and modest manner (Oshagbemi 2004). Notably, their willingness to cooperate and delegate may reflect that they place more value on establishing intimacy with others in the present and developing a sense of belonging in the social environment (Carstensen 2006), while their calm demeanor fits well with older people's general motivation to experience low-arousal positive states (Scheibe et al. 2013). In sum, age differences in affect and emotion regulation seem to have important implications for leadership, and the available evidence does seem to largely corroborate predictions from the general aging literature. Yet, continued inquiry is necessary, because studies that have combined leader age, affective processes, and potential outcomes of leadership are scarce.

Future Research Directions

Research on affect and emotion regulation in aging workers is historically young and incomplete. In the previous sections, several gaps in the literature were pointed out that require further study. In the following, two additional fruitful avenues for future research will be suggested in domains that have so far neglected worker aging but may benefit from taking into account age-related changes in affect and emotion regulation.

Group Affect

One interesting avenue for future research is to investigate how worker aging affects the development of group affect or the "consistent or homogeneous affective reactions within a group" (George 1990, p. 108). In organizations, where people often work in teams or subgroups, group affect develops frequently. Group affect is considered to occur as a result of affective interactive sharing processes (the dynamic pathway) and/or dispositional or contextual factors that happen to make group members feel similar (the static pathway; cf., Klep et al. 2011; Kelly and Barsade 2001). Group affect has a substantial impact on various significant outcome variables related to organizational functioning, such as cooperation, coordination, conflict, creative and analytical performance, and absenteeism (Collins et al. 2013). Therefore it is important to consider how aging may affect its development.

As described above, aging theories posit that older adults have a stronger hedonic motivation, a preference for low-arousal positive affect, and an aversion of high-arousal negative affect. As a consequence, older people often feel better or more positive than younger people do (Scheibe and Zacher 2013). Arguably, this tendency should be reflected in the development of group affect: The higher the mean age of the group members, the more likely it is that a positive group affective state will develop. This, in turn, may have positive consequences for group functioning. However, given that the development of group affect is also largely dependent on affective interactive sharing processes, it may be that it arises less

frequently in groups that have higher average age. Affective sharing processes demand that people attend to and notice other group members' affective states, so that over time people converge affectively. However, the accuracy in identifying others' emotions (i.e., emotion recognition) declines with older age, especially as far as negative emotions are concerned, because this demands high cognitive control and processing speed and a willingness to process negative information (Kellough and Knight 2012). In sum, future research may investigate the hypotheses that when average group member age increases, group affect develops less often, but if it does it is more positive in nature.

Regulating Others' Emotions

The bulk of research on age and emotion regulation in general, and in the work context in particular, has focused on issues around the regulation of people's own emotions. In comparison, research on age differences in regulating other people's emotions is largely lacking to date. In many work situations, modifying another person's emotional experience is, however, crucial to ensuring effective job performance. Psychotherapists' job, for instance, is to change their patients' feelings in response to distressing situations (Pletzer et al. in press). Service workers sometimes need to calm down their emotionally aroused clients. Leaders can positively influence their subordinates by bringing them into a positive, enthusiast mood so that they are more engaged and cooperative (Sy et al. 2005). An open question is whether older workers have an advantage over their young colleagues when it comes to regulating their interaction partners' emotions, whether and when they would be motivated to do so, what emotion-regulation strategies they would use, and how effective they would be.

Conclusion

The process of aging impacts on different facets of affect and emotion regulation. Developmental theories of emotion regulation suggest that young and older workers differ in their emotion-regulation goals, in the recruited strategies to reach those goals, and in the outcomes of strategy use. Age-related differences in emotion regulation can help explain positive age differences a wide variety of work outcomes, including job attitudes and well-being, organizational behavior, and leadership. It appears that older adults' stronger motivation to maintain well-being and their increasing emotional expertise represent a domain of strength for older workers and help them contribute to organizational effectiveness in important ways. For future research, it will be fruitful to explore whether similarly positive age differences are found in further relevant occupational outcomes, such as group affect and the regulation of other people's emotions.

Cross-References

- ▶ Age-Related Changes in Abilities
- ▶ Aging and Psychological Well-being
- ▶ Conflict Management and Aging in the Workplace
- ▶ Job Attitudes and Age
- ▶ Job Crafting in Aging Employees
- ▶ Leadership and Aging
- ▶ Socioemotional Selectivity Theory
- ▶ Strength and Vulnerability Integration
- ▶ Stress and Well-being: Its Relationship to Work and Retirement for Older Workers
- ▶ Workplace Mentoring, Role of Age

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Age and Blended Working

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Synonyms

Distributed work; Flexwork; Mobile work; Remote work; Telecommuting; Telework; Trust-based working.

Definition

Blended working is the opportunity to blend on-site and off-site working (i.e., working location- and time-independently), which is enabled by the utilization of information and communication technologies (ICTs) that provide workers with almost constant access to job-relevant information and coworkers.

Introduction

The workforce is aging rapidly, which means that organizations will have to learn how to manage older workers better to avoid labor shortages and a loss of organizational effectiveness (Czaja and Moen 2004). One way to do this, is to rely more on *blended working* practices, that is, the opportunity to blend on-site and off-site working enabled through modern information and communication technology (ICT) facilities (Van Yperen et al. 2014). This chapter summarizes and gives an overview of the opportunities and threats that blended working may have for older workers, and aims to show that blended working practices can be helpful to retain older workers and can keep them satisfied, motivated, and productive in their jobs.

Working from the office, having a business meeting with colleagues in a restaurant, preparing a meeting in the train, online file sharing, and work-related use of tablets and smartphones are the examples of blended working practices. Off-site working is becoming more and more common through the rise of, among others, the internet, e–mail, video calling and chat, and cloud-based data storage. These technologies provide workers with constant and location-independent access to job-relevant information and coworkers (Van Yperen et al. 2014; McLennan 2008). Obviously, not all work types are suited for blended working, as some work can only be done on-site, at specific times, or through face-to-face communication. Blended working is especially suited for knowledge and information work. These work types are becoming increasingly common and mainly revolve around obtaining, analyzing, and sharing knowledge, activities that can mostly be performed online and away from the office (Van Yperen et al. 2014; McLennan 2008).

Another major development in the world of work is that since 2010, the global workforce is aging more rapidly than ever before, as post-World War II cohorts are reaching ages 65 and over (Hedge and Borman 2012). Many older workers are delaying their retirement as a result of the recent economic crisis (Elias et al. 2012) but also with the intention to stay productive and mentally healthy (Lee et al. 2009). For organizations, it is important to retain older workers in order to avoid, or at least lower, the forecasted shortage of 20.8 million EU workers by 2030 (Sharit et al. 2009), and to keep workers with high levels of job expertise within the organization (Hedge et al. 2006). This poses new challenges to organizations and their personnel management strategies, since working for income and benefits only does not satisfy the needs of older workers (Hedge et al. 2006). Older workers find it increasingly important to feel intrinsically motivated in their job and put a stronger emphasis on learning and accomplishing new and worthwhile things (Hedge et al. 2006). At the same time, they find it important to experience more flexibility, to have more leisure time and time for nonwork activities, and are less willing to work under high levels of stress (Hedge et al. 2006).

This suggests that implementing blended working may be particularly relevant for older workers. Blended working offers the potential to fulfill older workers' needs and desires by creating a better balance between work and nonwork activities, which can help them to stay satisfied and effective in the job. It allows older workers to (re)design their jobs in a way that suits them best and that appeals to their needs (Hedge and Borman 2012; Hedge et al. 2006; Cutler 2006). Allowing for new and different work opportunities might therefore be a relatively simple and inexpensive method to keep the aging workforce satisfied, motivated, and productive in their job (Hedge et al. 2006).

On the negative side, blended working can pose several threats to older workers' well-being and performance (Van Yperen et al. 2014; McLennan 2008). Possible threats faced by the aging workforce are low levels of experience with the computer technologies required for blended working (Elias et al. 2012), as well as stereotypes about older workers being ill suited for new computer technologies (Sharit et al. 2004). If these threats are not addressed when implementing blended working practices, organizations and their workers will not be able to reap the expected benefits and might even incur unexpected costs. Hence, we will next discuss the opportunities and threats resulting from blended working in more detail, and zoom in on the effects of blended working for the older workforce.

Blended Working: Opportunities

Blended working has two core aspects: increased *discretion* to work from various locations and times and increased *connectedness* to job-relevant information and coworkers via ICTs. Hence, blended working can result in saving time (due to reduced commuting time) and freedom from distractions and interruptions when (partly) working from home (Van Yperen et al. 2014; Cutler 2006). Working connectedly increases (efficiency in) information access and can provide workers with information and feedback that they would not have obtained as easily or quickly otherwise (Mazmanian et al. 2005). Further, working connectedly via online devices enables workers to maintain or even extend their contact with coworkers, and to avoid social impoverishment and isolation when working off-site (Cutler 2006). Blended working, thus, offers unprecedented opportunities for workers to decide when, where, and how to work. Besides these general (potential) benefits, blended working offers some opportunities that are especially relevant for the older worker.

Older Workers and Off-site Working. Research in the US indicates that people working from home tend to be older than the average worker (Lister and Harnish 2011; Bailey and Kurland 2002). Possibly, older workers have gained enough job experience and earned sufficient trust on part of the organization to make frequent off-site working a viable option (Lister and Harnish 2011). Blended working can also be particularly relevant for the older workforce, as this arrangement may help older workers to move more slowly towards retirement, enabling older workers to keep on working longer than when working traditionally at the office (Lister and Harnish 2011).

Balancing Work and Nonwork. Blended working increases flexibility with regard to time and location, and therefore creates the opportunity to find an optimal work–home balance (Van Yperen et al. 2014) (however, see below). This opportunity is especially relevant for older workers, as they tend to shift their emphasis more towards leisure time and nonwork activities. They often want to continue working, but only if work and nonwork activities can be aligned closer with their needs (Hedge et al. 2006). Blended working can be attractive to older workers, because it enables them to obtain this balance through new work arrangements such as compressed workweeks, reduced workdays, job sharing and part-time working, as well as working from home (Hedge and Borman 2012). The result is that older workers can combine work and nonwork activities in a way that fits their needs (Hedge et al. 2006). This increases the probability that older workers will continue their working careers and retain a positive work attitude (Hedge and Borman 2012).

Freedom from Distractions. Blended working offers workers the discretion to decide on their optimal workplace and schedule. This way, one can more easily avoid working at a workplace that is known to create distraction. This can be especially helpful for older workers, because stressors such as noise or an overcrowded environment distract them more easily (Hedge and Borman 2012). Having the opportunity to work at other places than the office helps them to deal with these stressors from their direct environment (Hedge and Borman 2012), which could result in their continuing to work longer than they would have in a traditional work arrangement.

Less Need to Commute. Blended working lowers the need to commute, as workers can combine working at the office with working from home (Cutler 2006; Thompson and Mayhorn 2012). Travelling to work everyday is thus no longer necessary. This results in efficiency and time savings, and can help to overcome mobility limitations. Older age brings health changes, and workers close to retirement age sometimes face age-related health issues or mobility limitations that can make it difficult to travel to and from the workplace (Thompson and Mayhorn 2012). As the workforce is aging, the number of people facing such issues will increase (Czaja and Moen 2004). The use of blended working practices offers older workers the possibility to manage their health issues in a secure environment (Sharit et al. 2009) and hence increases the opportunity to continue working rather than retire (Czaja and Moen 2004).

It should be noted that, while working *solely* from home can be associated with the risk of professional and social isolation ("out of sight, out of mind") (Bailey and Kurland 2002), blended working refers to the opportunity to *combine* different ways of working (Van Yperen et al. 2014). Thus, it represents a benefit, as workers are enabled to find or create exactly the set of circumstances that work for them.

Caregiving Responsibilities. Given the increasing number of aging or elderly workers, it will become much more common for workers to have to provide elderly care or to take care of a sick or disabled partner or relative (Czaja and Moen 2004). In fact, the majority of workers that need to provide such care are aged 45 years or over (MacDermott 2014). Blended working represents an important opportunity for these workers, similar to the possibilities many young parents are given in order to be able to provide childcare (Hedge and Borman 2012). Blended working practices allow older workers to balance their work and family duties (Bailey and Kurland 2002) and are found to be related to increased work–family balance, lower work–family conflict, greater job satisfaction and productivity, and lower absenteeism (Hedge and Borman 2012).

Blended Working: Threats

Despite their clear potential benefits, blended working practices can also create several challenges or threats. Some of these are not specific to older workers. For example, being able to decide when, where, and how to work may come with the cost of increased complexity, and being constantly connected can result in feelings of external control, resulting from the pressure to be constantly available (Van Yperen et al. 2014). Task ambiguity may also arise, because being continuously connected to coworkers makes it unclear whether, how, and when information will be pushed to one's workplace, while role ambiguity can arise resulting from the increased work–home interference. Lastly, working from home increases the threat of procrastination and cyberslacking, and increases the likelihood of getting interrupted or distracted by family members (Van Yperen et al. 2014; Mazmanian et al. 2005). While the above issues apply to the working population at large, there are some possible risks that seem particularly relevant for older workers. We will discuss these below, and where possible will address ways to mitigate these risks.

Older Workers and Technology Use. Given that blended working requires extensive use of ICTs, it is essential that workers have the skills and confidence to use these technologies. Unfortunately, older people sometimes lack computer experience as computers were not yet available during their formal education (Elias et al. 2012). Because of this, older workers report a lower use of technology, more anxiety to start using these technologies, and are more likely to have a negative attitude towards technologies relative to younger workers (Elias et al. 2012). Whereas positive attitudes and successful experiences would result in better implementation of these technologies, anxiety often results in a negative attitude towards these technologies, and lower intentions to use these technologies (Elias et al. 2012). Research indicates that within cohorts of age 50 onwards, people are less likely to own a computer, or to use the internet or computers in general (Cutler 2006). Of those aged 65 years and

over, only about 40% uses the internet (Charness et al. 2010).

Older workers need more time to perform a computer-interactive task and make more errors while doing so relative to younger workers (Sharit et al. 2004), but this disadvantage mainly arises due to a lack of experience with these technologies rather than from chronological age itself (Hedge et al. 2006). As an increasing amount of future older workers will already have built up experience with computer technologies, this difference will probably diminish over time (Thompson and Mayhorn 2012). However, as older workers often face perceptual, physical, and cognitive declines, it may remain difficult for them to adopt rapidly changing technological innovations. Because of this, a lag in technological knowledge may continue to exist (Thompson and Mayhorn 2012).

Stereotypes: Older Workers and Technology. Problematically, the low rate of technology use among older workers is reinforced by negative beliefs and stereotypes about them, and older people may be less likely to use new technologies because of the social expectation that their age group is less willing to do so (Cutler 2006). Stereotypes about older workers as well as age biases against older workers are often present in the workplace, and can negatively affect both the individual older worker and the organization in general (Hedge and Borman 2012; Ng and Feldman 2012). Age biases can result in age discrimination when implicit biases affect decision making and hence the opportunities given to older workers with regard to employment, promotions, or training opportunities (Hedge et al. 2006) (also see below).

Typical stereotypes about older workers and technology use (such as the belief that these workers lack the right technological experience and newest technological skills, are afraid of new technologies, and are less willing and able to accept and adapt to new technologies (Hedge and Borman 2012; Ng and Feldman 2012)) are already applied to individuals of age 40 (Elias et al. 2012). Also, older workers are thought to need more time to learn and to be slower and more forgetful. Because of this, training programs are assumed to be less effective and more costly for older workers, which often results in denying them the right training opportunities (Hedge and Borman 2012). As older people in fact often do have less experience with new technologies, denying them training opportunities can result in their avoiding the use of new technologies altogether. The result is a self-fulfilling prophecy and a risk of stereotype threat: Their skills and knowledge in the job become outdated, which reinforces the stereotypes about older workers (Hedge et al. 2006).

Training Older Workers. The (possible) lack of computer experience highlights the importance of providing appropriate training opportunities for older workers, in order for them to become more familiar with computer technologies, to overcome anxiety, and accrue positive experiences with technology. Unfortunately, organizations are often resistant to provide older workers with training opportunities. This is not only because of the above-mentioned negative beliefs and stereotypes about older workers and technology use (Sharit et al. 2009; Thompson and Mayhorn 2012), but also because older workers provide fewer years in which organizations can reap the benefits of their training investments. In fact, the shorter future tenure is irrelevant, because training investments are likely to pay off within a few years. Hence, providing training to older workers who do not retire within 2–3 years or so, prevents organizations from the loss of expertise when losing these workers. As older workers are known to show low rates of absenteeism and turnover in the job, and high levels of organizational citizenship behavior, it is cost effective for organizations to give older workers the appropriate training opportunities and to retain them in the organization (Czaja and Moen 2004; Ng and Feldman 2008).

Although research indicates that older workers are somewhat resistant to engage in training activities (Ng and Feldman 2012), this is not the case for technological training (Ng and Feldman 2012). In fact, older workers are very willing to learn the technological knowledge and skills required for their job, and their experience of success when using new technologies results in favorable attitudes towards it (Czaja and Moen 2004; Cutler 2006; Ng and Feldman 2012).

To enable these positive outcomes, it is important to give the right type of training (Cutler 2006) and to include familiar tasks in the training program (Czaja and Moen 2004). Possible physical and cognitive declines need to be taken into account, and the training program must be aligned with the needs of older workers (Thompson and Mayhorn 2012; Sharit and Czaja 2012). When older workers have successful experiences with computer technologies, they experience these technologies as reducing the effort and time required to fulfill job tasks and as increasing their job performance, enabling them to keep working effectively and productive (Mitzner et al. 2010).

Work–Home Interference. As explained above, blended working has the potential to meet older workers' desire for a better work–home balance, because it allows them the discretion to schedule their work activities and work location as they see fit (Van Yperen et al. 2014; Hedge et al. 2006). Paradoxically, however, blended working practices also introduce the risk of increased work–home interference, as workers may feel an expectation to be constantly available and may experience a blurring of work and private life; this can put a strain on workers themselves and on their relations with partners, family members, and friends (Van Yperen et al. 2014; Mazmanian et al. 2005). This may be particularly problematic for older workers. First, older workers have a stronger need to adequately balance work and private life (and tend to put a stronger emphasis on leisure time) (Hedge et al. 2006). Secondly, older workers are more likely to face health issues, both regarding their own health (which may mean that they need more opportunities to recover from work) (Thompson and Mayhorn 2012) and the health of their partner or other family members (which means that they may need more time to fulfill caring duties) (Czaja and Moen 2004; Hedge and Borman 2012).

Successful implementation of blended working practices among an aging working population requires that these issues are explicitly addressed. The perceived pressure resulting from constant connectedness is found to be contingent on the presence or absence of a shared notion that different workers might use ICTs differently (Mazmanian et al. 2005). Thus, it is important that older workers are not simply trained and encouraged to use new ICTs but also that they are encouraged to use them in the way that best fits their personal situation.

Integration and Practical Implications

Blended working practices can fulfill important psychological needs, some of which are particularly salient among older workers (such as the need for a distraction-free environment or a better work–home balance), but also introduces new pitfalls – some of which, again, may be particularly relevant to older workers (such as intensive use of new technologies and having to deal with negative stereotypes). If this brief review shows anything, it is that a *contingency approach* (Bailey and Kurland 2002) is essential when it comes to the implementation of blended working practices. Older workers' job performance can increase when the work environment is changed so as to fit more closely with their needs. They prefer a work environment that does not entail many changes, that allows for a flexible approach in conducting tasks, and in which they feel supported and receive the appropriate training (Hedge and Borman 2012). Taking workers' age, needs, and motives into account will help determine how blended working can best be put into practice for each individual worker, and can give insight in what aspects would require (additional) training opportunities (Van Yperen et al. 2014).

However, as noted, negative age stereotypes often result in excluding older workers from learning and training opportunities and lower their comfort to use these technologies. It should be stressed that such stereotypes are counterproductive and inconsistent with research evidence (Thompson and Mayhorn 2012; Ng and Feldman 2012). Organizations should become aware of these (implicit) biases and start changing their knowledge about older workers in accordance with what has been shown in the literature (MacDermott 2014; Ng and Feldman 2012).

The aging workforce is a fact, not an option. Therefore, the challenge is to implement blended

working in a way that matches older workers' needs and motives, while minimizing the associated risks. While technological training can be particularly helpful in this regard, it is not simply a matter of teaching older workers new tricks. Coworkers and supervisors will need to change along with their older colleagues – not just for the benefit of their colleagues and the organization but also with an eye to their own future. After all, the world of work will continue to change, and every worker and organization should prepare for these changes as well as they can.

Cross-References

- Age Stereotypes in the Workplace
- Age-Related Changes in Abilities
- Job Crafting in Aging Employees
- Organizational Strategies for Attracting, Utilizing, and Retaining Older Workers
- Technology and Older Workers
- Training at Work and Aging
- Work Design and Aging
- Workplace Mentoring, Role of Age

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Age and Intraindividual Variability

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Synonyms

Inconsistency; Reaction time variability; Within-person variability

Definition

Intraindividual variability is broadly defined as the fluctuation in an individual's cognitive performance over time. This can refer to the moment-to-moment fluctuation in reaction time on a single task, variation across multiple tasks in a cognitive battery, or a single task repeated over a period of days, months, or years.

Background

While cognitive and experimental psychologists have long been interested in age differences as reflected by mean level of performance on a particular task, there has been increasing recent interest in the way that individuals vary over time. This intraindividual variability (IIV), also referred to as within-person variability and inconsistency, is not only of interest to researchers in ageing but also to researchers in several other fields (e.g., schizophrenia, attention deficit hyperactive disorder) as it may provide valuable insights into a variety of issues including personality, cognitive performance, neurological status, and a range of other individual differences.

Within geropsychology, interest in IIV has stimulated an expanding volume of research in areas including personality development, health behavior, stress and anxiety, and medical rehabilitation (see Diehl et al. 2015), for a broad overview of current work). The present article, however, focuses on cognitive and neuropsychological work relating to IIV in older adulthood and provides an introduction to the construct, its theoretical and empirical basis, and potential not only to provide important insights into healthy and neuropathological brain ageing but also to help assessment of neurological disorders in clinical contexts. IIV can refer to within-person variability at the "macro" level (e.g., over days, months, or even years) or at the "micro" level (e.g., moment-to-moment variation recorded in milliseconds). Although variability at the macro and micro level may be related, distinctions have been made between them. For example, whereas external factors such as stress or fatigue may influence variability at a more macro level (e.g., across assessment sessions), endogenous factors related to, for instance, neurobiological disturbance may have greater influence on moment-to-moment variability as captured by successive trials of a cognitive task (Hultsch et al. 2008). A further distinction has been made between moment-to-moment variability on a single cognitive task (referred to as "inconsistency") and variation across different cognitive tasks (referred to as "dispersion") (Hultsch et al. 2002). As there is evidence that both types of IIV are associated, it is thought that they may capture similar underlying constructs. However, as an impressive body of work has built up around the "micro inconsistency" operationalization of the construct, and measures arising from this work have considerable potential in clinical practice, the present entry will primarily focus on intraindividual variability in reaction times (IIV_{RT}) obtained from trial to trial for a given neurocognitive task.

IIV_{RT} data are generally collected for an individual by recording response times (normally in milliseconds) from a series of computer-generated stimuli presented in either the visual or audio modes. Researchers have historically tended to quantify performance on such tasks by computing accuracy or calculating measures of "central tendency" such as mean or median RT. However, it has long been recognized that such within-person series of RTs exhibit varying degrees of variability

for a given cognitive task and are frequently punctuated by either phasic shifts in response speed or intermittent slower responses. Although largely ignored within experimental psychology, Nesselroade (1991) has pointed out that such within-person variation is likely to convey important information beyond that conferred by measures of central tendency. In the context of neurocognitive ageing, this has generated considerable interest as it has been suggested that IIV_{RT} may reflect attentional lapses, or relatedly fluctuations in attentional and executive control mechanisms (Bunce et al. 1993, 2004; West et al. 2002), or at a biological level, neurobiological disturbance (e.g., Hultsch et al. 2008). Recognition that IIV represents more than random error variance has generated an expanding body of empirical research and theoretical comment, and the interested reader is directed to several authoritative sources for further information (e.g., Diehl et al. 2015; Hultsch et al. 2008).

The present entry, however, will provide an overview of the main theoretical perspectives that have been used to understand IIV_{RT} and then, given space limitations, provide a selective review of cross-sectional and longitudinal empirical research in the ageing area. Given the importance of work demonstrating that IIV is not simply error variance, examples are provided of neuroimaging work suggesting that IIV_{RT} varies systematically in relation to the integrity of neuroanatomical structures (e.g., white matter connective tracts) and functional brain activity. As IIV measures have the potential to provide quick-to-use assessment tools in clinical contexts, issues are then highlighted that research should address in developing the measures for possible practitioner use. In the final section, some of the broader issues are emphasized where research effort is needed to increase our understanding of IIV.

Theoretical Perspectives on IIV_{RT}

Theoretically, how has IIV_{RT} been viewed? As the answer to this question is central to the interpretation of empirical research and its implications for clinical practice, this section will briefly summarize the main perspectives and interpretations of IIV_{RT}. Broadly, perspectives fall within methodological, cognitive, neurocognitive, or neurobiological domains.

Error variance: As indicated earlier, IIV, and particularly IIV_{RT}, until recently has largely been ignored by experimental and cognitive psychologists as being random noise related to error variance attributable to a variety of sources such as accidental key presses and computer logging errors. However, the rapid development of computing power with millisecond accuracy together with the recognition that IIV varies systematically according to a range of individual differences (e.g., age) and the complexity of the cognitive task and experimental condition has largely dispelled this idea and led to the body of research forming the focus of this entry.

Faster and slower responses reflecting similar underlying cognitive operations: A second interpretation stems from the idea that faster and slower RTs for a given cognitive task qualitatively reflect exactly the same underlying cognitive operations, but simply take differing lengths of time to initiate and complete. However, such interpretations appear limited as (a) conceptually, they ignore the question of why a succession of trials for the same cognitive task should vary over relatively short periods of time, and (b) they do not take into account the accumulating empirical experimental, neuroimaging and clinical work that clearly demonstrates IIV to systematically vary according to a variety of individual differences and task-related factors.

Attentional lapses and variation in attentional and executive control mechanisms: An alternative explanation for IIV within the context of ageing has its roots in cognitive psychology and holds that response speed variation over the course of a cognitive task reflects age-related attentional lapses or, relatedly, the strength of engagement of attentional or executive control mechanisms (Bunce et al. 1993, 2004; West et al. 2002). One way to think of this is to imagine an attentional spotlight, whereby RTs of different durations reflect the extent to which the individual is focused on the task in hand; faster RTs indicate a

greater level of attentional engagement with a narrower, more focused spotlight, whereas slower RTs reflect a broader less focused attentional spotlight. Layered onto these phasic shifts in the focus of the attentional spotlight are intermittent and unusually slow RTs reflecting attentional lapses where inhibitory failure has allowed task irrelevant information (e.g., internal momentary daydreaming or external environmental disturbance) to interfere with information processing. Although such interpretations have been contentious, recent functional brain imaging work (e.g., Weissman et al. 2006) in younger adults is consistent with the view that trial-to-trial responses of differing speeds may reflect the extent to which attentional or executive control mechanisms are engaged.

Neural noise: An approach that integrates neurobiological perspectives proposes that age-related increases in neural noise are responsible for the broader cognitive decline observed in old age. The idea that reductions in neural signal to noise arising from age-related dopamine (one of several neurotransmitters responsible for efficient neural communication) depletion may explain behavioral increases in IIV in old age is central to recent theoretical accounts. For example, using computational modeling techniques, Li and colleagues (2001) demonstrated that modifying model parameters that simulate age-related dopamine depletion lead to more random activation during signal processing. Computationally, this parallels age-related reductions in signal to noise that compromise the distinctiveness of cortical representations. The authors argue that a behavioral consequence of this is an increase in the within-person variation of cognitive performance. Functional imaging work demonstrating a link between dopamine modulation and behavioral IIV in older adults supports the view that age-related reductions in this neurotransmitter may be one of the neurobiological mechanisms underpinning increased IIV in old age (MacDonald et al. 2012).

Neurobiological disturbance: Whereas later accounts of the neural noise perspective link increased IIV to a specific mechanism, dopamine depletion, this account is more generic in that it proposes that more general age-related deterioration of the central nervous system is responsible for increased IIV in old age (e.g., Hultsch et al. 2008). Such deterioration might be related to specific neuropathology associated with, for example, the development of dementia or the consequence of major trauma such as brain injury. Evidence consistent with this view comes from work showing that increased IIV is associated with mild dementia (e.g., Hultsch et al. 2000).

Empirical Research into Healthy and Neuropathological Ageing

Given the foregoing theoretical perspectives, what does the existing empirical literature say about age and IIV_{RT}? The bulk of research tends to be cross-sectional, normally looking at individual differences and/or the effects of experimental manipulations of task condition. Although this work provides important insights into a range of influences on within-person variability, it says little of causal or temporal factors related to IIV. Such issues are addressed by longitudinal investigations which by comparison are in the extreme minority. Here, the main findings from cross-sectional and longitudinal studies investigating age and IIV_{RT} are selectively reviewed.

Cross-Sectional Studies

There are a number of cross-sectional studies that suggest a reliable increase in variability across the adult lifespan. For example, in a meta-analysis of studies taking age into account (Dykiert et al. 2012), increased IIV was found for simple or choice reaction time (RT) tasks in older (age 60+) relative to middle-aged (40–59) and younger (age 20–39) adults. As pooled effect sizes were larger for contrasts between older and younger participants than for older and middle-aged participants, the findings suggest that increased IIV is not restricted to older age, but increases gradually across the lifespan. The association between IIV and age has also been shown in more complex tasks such as memory tests and

tasks requiring attentional or executive control (e.g., Hultsch et al. 2002). Across a variety of tasks, the evidence suggests that age differences in IIV are increased with greater cognitive demands.

In addition to increases in within-person variability in healthy ageing, elevated IIV has also been shown in persons exhibiting mild cognitive impairment. As noted earlier, IIV is thought to be a marker of neurobiological disturbance and increased variability has been shown in individuals with mild dementia compared to neurologically intact controls or individuals with arthritis but no cognitive impairment (Hultsch et al. 2000). Because mild dementia is a disease of the central nervous system while arthritis is not, this study was one of the first to suggest that IIV_{RT} may be particularly sensitive to central nervous system integrity. Similarly, increased IIV_{RT} has also been shown in patients with Parkinson's disease relative to healthy controls (de Frias et al. 2012), and that this difference increases with task complexity.

Longitudinal Studies

Although there is much less longitudinal work in the area, there is evidence that IIV_{RT} increases with age and is predictive of future cognitive decline and also of future neuropathology. For example, a large-scale study tested three age cohorts (20s, 40s, and 60s) at 4-year intervals over 8 years on simple RT and more complex choice RT tasks (Bielak et al. 2014). Multilevel modeling adjusting for a range of potential influences including education level, health background (e.g., diabetes, hypertension), anxiety, and depressive symptoms showed an increase in simple RT variability over time in the older group. Consistent with the view that more marked age effects are generally found in more complex tasks, increases were also found over time for both the 40s and 60s groups for a choice RT task, although this trend was stronger in the older group.

There is also longitudinal evidence that increased IIV may be an early marker of age-related neuropathology and is predictive of subsequent cognitive decline. For example, one study (Lovden et al. 2007) had participants (aged 70–102 years at baseline) complete cognitive tasks, including perceptual speed and category fluency, on five occasions over a 13-year period. The results showed that longitudinal change in IIV_{RT} was highly correlated with change in level of performance. Increased IIV_{RT} temporally preceded cognitive decline, whereas lower cognitive performance had a negligible influence on subsequent change in variability. Importantly, this is one of the first studies to suggest that increased IIV may serve as an early marker of future cognitive decline.

Longitudinal evidence also indicates that increased IIV_{RT} may be an early marker of age-related neuropathology (Bielak et al. 2010). Over a 5-year period, community-dwelling older adults aged 64–92 years at baseline were grouped according to four classifications of CIND (cognitive impairment no dementia). Over the course of the study, participants either (i) remained cognitive intact, (ii) remained stable CIND, (iii) fluctuated between CIND and cognitively intact, or (iv) transitioned into CIND. Baseline $IIV_{RT,}$ computed from multitrial computerized tasks, not only differentiated between participants who were consistently intact and those who were stable CIND over time, but importantly identified those who transitioned into CIND.

Further evidence that IIV can predict future neuropathology comes from a longitudinal study that investigated whether change in variability distinguished between Parkinson's disease patients who did or did not develop dementia (de Frias et al. 2012). This study followed Parkinson's disease patients aged 65–84 and 43 matched controls. Participants were assessed at three time points: baseline (T1), 18 months (T2), and 36 months (T3). All participants had normal cognition at T1 and T2; however, at T3 10 Parkinson's disease patients were diagnosed with either dementia or cognitive impairment. IIV_{RT} measures were obtained from simple and choice RT tasks at T1 and T2. Change in variability differentiated the Parkinson's with dementia group from the Parkinson's patients who

remained cognitively intact and the healthy control group. Specifically, the Parkinson's with dementia group showed an increase in variability from T1 to T2, whereas the other groups did not.

IIV_{RT} also predicts falls and gait impairment in old age. A recent systematic literature review (Graveson et al. 2015) identified five studies (two prospective) reporting statistically significant associations between IIV measures and falls. A further four studies investigated the association between IIV and gait impairment finding more mixed evidence of an association although this may have been due to methodological differences between studies. However, this review clearly underlines the potential of IIV measures to identify older persons at risk of falling, although more prospective studies are required in the area.

Finally, several studies have shown that in older adults, increased IIV predicts all-cause mortality at least 12 years in the future (e.g., MacDonald et al. 2008). The findings from these mortality studies are of note as they suggest that the neurological disturbance that may be related to eventual death is present more than a decade in advance of the event. These studies highlight the potential of IIV measures to identify individuals at an early stage in the course of age-related decline thereby opening possibilities for intervention.

Although a selective review, the examples of individual studies detailed above, and evidence assimilated from qualitative and quantitative reviews of the literature, are representative of the broader body of research in that IIV increases over time with age and also predicts future cognitive decline and neuropathology.

Is IIV Systematically Related to Brain Structure and Activity?

A key part of our understanding of IIV stems from brain imaging work that suggests that IIV_{RT} is not simply random noise, but rather is systematically associated with either neuroanatomical structures or brain processes such as neurotransmitter modulation. Several studies, for example, have described the relationship between IIV and brain structural integrity reflected in magnetic resonance imaging (MRI) measures of white matter hyperintensities (WMH, microscopic white matter lesions) or diffusion tensor imaging. For instance, a recent MRI study (Bunce et al. 2013) investigated WMH in relation to RT variability in healthy middle-aged adults. Consistent with the view that elevated IIV is associated with neurobiological disturbance, greater frontal WMH burden was related to increased IIV_{RT}. Such associations between frontal WMH and IIV_{RT} are of interest as they are consistent with the idea that attentional mechanisms supported by the frontal cortex play a key role in the degree of RT variability. As noted earlier, there is also evidence that the neurotransmitter dopamine influences the level of IIV_{RT} in old age. Positron emission tomography has been used to assess dopamine D_1 binding potential in younger (mean age 25 years) and older (mean age 70 years) adults relative to IIV_{RT} on an interference task (MacDonald et al. 2012). Increased variability was associated with older age and diminished D_1 binding in brain regions that form part of the attentional network (e.g., dorsolateral prefrontal cortex and anterior cingulate gyrus). The findings suggest that dysfunctional dopamine modulation in attentional networks may contribute to increased RT variability in older adults. (Although conducted in younger adults, the functional imaging study (Weissman et al. 2006) mentioned earlier also provides some interesting functional MRI evidence of the brain activity associated with IIV.)

Although several imaging studies support a systematic association between IIV and brain structures, processes, and activity, a particularly interesting insight into that association is provided by recent work suggesting that an inverse relationship may exist between behavioral measures of IIV_{RT} and variability in brain activity as measured by the blood oxygen level-dependent (BOLD) response (a measure of brain activity obtained in MRI investigations). For example, Garrett and colleagues (2011) examined the relationship between BOLD variability and IIV on three cognitive tasks (perceptual matching, attentional cueing, and delayed match to sample) in younger (aged 20–30 years) and older (aged 56–85 years) adults. Across tasks, being younger

and behaviorally faster and less variable was associated with greater BOLD variability relative to older, poorer-performing adults. This study not only provides important evidence that BOLD activity is functionally associated with IIV but also suggests that (a) BOLD variability decreases with age and (b) greater BOLD variability is related to superior behavioral performance (in this case, lower IIV). Therefore, increased variability at the neural level may reflect greater signal to noise (i.e., more distinct signal) that, in turn, feeds into higher behavioral performance marked by less within-person variability.

In sum, the accumulating evidence suggests that the level of IIV is related to the structural integrity of the brain and that behavioral IIV varies systematically as a function of brain processes and activity. Interestingly, early evidence also suggests that greater functional brain activity may be inversely related to behavioral performance and that this association may change with age.

What Does RT Intraindividual Variability Convey Beyond Mean RT?

A key question concerns whether IIV_{RT} measures from a given cognitive task provide information beyond that obtained from measures of mean or median RT (i.e., measures of central tendency). Because mathematically, shifts in the intraindividual RT standard deviation are closely linked to shifts in mean RT, researchers have concerned themselves with disentangling the effects of the two measures. One approach involves adjusting for mean RT in order to confirm that IIV effects are independent. Several studies have been published in older adults relating to various outcomes that demonstrate that IIV has independent effects. For example, the aforementioned meta-analysis (Dykiert et al. 2012) investigated age effects in variability and generated pooled effect sizes for studies that adjusted variability for mean RT in contrast to studies that were not adjusted. For both simple RT and choice RT, pooled effect sizes were smaller when using mean-adjusted IIV but remained statistically significant. This suggests that although some of the age-related increase in IIV was associated with age-related response slowing, a portion of the variance arises from other sources.

Another insight into this question comes from studies that show a dissociation between IIV and mean RT measures from the same cognitive task. That is, significant effects in relation to outcome are obtained for the IIV measure but not mean RT. For example, Hultsch and colleagues (2000) found that IIV was uniquely predictive of neurological status (mild dementia compared with healthy older adult or arthritic control groups), and structural MRI studies also indicate a dissociation between IIV and mean RT in relation to, for example, frontal white matter hyperintensities (WMH) (Bunce et al. 2013).

Together, this accumulating evidence suggests that IIV does provide unique information that measures of mean RT from the same task do not capture. Given theoretical accounts that link increased IIV to neurobiological disturbance and empirical evidence supporting the association, a key question is whether IIV measures have the potential to supplement commonly used neuropsychological assessment measures to help identify age-related neuropathology. Indeed, is it the case that these measures are particularly sensitive to the subtle early manifestations of neurological disorders and therefore have potential as early warning devices? This issue is considered in the next section.

Clinical Implications and Practice

Some of the empirical studies reviewed clearly suggest that IIV measures can provide an early marker of future cognitive decline or neurological disturbance (e.g., Lovden et al. 2007; Bielak et al. 2010). This raises the possibility that the measures may have potential in clinical practice either as supplements to neuropsychological assessment batteries or as stand-alone metrics. Use of variability measures is attractive for several reasons. First, they can be administered on commonly available PCs, laptops, or tablets using

responses to stimuli appearing on a screen requiring minimal linguistic content. The measures may, therefore, possess advantages when used with individuals from culturally and linguistically diverse backgrounds. Second, administration requires minimal neuropsychological training, and assuming appropriate normative data, the measures may have considerable potential in primary healthcare. Finally, IIV measures are quick to administer. For example, a recent study in cognitively intact community-dwelling middle-aged persons (Bunce et al. 2013) found statistically reliable predictions of potential neuropathology (frontal cortex burden of WMH) were obtained from as few as 20 RT trials taking approximately 52 s to administer. Although it is not clear whether the WMH in this sample were indicative of future neuropathological disorders such as mild cognitive impairment (MCI) or dementia, the potential of IIV_{RT} measures to provide quick and simple identification of persons at risk of such disorders is clear. An important direction for future work, therefore, is to explore the potential of IIV measures in clinical contexts.

Future Research: Gaps in Knowledge

Clearly, IIV measures may not only provide important insights into ageing neurocognitive processes but, as the foregoing section has highlighted, also provide a potential neuropsychological assessment tool in clinical contexts. Against this background there are some important gaps in our knowledge that future research needs to address.

First, to date, studies investigating IIV_{RT} have used a wide variety of cognitive tasks ranging from fairly straightforward psychomotor tasks (e.g., simple or choice RT) to more complex attentional or executive control tasks (e.g., Stroop and Flanker tasks). Although tasks of varying complexities have been shown to be significantly associated with various outcomes, a key question is what type of task and level of complexity is most suited to identifying which condition and under which circumstances. Indeed, is it possible to develop one ubiquitous "catch all" task, or are different tasks best suited to different clinical conditions and contexts?

Relatedly, in quantifying the intraindividual standard deviation (*SD*) measures used to estimate IIV, investigators have used a range of metrics including the raw *SD*, the coefficient of variation (intraindividual *SD*/intraindividual mean), ex-Gaussian parameters (i.e., mu, sigma, tau), fast Fourier transformations, and procedures that statistically partial out potentially confounding effects that inflate IIV such as time-on-task effects (e.g., practice, fatigue) and individual differences (e.g., age). Though all of these measures have been found to be significantly associated with a range of outcomes, important questions again concern what is the most appropriate metric and under what circumstances. Although existing research (e.g., Lovden et al. 2007; Bunce et al. 2013) suggests that different metrics produce similar outcomes, issues such as psychometric specificity and sensitivity are important as well as the practicalities of computation and interpretation by time-pressured practitioners working in busy clinics. Research is clearly required regarding the suitability and rigor of different computations of IIV. Further evidence is also needed of the number of trials that should be administered in order to produce a reliable predictor of outcome.

Third, as noted earlier, to what extent do IIV measures provide information beyond that present in mean RT measures obtained from the same task? Although numerous studies have either adjusted for mean level of performance (either statistically or in the computation of the IIV measure itself) or demonstrated a dissociation between IIV_{RT} and mean RT tasks where the former but not the latter significantly predict outcome, more evidence is required of the independence of IIV_{RT} relative to mean RT.

Fourth, most of the research to date has been cross-sectional in nature, and so temporal relations between IIV_{RT} and outcome need to be better understood. Although research has shown IIV to be predictive of future cognitive decline, MCI, mild dementia, falls, and all-cause mortality, it is important that research provides more evidence of the measure's predictive utility.

Finally, if clinicians are to use well-developed measures of within-person variability, metrics need to be normed while taking into account individual differences such as age and education. Importantly, consideration needs to be given to linguistic ability and cultural background. Although, in theory, straightforward psychomotor tasks involving visual stimuli may appear suitable for a range of linguistic and cultural backgrounds, research has yet to demonstrate that this is actually the case. With the multicultural profile of many cities around the world, and also reports that undetected MCI and dementia prevalence is greater among ethnic minority and immigrant groups, answers to this question are obviously of pressing importance.

Conclusions

In summary, this selective review has described research showing that increased IIV_{RT} is associated with a range of outcomes including greater age, MCI, mild dementia, falls in old age, and all-cause mortality. Associations have been demonstrated in both cross-sectional and longitudinal research although there is a need for more investigations in the latter category. Against this background and given that the measure is relatively straightforward and quick to administer and requires little training for practitioners, it obviously has considerable potential for neuropsychological assessment in clinical contexts. It is therefore important that further research adds to an already impressive body of evidence underlining the measure's potential as a neuropsychological assessment tool.

Cross-References

- ▶ Age-Related Slowing in Response Times, Causes and Consequences
- ▶ Aging and Attention
- ▶ Aging and Inhibition

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Age and the Psychological Contract

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Synonyms

Aging workers; Employee motivation; Employment relationship; Older workers

Definition

Psychological contracts describe the exchange relationships between employees and organizations. It consists of the unwritten mutual obligations between the two parties. In the current chapter, three ways through which age has an impact on the psychological contract are described. First, age can have an impact on the type of obligations employees exchange with their employers. Secondly, age can have an effect through influencing the type of psychological contract (i.e., transactional or relational) employees have with their organization. Finally, age influences the responses employees show towards breach and violation of the psychological contract.

Introduction

The aging population has important implications for workforces, organizations, and employees (Bal et al. 2015; United Nations 2009). Throughout the Western world, the average age of the populations is increasing due to decreased fertility rates, increased longevity and the baby boom generation that is currently approaching their retirement age. As a consequence, workforces will be composed more and more of older workers, and with many governments increasing the statutory retirement age, the available pool of potential employees will increasingly be consisted of older workers (Truxillo and Fraccaroli 2013). As a consequence of these changes in the workforce constitution, organizations have to adjust their policies and practices to facilitate older workers to stay and remain motivated, productive, and healthy contributors in the organization. However, very few organizations actually manage to successfully implement policies and practices to retain and motivate their older workers (Bal and Jansen 2015). One way the employment relationship between employee and organization can be understood is through the lens of the psychological contract. The psychological contract describes the exchange relationship between employees and the organization (Rousseau 1995), and is essential to understand the attitudes and behaviors of employees in their organizations. This chapter

explores how age may affect the psychological contract between employees and organizations, and explores the theoretical processes through which age has an impact on psychological contract dynamics. I describe three ways how the psychological contract is influenced by employee age. First, age can have an impact on the obligations employees exchange with their employers. This means employers and employees develop different expectations of each other when the employees become older. Secondly, age can have an effect by influencing the type of psychological contract employees have with their organization. Research has distinguished between transactional and relational contracts (Rousseau and McLean Parks 1993; Zhao et al. 2007), and previous studies have shown that age may be related to the type of contract one has with the organization (Vantilborgh et al. 2015). Finally, age influences the responses employees show towards breach and violation of the psychological contract (Bal et al. 2008). Below, each of the pathways through which age may impact the psychological contract will be outlined.

The Psychological Contract

The psychological contract has been developed as a scientific construct in the early 1990s (Rousseau 1989, 1995), while being introduced in the early 1960s in the research of Argyris (1960) who described it as a relationship that developed between employees and their foremen at work. The relationship consisted of expectations of employees and managers about each other's behavior beyond what is traditionally defined in contracts such as the number of working hours and the remuneration. Argyris (1960) referred to this relationship as a psychological contract between the two parties, and subsequent work by Rousseau (1989, 1995) developed the construct more thoroughly. Rousseau defined the psychological contract as the employees' perceptions about the mutual written and unwritten obligations between them and their organizations. In other words, the psychological contract is a mental model about what the employee thinks the organization should do for the employee, and what the employee should do in return. These mutual obligations may have arisen from preemployment experiences, but are also communicated via recruitment processes, communication from the organization (such as employer branding), and promises made by managers to the employee (Rousseau 1995). Key to understanding the psychological contract is its subjectivity: employees form perceptions of the mutual obligations between them and their organizations, and these perceptions lead their attitudes and behaviors (Zhao et al. 2007). Psychological contract research typically distinguishes between three ways the psychological contract can be approached; first research has focused on the *content* of the psychological contract, or the perceptions of the employee about what is exchanged between employee and organization (Conway and Briner 2005). Second, research focused on the type of psychological contract that employees have negotiated or formed with their organization, and has distinguished between transactional and relational contracts (Rousseau and McLean Parks 1993). Finally, the majority of research on psychological contracts has focused on the breach of the psychological contract and its consequences on various outcomes, such as motivation and performance (Zhao et al. 2007; Bal et al. 2008). Each of these elements of the psychological contract may be related to employee age and will be discussed in greater detail below. However, to do so, first a discussion will follow on the theoretical development of the concept of age in organizations in relation to psychological contracts.

Theories of Age and the Psychological Contract

Research on the role of employee age in the workplace can be traced back to the early 1980s (Maehr and Kleiber 1981; Rhodes 1983). While initial interest primarily was on the direct effect age has on various work outcomes, such as job satisfaction and job performance (Avolio et al. 1990), during the last year scientific work on the role of employee age in the workplace has advanced substantially (see e.g., Kooij et al. 2008). More specifically, theory of aged heterogeneity

(Nelson and Dannefer 1992) postulates that the older people become, the more heterogeneous they become as well. Hence, recent work on aging in the workplace has acknowledged that the predictive value of employee age with respect to job attitudes and behaviors is very marginal (Bal and Jansen 2015; Kooij et al. 2008; Bal and Kooij 2011). Because the aging process is associated with various changes, including changes in personality, life styles, health, organizational experiences, and psychosocial perceptions, it has been argued that the older people become, the more different they become from their peers. Hence, older workers will also be more different from each other and therefore also show more complex patterns in relation to work-related experiences, including psychological contract perceptions, job attitudes and job behaviors. Hence, it is important to ascertain the underlying changes that cause psychological contract perceptions and job attitudes to change with age. Therefore, theories of gerontology and development psychology shed more light on the changes that people experience when aging at work. Especially the Socioemotional Selectivity Theory (SST; Carstensen 2006), and the Selective Optimization with Compensation model (SOC-model; Baltes and Baltes 1990) may inform theory about aging and psychological contracts.

Socioemotional selectivity theory states that in young adulthood time is perceived as expansive (Carstensen 2006). Young people prepare for a long and unknown future and therefore primarily focus on growth and knowledge-related goals. For older people, however, the experience of approaching the end of life causes a shift towards present-related emotional goals over knowledge goals, and a focus on emotional well-being. Older people increasingly focus on the present, and in particular on maintaining positive feelings and avoidance of negative feelings (Carstensen 2006; Carstensen and Mikels 2005). Although older people may be sensitive to emotional situations, they are more focused on maintaining positive feelings (Carstensen and Mikels 2005). The central idea of SST is that with increasing age, people have a different time perspective, and these changes in time perspective are predictive of how they perceive their psychological contract should be, and how they react to psychological contract experiences. Time perspective causes people to shift from knowledge-related goals to emotional goals and well-being, and this also has implications for psychological contracts.

The SOC-model of aging (Baltes and Baltes 1990) postulates that people experience losses in their capabilities when they age. To cope with these losses, they will use a number of strategies to adapt to their environment, namely selection, optimization, and compensation. People select by narrowing their range of activities to fewer but more important or rewarding goals. For instance, employees may give up job responsibilities or involve others in their less central tasks because the overall workload becomes too high. Optimization refers to acquisition of, and investment in, means and abilities to achieve the goals people set in their work. For instance, people who perceive that their competencies are becoming obsolete may search for alternative strategies to maintain their performance. Finally, people compensate for losses through employing alternative means to maintain a desired level of functioning. For instance, people use pragmatic means (e.g., how they present themselves to others; Abraham and Hansson 1995) to make up for losses they experience. More specifically, people act in ways that "minimize the effects of developmental losses on the evaluation of their performance in the workplace" (Abraham and Hansson 1995, p. 96). Previous research has shown that people who are successful in employing their SOC-strategies obtain a more satisfactory level of performance at work (Kooij et al. 2008). Hence, the SOC-model may play an important role in explaining how older workers cope with age-related losses in forming their psychological contracts with the organization. Below, the chapter discusses how aging may impact the three elements of the psychological contract, based on the main theoretical notions of aging.

Age and Content of the Psychological Contract

The content of the psychological contract is the first element that can be affected by employee age.

The content of the psychological contract refers to the employee's beliefs about what the employer is obligated to the employee and what the employee owns in return (Rousseau 1995). Research has shown that obligations that employees expect their organizations to deliver include financial rewards, interesting jobs, a nice working atmosphere, career development, and work–life balance (De Vos et al. 2003). Conversely, perceived employee obligations include inrole behavior, such as job performance, extra-role behaviors, flexibility, loyalty and ethical behavior (De Vos et al. 2003). Surprisingly, there is not much research on the role of age in the development of these obligations. Schalk (2004) reported that in general, employee obligations tend to increase with age, while employer obligations show a more complex pattern. Based on findings that older workers become more benevolent, Schalk (2004) concluded that older workers form a psychological contract that emphasizes the employee's contributions over that of the organization. Hence, a first conclusion is that over the life course people will expect less from their employer, while their perceptions of their own obligations may be stable even increase with aging.

Theoretically, SST predicts that older people have a more constraint future time perspective and therefore prioritize emotional goals over knowledge goals (Carstensen and Mikels 2005), and the SOC-model states that in order to cope with age-related losses, older people become more prevention-focused (Baltes and Baltes 1990). As a consequence, older workers should be less focused on employer obligations such as development, and more on obligations such as work–life balance and social atmosphere, as they are more aligned with emotional goals. However, research on the direct impact of age on perceived obligations is scarce. Bal (2009) reported a negative correlation between age and developmental obligations, but found no significant relation of age with other employer obligations. Hence, there is some tentative evidence for an effect of age on content of the psychological contract, indicating a decrease of employer developmental obligations over the life course, and increase of employee obligations with age.

Age and Psychological Contract Types

Type of psychological contract refers to the nature of the relationship between employee and organization, and instead of describing the specific obligations which are part of the exchange relationship, types define the more generic nature of the relationship. The most often studied psychological contract types are transactional and relational contracts (Rousseau 1995). Transactional contracts refer to the short-term monetizable aspects of the relationship where there is little mutual involvement in the lives and activities of each other (Rousseau and McLean Parks 1993). The focus is purely materialistic. Relational contracts, however, entail aspects of the relationship that focus on mutual agreement with both exchanges of monetizable elements and socioemotional elements, including career development. The focus is on establishment of a long-term and open-ended relationship (Rousseau and McLean Parks 1993). Because of the focus of relational contracts on career development, it could be argued that older workers over time develop a more transactional and less relational contract. However, given the emotional nature of relational contracts, it can also be argued that older workers develop a more relational contract over time and given older workers' longer average tenure in organizations, they might also develop less transactional contracts. Research shows inconsistent patterns of relationships. A meta-analysis of Vantilborgh and colleagues (Vantilborgh et al. 2015) showed that age was negatively related to transactional contracts, while it was unrelated to relational contracts. Another study by Bal and Kooij (2011) found that the extent to which age has an impact on type of contract, depended upon how central the role of work in the lives of older workers was. While work centrality did not matter for younger workers, they found that for older workers, the centrality of work in their lives determined whether they were willing to invest in the relationship with the organization and develop a relational contract. In contrast, older workers with low work centrality were more likely to have a transactional, tit-for-tat relationship with their

organization. However, given the complex nature of the meaning of age as well as type of psychological contract, there is no definitive answer to the question whether older workers have more transactional or relational contracts.

Other research on the relation between age and types of psychological contracts has focused on the degree of balance in employer versus employee obligations (Vantilborgh et al. 2013). Vantilborgh and colleagues (2013) found that in line with the benevolence hypothesis, older workers tend to report more under obligations, while younger workers were more likely to report over obligation. This means that older workers perceived their own obligations to the organization to be higher than what the organization should do for them, while younger workers reported that the organization owed them more than they owed the organization. This indicates that while younger workers, who have more expanded future time perspectives (Carstensen 2006), focus on learning and development and consequently expect the organization to deliver upon these obligations. Older workers, however, have a lower future time perspective and therefore have lower expectations concerning what the organization should do for them, and they may fulfill their emotional goals through different means than the organization. In sum, there is mixed evidence of the relationships of age with type of psychological contract. While meta-analytic evidence suggests that older workers have less transactional contracts, there is also evidence that hints at the contingent nature of the relation between age and relational contracts, with a potential moderating effect of work centrality. Hence, the extent to which older workers develop different types of psychological contract depends upon how they experience the aging process, the role of work in their lives, and the goals they have in their lives and at work.

Age and Psychological Contract Breach and Violation

The majority of studies on psychological contracts have focused on breach and violation of the contract (Zhao et al. 2007; Bal et al. 2008). Contract breach is defined as the cognition by the employee that the employer has failed to fulfill one or more elements in the psychological contract (Morrison and Robinson 1997). Contract violation is subsequently defined as the emotional reaction following a breach. Previous meta-analytic work has shown that contract breach and violation are associated with a range of outcomes, including lower work motivation, job satisfaction, organizational commitment, and job performance, and higher employee turnover (Zhao et al. 2007; Bal et al. 2008). Hence, psychological contracts become salient for employees and organization when there is a disruption, and employees perceive a breach, since this may have severe consequences for employee attitudes and behaviors, which may be related to negative consequences for the organization as well. It is not surprising given the importance of breach that most of the research on the role of age in psychological contracts has focused on how age influences breach and reactions to breach.

The first published study on the role of age in psychological contracts was in fact a meta-analysis looking at the moderating role of age in the relations between contract breach and job attitudes (Bal et al. 2008). Based on SST, the authors argued that when workers become older, they are more focused on emotional goals and maintenance of emotional well-being, and hence when they are confronted with a negative emotional experience such as a breach, they are focused on maintaining their existing relationships. Hence, it was expected that older workers would react less intensely when a contract breach occurred as it would disrupt their relationship with the organization. Bal et al. (2008) found overall support for this hypothesis, and found that younger workers reacted more strongly to breach in relation to trust and organizational commitment. However, they also found that older workers reacted more strongly in relation to job satisfaction, and hence, more research was needed to ascertain the specific relationships.

Theoretically, SST proposes that older people have fewer future opportunities, and therefore concentrate on emotional well-being, and the

SOC-model proposes that in order to cope with age-related losses, people become more focused on prevention of losses and maintenance of well-being and current functioning (Carstensen 2006; Baltes and Baltes 1990). Hence, it is to be expected that age may have different effects on breach and violation, and in particular the way people react to breach and violation. Following these theoretical notions, a number of studies have focused on explaining the different reactions people show in response to breaches. A study of De Lange and colleagues (2011) investigated the relations between breach and work motivation, and in particular they ascertained the role of age-related factors as moderators. Based on the idea that the aging process entails different changes, they looked in particular at the role of future time perspective and regulatory focus. Their study indicated that older workers indeed experienced a lower future time perspective as well as a lower promotion (i.e., learning and development) focus. Moreover, they found that people with high future time perspective and a low prevention focus reacted more strongly to contract breach in relation to work motivation. Their study shows evidence for a mediated moderation effect: the relations of contract breach with outcomes are dependent upon employee age, but via future time perspective and regulatory focus. Taking this idea further, Bal and colleagues (2013) tested a model where the relations between breach and organizational commitment were moderated by two age-related factors: future time perspective and occupational expertise. The authors showed that while age was related to lower future time perspective, it was related to higher occupational expertise, as people develop their expertise over time. They showed that while high future time perspective (i.e., younger workers) was related to stronger reactions of breach on commitment, they also showed that high occupational expertise (i.e., older workers) also related to stronger reactions to breach. Thus, they concluded that the overall effect of age on the reactions to breach may be nullified through the differential effects age has on time perspective and expertise. Thus, by disentangling the effects age has on how people experience their environment and themselves, the reactions to breach can be studied in greater detail. Finally, a study of Bal and Smit (2012) focused on the emotion regulation aspect of SST, and proposed that older workers may be better in regulating their emotions once a breach has occurred. They found support for this notion; the relations of psychological contract breach with positive and negative affect were moderated by age, and in line with their predictions, emotion regulation strategies were also important in relation to breach. While in general suppression of emotions is negative, the study showed that because older workers are better in expressing their emotions, suppression has adverse effects for older workers in response to breach, while it was beneficial for younger workers in response to breach. Their results show that younger workers do not yet have developed the appropriate emotion regulation strategies and therefore should be careful with expressing what they feel, while older workers in general have better skills to express themselves after a breach has occurred.

In sum, these studies show that age has a strong effect on how people react to psychological contract breach and violation. In general, older workers tend to react less intensely, but these reactions are dependent upon age-related changes people experience over their lives. Because people when they become older have fewer opportunities in their future, are less promotion-focused and more prevention-focused, they are inclined to react less intensely when they experience a contract breach. However, older workers also have accumulated skills and expertise, through which they feel more entitled and show stronger reactions to breach. Moreover, they have developed more appropriate emotion regulation skills and therefore their reactions may also be qualitatively different from those of younger workers. However, future research is needed to further ascertain how younger and older workers differ in their reactions to breach and violation.

Conclusion

This chapter explored the role of employee age in psychological contracts. Psychological contracts

describe the unwritten, mutual obligations between employees and their organizations, and are subjectively experienced by employees. Research has shown that psychological contracts, and in particular perceptions of breach and violation, are profoundly related to various outcomes, including lower motivation, commitment and performance, and higher employee turnover (Zhao et al. 2007; Bal et al. 2008). There are three elements of the psychological contract that can be influenced by age: the content, the type, and the reactions to breach and violation. Building on theoretical notions of SST (Carstensen 2006) and the SOC-model (Baltes and Baltes 1990), age can have a three-folded effect on the psychological contract.

First, age can impact the obligations that employees perceive their organization has towards them and the obligations that employees themselves have towards their employer. While there is some research on this, indicating some benevolence of the older worker, there is still much left to be investigated. More specifically, there is little known on whether obligations become less or more important as employees grow older, and whether obligations will change more qualitatively. For instance, while work–life balance may be important for younger workers to have flexibility to develop themselves in other areas outside their work, for middle-aged workers work–life balance can be important to be able to fulfill demands from work, family, and other domains, while for older workers work–life balance may be important to balance the demands of the job with the decreased physical capabilities that are associated with the aging process (Lub et al. 2011). Hence, there may be no main effect of age on these types of obligations, but the reasons why people think their employer is obligated to deliver something may differ substantially according to someone's age, or needs resulting from age-related changes, including time perspective and prevention focus.

Second, age may have an impact on the type of relationship one has with the employer. Meta-analytic evidence shows a decline of transactional contract with age (Vantilborgh et al. 2015), but this effect may also be due to a selection of survivors within organizations. Perhaps employees with more relational and less transactional contract may be more likely to stay in the organization, while others with a more transactional contract leave or are made redundant more easily. Hence, a negative correlation could be due to employees leaving the organizations, and older workers being the survivors within the organization. Theoretically, there are multiple reasons why older workers should have more transactional and more relational contracts, and it is through research looking at contingency factors that we obtain more understanding of the process through which older workers develop their psychological contracts over time. For instance, Bal and Kooij (2011) showed that work centrality may be an important factor that determines whether older workers still invest in their relationship with the organization, or just accept a transactional agreement that only entails a number of hours and salary in exchange for work. Hence, future research can also shed more light on the relationships between age and type of psychological contract.

Finally, age can have an effect on how people respond to psychological contract breaches. Meta-analytic work (Bal et al. 2008) and primary research has shown that older workers may show different reactions to contract breaches, but these reactions may differ depending on the age-related changes that people experience with the aging process. For instance, research of Bal et al. (2013) showed that future time perspective and occupational expertise may have contrasting effects for older workers on the relationships of breach with organizational commitment. Moreover, Bal and Smit (2012) showed the importance of emotion regulation strategies for younger and older workers, and De Lange and colleagues (2011) showed the important of time perspective and regulatory focus. In sum, these studies show that it is important to assess the underlying changes associated with age that actually cause people to perceive their psychological contract differently, and react in a different way to contract breach and violations. Age can thus have differential effects on the psychological contract, and thus via influencing the exchange relationship

between employee and organization, may have important effects on employee attitudes and behavior in the workplace. A final note should be made about the majority of research on psychological contracts, which has been primarily cross-sectional in nature, or has used limited longitudinal designs. Therefore, it is impossible to separate aging effects from generational or cohort effects in the psychological contract literature. Hence, future research should also take into account the possible generational impact on psychological contracts at work (Lub et al. 2011).

Cross-References

- Age Diversity At Work
- Age Stereotypes in the Workplace
- Job Attitudes and Age
- Recruitment and Selection of Older Workers
- Work Design and Aging
- Work Motivation and Aging

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Age and Time in Geropsychology

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Synonyms

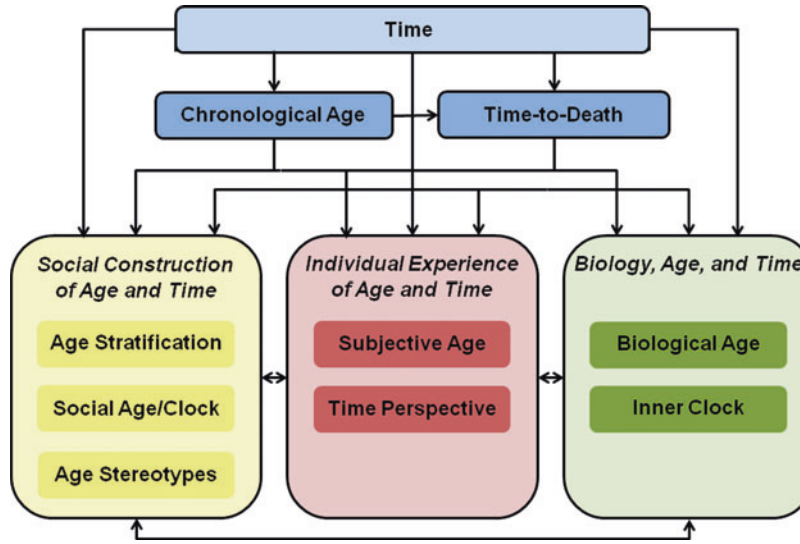
Biological age; Biological clock; Historical time; Life course; Social age; Subjective age; Time perspective; Time-to-death

Definition

Following the Merriam-Webster dictionary, we define age (in a geropsychological context) as "one of the stages of life," paying particular attention to "an individual's development measured in terms of the years requisite for like development of an average individual" (Age 2015). Similarly, we define time (in a geropsychological context) as "a nonspatial continuum that is measured in terms of events which succeed one another from past through present to future" or "the measured or measurable period during which an action, process, or condition exists or continues" (Time 2015). In this contribution of the *Encyclopedia of Geropsychology*, we illustrate the multifaceted and interwoven nature of age and time.

Overview

Age and time are intricately intertwined. Processes of aging are often a product of the passage of time. Although human beings are highly adaptable and human development is defined by a high degree of plasticity, many functions decline with increasing age. At the same time, the finite nature of lifetime becomes progressively more salient. The goal of this contribution is to provide an overview of the various concepts and definitions related to age and time, consider how these develop as people go through life, discuss reciprocal associations between age and time (Fig. 1), and outline various approaches aimed at disentangling age- and time-related processes. First, the authors briefly review demographic developments over time that have contributed to the growing societal and scientific interest in age and aging; particular attention is paid to differences in life expectancy, health outcomes, and psychological functioning of members of different birth cohorts. The authors then explain how chronological age and time-to-death are used to situate individuals within the life course. Next, the authors turn to the influence of age and time on people's societal embeddedness, individual experience, and biology and consider interrelations between these concepts. Additionally, relevant theories that are concerned with associations between age and time and touch on methodological challenges are presented. To conclude, the authors return to the issues revolving around the



Age and Time in Geropsychology, Fig. 1 Interrelations between age and time and associated concepts

interrelations between age and time and deliberate to what extent scientists have been successful at disentangling the two and suggest future avenues on this quest.

Historical Time and Age-Related Outcomes

Aging, Life Expectancy, and Life Span in Historical Context

Although aging encompasses processes that occur throughout life and do not start at a particular number of years past birth, aging is generally associated with the later years of life. Systematic research on aging is a relatively new field. Until the 1980s, "old age" was not really recognized as part of the life course (Kohli 1986). Life expectancy or average life span, which refers to the age at which 50% of individuals are still alive, has risen dramatically over the past century. Whereas average life expectancy worldwide in 1840 was approximately 45 years in the longest-lived group of people (Swedish women; (Oeppen and Vaupel 2002)), in 2012 it was 84 years in the longest-lived country (Japan) and 70 years worldwide (World Health Organization 2014), and it seems to be continuously increasing (Oeppen and Vaupel 2002; Vaupel 2010). Thus, it is no surprise that being a certain age today means something entirely different than it did 150 years ago. Originally, rising life expectancy could be attributed to decreases in childhood mortality. Subsequently, survival rates at higher ages grew (Vaupel 2010), meaning that death has become more concentrated in later life (Kohli 1986). Thus, mean age at death has increased, whereas variability in age at death has decreased. In contrast, the maximum life span or the age of the longest-lived human being has remained essentially the same.

About 30 years ago, Fries (1980) proposed that increases in life expectancy would be accompanied by a greater delay in the age of onset of morbidity than in the age of death; thus, the proportion of lifetime that is spent in good health would increase; this idea was referred to as compression of morbidity and has been the subject of studies in various fields over the past decades. Whether it can be concluded that morbidity has been compressed into the later years of life seems to depend on its definition. If the number of medical diagnoses of physical health conditions is considered, there is little evidence for a compression of morbidity. The age of first occurrence of various health conditions (e.g., heart attacks) has remained largely the same (Crimmins and Beltrán-Sánchez 2010). However, if morbidity is viewed as level of disability as indicated by impairments in activities of daily living (ADLs), evidence from several longitudinal studies

suggests that morbidity has, indeed, been postponed (Fries et al. 2011). There is some controversy around whether this truly constitutes a compression of morbidity because outside factors such as environments conducive to living with chronic disease and better medical treatments seem to underlie the lower incidence and prevalence of disability (Crimmins and Beltrán-Sánchez 2010). However, other experts argue that the focus should be on disability-free life expectancy, which has, indeed, increased historically (Cutler et al. 2013).

Historical improvements can also be observed in psychological measures that are related to or relevant in old age. Evidence is accumulating that compared to earlier-born cohorts, later-born cohorts have better cognitive performance and also report higher levels of well-being (Gerstorf et al. 2015). These developments are thought to be the result of a myriad of secular advances, including improvements in material and economic environments, medical practice, educational and media systems, as well as psychological resources such as reading, writing, and computer literacy.

Time and Organization of the Life Course

The passage of time marks individuals' moving through the life course. People experience certain (prototypical) changes at different points of the life course; e.g., the later years of life often are associated with declines in physical functioning and gains in life experience. Time-based metrics are used to place individuals with regard to their progression throughout life.

Chronological Age

Chronological age or time since birth is still the most popular marker of situating people in the life course, even though it may not reveal "how old" an individual really "is" or "how old" an individual feels. People of the same age often show huge individual differences in a given domain of functioning; lifestyle choices and the historical period people are living in are only two of many contributing factors. Decades ago, researchers have recognized that chronological age alone is a poor predictor of health and psychological outcomes (Neugarten 1982). Although biological factors are thought to determine the maximum life span of the human species, genetics seem to play a relatively minor role in determining individual life span, explaining only about 25–30% (Slagboom et al. 2011); they may become increasingly important in people who have survived into advanced age (Vaupel 2010). Gerontologists acknowledge that chronological age is only of limited utility for understanding individual aging, but they continue to utilize chronological age frequently in empirical research, for example, to select and describe target groups.

Time-to-Death

One approach to dealing with the huge individual differences in a given domain of functioning for people of a certain chronological age has been to focus on time-to-death or the time left in life. Compelling evidence has accumulated to indicate that the last years of life are accompanied by steep deteriorations in levels of functioning across a myriad of life domains, including physical health, sensory functioning, cognitive fitness, emotions, and well-being (Gerstorf and Ram 2013). As a consequence, time-to-death seems to be a valid predictor for healthcare expenditures and is sometimes used to determine whether certain services for older people such as hospice or palliative care should be awarded. A shift to awarding benefits and services in old age based on remaining life expectancy has its own challenges, among other things, because estimates rely on population statistics rather than individual statistics. Further operational definitions of the general time-to/from-event logic to track event-related changes in certain domains of functioning include menopause, retirement, disability, onset of a given pathology, etc. (Ram et al. 2010).

Social Construction of Age and Time

People's position in the life course shapes their embeddedness within society. Chronological age is present in frameworks to formally organize the

population. Furthermore, it seems to affect social perceptions.

Age Stratification and Social Age

Chronological age plays a big role in structuring society. Many policies are age based, meaning they only apply to people who have lived a certain number of years; the most well-known concern formal schooling and entry into retirement. In fact, retirement is frequently viewed as a marker of entering "old age." Retirees can expect to receive a range of benefits that are based primarily on their chronological age. In recent decades, however, the call for a system that awards benefits and services based on needs has become louder because the group of retirees is by no means homogeneous (Neugarten 1982). At the same time, retirement is beginning to be a less clear-cut transition because some people work beyond the mandated retirement age, some gradually reduce their work, and still others return to work for a while after their official retirement. Still, the proportion of people who benefit from retirement pensions has increased greatly since its formal creation (Kohli 1986), and protests arise at discussions of raising retirement age by even a few years or months.

The age-group or age stratum that someone belongs to can also influence the social roles that the individual is willing or expected to play, similarly to social class. Unlike social mobility, all people move through different age strata and the associated roles; they can experience stress or stigma if they adopt or are forced into a role that is not commonly viewed as belonging into a particular age stratum (e.g., men becoming fathers at 60+ years). A relatively "normative" model of the life course allows others (e.g., employers) to judge whether someone is following an orderly progression (Kohli 1986). These types of "norms" can differ by cohort. For example, the role of grandparents has changed significantly over time. First of all, due to increased life expectancy, it is now more likely for grandparents to be alive well into their grandchildren's childhood and youth, sometimes adulthood. Secondly, grandparents tend to be healthier than they were historically and are better able to step in to help with the care of their grandchildren (Datan et al. 1987). Although people tend to affiliate with others of similar age outside the family and policy systems contribute to age stratification (Kohli 1986), the clear segmentation of the life course into schooling, work, and retirement is slowly dissolving (Von Maydell et al. 2006). Still, in many regions of the world, age-based policies such as a mandatory retirement age are being upheld, and attempts to eliminate or even alter them slightly tend to result in significant public opposition and reluctance.

Another way of understanding the roles that are associated with distinct times in the life course is the idea of a social clock (Helson and McCabe 1994). According to this model, a set of social norms related to age is superimposed onto the biological clock, which is supposed to reflect biological processes related to aging per se; most of these concern family and work. In the Western world, it is typically expected that people enter the workforce in their (early to mid) twenties after they have cognitively matured and completed formal schooling. Social clocks can differ between cultures. For example, expectations regarding the age at which people should enter the workforce differ between developed and developing nations.

With the surge of research on age and aging, age stratification can be observed here, too, as a way to understand the increasingly heterogeneous time of "old age." Attempts are being made to stratify based on characteristics other than chronological age, but even among aging researchers this approach is not always implemented consistently. Neugarten (1982) was perhaps one of the first to argue for a distinction by "quality," rather than by age. She defined the "young old" as those older adults who are still healthy and active in society; the "old old," on the other hand, correspond to those older adults who fit traditional views of aging by showing declines in physical, mental, or social functioning and by being in need of help and care. The "young old" are also referred to as people in the "third age" and the "old old" as people in the fourth age (Baltes and Smith 2003). Third versus fourth age can be defined based on the population or the individual. In the former case, the transition from third to fourth age happens when 50% of a birth cohort have died (i.e., at

average life expectancy). Some argue for a slight modification, specifically that the transition occurs when 50% of a birth cohort who had made it to 50–60 years have died. The person-based definition, in contrast, is based on estimates of an individual's maximum life span; the shift from third to fourth age is thought to occur at the point at which future potential in terms quality of life is predominantly negative with dysfunctions and steep declines across a broad spectrum of areas of life. However, the proportion of people that reaches the fourth age has begun to grow as well. As a result, further subdivisions of "old age" have emerged, but they continue to be defined by chronological age, with young old referring to those roughly 65–74 years, middle old to those roughly 75–84 years, old old to those over age 85, and centenarians to those of at least 100 years of age.

Age Stereotypes: Associations with a Time Period in the Life Course

Although "old age" is a heterogeneous time period, people most often have negative associations with it (Hummert 2011). The content of these associations ranges from views regarding physical characteristics to social status/roles and behavior; for example, "old age" is often viewed as a period of declines in physical and cognitive functioning, illness, frailty, and loneliness. Images of old age or age stereotypes can be both explicit and implicit. Positive age stereotypes also exist; they concern, for example, a gain in wisdom and experience. Age stereotypes are found across cultures, although specifics around content may differ. Older people hold age stereotypes, too; when these stereotypes are internalized and people act in accordance with them, they can have long-term consequences. For example, positive views of one's own aging are associated with increased longevity (Levy et al. 2002). Similarly to social policies, age stereotypes may also contribute to demarcation of "old age" as a special time in the life course.

Individual Experience of Age and Time

Individual differences exist in the experience of both age and time. These personal views are influential for outcomes in the health, cognitive, and social domains. Although subjective perceptions of age and time are related to chronological age, there is no one-to-one correlation.

Subjective Age

The concept of subjective age considers individuals' own understanding of age. Research in this field has arisen from examination of change versus stability in personality; researchers wanted to know whether people see themselves as changing with age (Ryff 1986). Generally, study participants are asked to indicate how old they feel, and this subjective perception is linked to other domains of life, be it as antecedent or outcome. People tend to feel younger than they actually are, and the discrepancy between subjective and chronological age increases the older people are.

Subjective age is shaped by demographic developments in a given society, i.e., perceptions about aging tend to differ between societies with longer compared to shorter life expectancies (Settersten and Hagestad 2015). Additionally, subjective age is influenced by cohort membership; for example, the mentality that social class membership predetermines progression through the life course (e.g., with members of lower social classes experiencing "old age" earlier than those of higher social classes) seems to be more prevalent in earlier- compared to later-born cohorts. Societal factors continue to contribute to the evolution of subjective age. Nowadays, "age" is increasingly attributed to individual agency, which can be experienced positively when it comes to age-related gains, but can also have negative consequences in the case of age-related losses.

The concept of subjective aging has been extended by Diehl and Wahl (2010), who developed a framework of awareness of age-related change (AARC). AARC refers to an individual's awareness of changes that are the result of his or her aging; these changes can be experienced as either positive or negative. What distinguishes AARC from traditional subjective age is that it does not simply ask individuals to put a potentially arbitrary number on how old they are feeling. According to Diehl and Wahl (2010),

individuals are aware that age-related changes occur in multiple domains (health and physical functioning, cognitive functioning, interpersonal relations, social-cognitive and social-emotional functioning, and lifestyle and engagement). Measures assessing AARC therefore ask for individuals' subjective experience of changes in the form of gains or losses they have noticed in the various domains as they move through the life course. Factors influencing these subjective experiences, for example, personality traits, are currently under study. Experiences may not necessarily converge, with gains experienced in some domains and losses in others.

Time Perspective

Time perspective captures individuals' subjective experience of time. It can be manipulated by outside factors; for example, situations that are experienced as interesting or pleasant appear to pass more quickly than boring or unpleasant situations (Schües 2014). Personal values and experiences in the present constitute the basis for interpreting the past and imagining and anticipating the future (Chappell and Orbach 1986). The experience of time emerges gradually over the course of development and is thought to be unique to humans (Wallace and Rabin 1960).

As people age, more and more life events accumulate and mark the passage of time, and thus, the sense that one is closer to the end of life is heightened (Kennedy et al. 2001). Philosophers maintain that being confronted with the finite nature of one's own life is a hallmark of age (Schües 2014). According to socioemotional selectivity theory (Carstensen et al. 1999), time perspective influences the goals that people strive for, such that those who have a relatively open-ended future time perspective (usually, younger people) prepare for that open-ended future by expanding their social networks and acquiring information, whereas those who have a more limited future time perspective (usually, older people) savor the present by seeking out meaningful relationships and situations. An additional reason for the shift in socioemotional goals associated with a reduced time perspective may be the desire or necessity to avoid losses because temporal resources to compensate for the losses are diminishing (Brandstädter and Rothermund 2003).

The idea that meaning-making becomes increasingly important as lifetime becomes limited is also subject of other developmental theories, e.g., Frankl's theory of logotherapy and Erikson's developmental theory of psychosocial values. In Frankl's and Erikson's theories, a focus on recognizing and seeking meaning was attributed to facing death and advancing through the life course, respectively. Socioemotional selectivity theory posits that it is tied to subjective experience of time left, but the experiences that prime the fleeting nature of time do not necessarily have to be related to the end of life. Although time perspective tends to be correlated with age when comparing younger, middle-aged, and older adults, other factors can also lead to constraints in time perspective, for example, terminal illness, end of a life stage marked by a significant geographic relocation, and events that serve as reminders that life is finite (e.g., September 11 attacks, SARS epidemic). As a consequence, age and time perspective are often only moderately interrelated when solely examining older adults.

Empirical evidence has begun to accumulate that future time perspective might differ by domain. For example, people might have a constrained time perspective with regard to their occupation, but an open-ended one with regard to their health. In addition, time perspective has been shaped by historical developments (Schües 2014). Before the industrial revolution, humans depended greatly on the temporal rhythms dictated by nature, e.g., the seasons and the day-and-night cycle; nature governed when people could pursue various activities. With industrialization, people started to be able to operate relatively independently of these natural forces. The experience of time pressure became more prevalent, and nowadays, there even seems to be value placed on it. Developments in the realm of communication that permit instant exchange between people have accelerated the pace of life. Simultaneously, norms have changed such that people are expected to always be reachable. Various programs and

apps that allow their users to track their time use also promote the hastening of life's pace and the optimization of time use. However, old age might not be conducive to keeping up with this ever-increasing pace. On the one hand, some degree of slowing in physical and cognitive functions with advancing age can objectively be observed. On the other hand, the value placed on a fast-paced lifestyle would mean that older adults would be rushing toward the end of life and may not be compatible with their constrained time horizons.

Biology, Age, and Time

More and more, attention is being devoted to figuring out the biology behind life-span developmental trajectories. The ultimate goal is to disentangle age and time.

Biological Age

The concept of biological age is an attempt to understand age per se. Biological age is not as firmly linked to the passage of time as chronological age (Ludwig and Smoke 1982). However, it is often impossible to resolve whether degenerative processes are due to the passage of time, age, or disease. The concept of biological age acknowledges that the rate at which aging occurs varies between organs and functions, i.e., some organs age more rapidly than others, and some functions deteriorate sooner than others. For example, activities of daily living (ADLs) can be categorized by the time at which they are lost; dressing and personal hygiene fall into the early loss category, whereas toilet use, transfer, and locomotion fall into the middle loss category, and finally, bed mobility and eating are contained in the late loss category (Morris et al. 1999). "Differential development" can also be observed in the cognitive domain, meaning that different functions have divergent developmental trajectories. Specifically, crystallized intelligence (e.g., knowledge of vocabulary) is stable into old age, whereas fluid intelligence (e.g., reasoning, working memory, processing speed) starts to decline in young adulthood already (Anstey 2014). Additionally, the variability in the aging of organs differs between individuals.

An agreed-upon definition of biological age does not seem to exist (Ludwig and Smoke 1982). Some interpretations are based on manifestations of physical diseases, whereas others focus on cellular processes. Existing definitions also differ in that some rely on one indicator and others on multiple. One way to understand biological age is the notion that the more vulnerable an organism is to environmental pressures, the older the organism is biologically, presumably because underlying aging processes make the organism more susceptible. In another approach, overall morbidity is considered a proxy for biological age. A third interpretation suggests that the accumulated genetic error in somatic cells is an index for biological age. Genetic error can accrue as a result of environmental factors (physical, chemical, or biological) and of DNA replication errors. A recently developed framework (López-Otín et al. 2013) has expanded upon this latter definition and suggests that indications of age can be observed in nine areas: (1) genomic instability, (2) shortening of telomeres, (3) epigenetic alterations, (4) loss of proteostasis, (5) deregulation of nutrient sensing, (6) mitochondrial dysfunction, (7) cellular senescence, (8) exhaustion of stem cells, and (9) deregulation of intercellular communication. Regardless of which definition one adopts, biological age is measured most accurately by autopsy, looking for the types of cellular changes that are described above.

It is important to recognize that degenerative processes that are associated with biological age are influenced by behavior (Siegler and Davey 2012). Engaging in behaviors that are considered risk factors (e.g., inactivity, dwelling on negative emotions) can speed up deterioration, whereas engaging in behaviors that are considered protective factors (e.g., physical activity, seeking social support) can slow it down. This is not only true with regard to physical health, but also applies to the cognitive domain (Anstey 2014). The degree to which these risk and protective factors influence declines seems to change throughout the life course; some behaviors are more influential early on, and others kick in at the very end of life (Siegler and Davey 2012). In some cases, the biological mechanisms that underlie the link

between risk factors and health or cognition outcomes are known. For example, chronic inflammation occurs with many chronic diseases such as diabetes and impacts the functioning of the organism. Protective health behaviors may lead to the development of a "reserve capacity" that protects against behavioral and environmental risk factors. The concept of reserve capacity is not fully understood, e.g., it is unclear whether it has to be established by a certain age. The heterogeneity in the aging process points to its existence. Scientific evidence is available in some domains, e.g., cognition, where the link between cognitive engagement and preserved cognitive functioning is relatively well established. However, in many areas (e.g., link between positive social support and cognitive functioning), mechanisms linking lifestyles and outcomes remain elusive (Anstey 2014).

The concept of biological age also appears in a popular scientific context. The perhaps most well-known example is the RealAge test developed by Roizen (1999). Widgets to calculate one's own biological age have caught on in the general public. They rely on equations that take into consideration statistics on average life expectancy at the individual's specific age, genetic predispositions (e.g., gender, age of grandparents), health-promoting behaviors (e.g., physical activity, fruit and vegetable intake, smoking), and psychosocial factors (e.g., stressful life events, social support). Departing from an individual's actual age, time is added for favorable genetic predispositions and lifestyles and subtracted for unfavorable ones.

Inner Biological Clocks

Being oriented in time seems to be an important marker of functioning, and is therefore frequently used to evaluate cognitive and psychosocial status (Hendricks 2001). Many biological functions, e.g., breathing and heartbeat, only operate normally in a specific rhythm. The most obvious manifestations of the "timing" of the human organism are sleep-wake cycles or circadian rhythms. Although some individual differences exist in circadian rhythms, for example, some people operate better in the morning and others in the evening, all reasonably healthy human beings have a circadian rhythm.

Interestingly, circadian rhythms change as people get older; they shift from being monophasic in younger years to being polyphasic in older age (Chokroverty 2009). Several factors seem to contribute to this shift. First, the suprachiasmatic nucleus and the brainstem hypogenic neurons – the "inner time keepers" – change with increasing age. Second, social activity tends to transform with age. Third, older people who live in institutions such as nursing homes may be exposed to different external time cues than older adults living in the community.

Age is associated with a phase advance in the circadian rhythm such that older people wake up and sleep earlier than younger people (Chokroverty 2009). During sleep, there is a reduction of amplitude and incidence of delta waves in slow-wave sleep; a decrease in non-REM stages 3 and 4; a decrease in frequency, amount, and amplitude of sleep spindles; and a reduction in eye movements per minute in REM sleep. The cyclic pattern between REM and non-REM sleep is preserved, but the first cycle is often reduced. Although the total amount of REM sleep is shorter at advanced ages, its proportional contribution to the total amount of sleep remains the same because overall nighttime sleep amount diminishes as well.

Shifts can also be observed in body temperature rhythm, which is advanced and attenuated in older age and influences the circadian rhythm, and in EEG measures. During waking, a slowing of the alpha rhythm and an increase of fast activities, diffuse slow activity, and focal slow waves is evident. To the best knowledge of the authors, the effects of these age-related changes on psychological outcomes have not been studied systematically to date. It would, however, be highly interesting to examine if changes in EEG during waking are associated with age-related cognitive declines.

Links Between Concepts

Time emerges as the overarching link between the concepts discussed in our contribution. The progression of time determines a person's place

within the life course, which can be described by chronological age or time-to-death. Beyond individual lifetimes, passage of time is associated with demographic developments at the population level and with differences in significant historical events experienced by particular groups of individuals (cohorts) at distinct points in their lives. Historical time is accompanied by an evolution of norms and values, which in turn shapes societal embeddedness and individual experience of age and time. The time-based measures chronological age and time-to-death affect how individuals are perceived by society and how they perceive themselves. Interrelations between social and self-perceptions are also being uncovered, but the mechanisms explaining them are not yet well understood. Biological developments are related to chronological age and time-to-death. What remains unclear to date is how biological developments and social and self-perceptions of age and time are related.

Methodological Issues

The interconnectedness of age and time is represented in methods used in life-span developmental research. A move toward the longitudinal study of development reflects the realization that cross-sectional comparisons do not allow us to disentangle the effect of age itself versus time (influence of the historical period or a specific cohort's reactions to historical events) on group differences (Alwin and Campbell 2001). Despite these obvious advantages, longitudinal studies to date also have a limitation in that most of them are purely observational and cannot employ any experimental manipulations (Anstey 2014). With technological evolution in the form of high-capacity computing, modeling of longitudinal change has become much more feasible.

For quite some time, life-span developmental research has employed both event-based and process-based strategies. In an event-based approach, the consequences of certain life events are examined, whereas a process-based approach focuses on gradual changes over time (Alwin and Campbell 2001). One caveat with research that focuses only on consequences of events without considering process-based change is that it may miss the influence of factors that led to the event and the outcome of interest.

Another advance in life-span developmental research concerns the consideration of different time spans. In addition to examining outcomes over long time frames such as lifetime or years, scientists in this field are now concerned (again) with variations over shorter time frames such as days and hours. Such advances have been aided and made possible by technology. Investigations of short-term variability rely on experience sampling. Here, participants are provided with a device (e.g., smartphone, tablet) that allows them to complete self-report questionnaires (e.g., time use, emotional experience) and objective assessments (e.g., cognitive performance) on the go. An ever-growing number of activity monitors that rely on accelerometry also allows for the objective measurement of behaviors such as physical activity and sedentary behavior.

Conclusion and Outlook

The association between age and time has been examined and described in a variety of ways. It is reflected in methodological approaches and theories in life-span developmental research and is also present in everyday life. Society dictates many age-related expectations that may have nothing to do with how old an individual feels or how old an individual "is" according to measures that are not based on the passage of time since birth. In this contribution, methods aimed at measuring "age" objectively and accurately and disentangling it from time were described, and the associated challenges were identified. The authors conclude that to date, age and time continue to have to be viewed as highly interrelated. Furthermore, approaches acknowledging high degrees of variability in individuals' subjective experience of age and time were highlighted. Future research should pinpoint how and when the various operational definitions of age and time (see Fig. 1) do and do not overlap. For example, when or for whom do biological and subjective

age converge, and how do the predictors and outcomes of different facets of age and time coincide versus diverge? In the quest to further understand the heterogeneity of "old age" and independent contributions of age and time to human development, the examination of linkages between objective measures and subjective experience seems to be the logical next step.

Cross-References

- ▶ Age Stereotyping and Views of Aging, Theories of
- ▶ Attitudes and Self-Perceptions of Aging
- ▶ Distance-to-Death Research in Geropsychology
- ▶ History of Longitudinal Statistical Analyses
- ▶ Life Span Developmental Psychology
- ▶ Time Perception and Aging

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Age Discrimination

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Synonyms

Age Bias; Age Prejudice; Ageism

Definition

Age discrimination refers to behaviors that unfairly discriminate against individuals and groups, either positively or negatively, on the basis of actual or perceived age, acting either implicitly or explicitly, and expressed at either the individual or institutional level. Age discrimination may thus be conceptualized as the behavioral component of the broader attitudinal variable that is ageism, whereas age prejudice represents the countervailing affective component.

Key Concepts and Components

The definition of age discrimination in this chapter incorporates five concepts, including the ways that the age construct may be operationalized, the valence of ageist outcomes, the target's age, the ways by which ageist outcomes may be measured, and the level at which age discrimination may be expressed. These five concepts are summarized in Table 1 and further delineated by components.

Target Age

Although ageism and age discrimination most commonly concern the study of attitudes toward older adults, and possibly because of early focus on research in age discrimination to include only older adults, recent scholarship recognizes the notion that ageism may be directed toward any individual along the spectrum of age on the basis of actual or perceived age. Most comprehensively,

Age Discrimination, Table 1 Key Concepts and Components

Concept	Components
Target age	Young Old
Age operationalization	Objective Subjective
Outcome valence	Positive Negative
Measurement	Implicit Explicit
Level of expression	Individual Institutional

research by Finkelstein et al. (2012) has documented type and prevalence of both positive and negative stereotypes and meta-stereotypes toward both younger and older adults.

Age Operationalization

Age may be either objective chronological age or subjective perceived age – the age that an individual, or others, view him or her to be (Kooij et al. 2008). Illustratively, some older individuals may appear younger than their age, and may therefore be subjectively perceived as younger than the typical individual in their age-group; vice versa for younger individuals who appear older than their age.

Outcome Valence

In line with evidence establishing older adults to fall into the incompetent but warm quadrant of the stereotype content model (Fiske et al. 2002), the definition recognizes that age discrimination may be either positive (benevolent ageism) or negative (hostile ageism).

Measurement

Explicit age discrimination refers to conscious and controllable behaviors elicited toward individuals on the basis of their age. In contrast, implicit age discrimination refers to such countervailing behaviors that exist and operate without conscious awareness, intention, or control (Levy and Banaji 2002). Whereas explicit age discrimination is most commonly measured through self-report or observation, implicit age discrimination may be measured via measures of implicit social cognition, such as the implicit-association test (IAT), or via stereotype priming (see Levy and Banaji (2002) for a review).

Level of Expression

Age discrimination may be expressed interindividually, by individual actors toward other individuals and acting on the basis of their actual or perceived age, or may be expressed at the broader institutional level, in terms of governmentally regulated social policy, normative social conventions within an industry or sector, or organizational practices (see Iversen et al. (2009) for a review). Illustratively, institutional age discrimination may include events such as governments denying scholarships for graduate education for individuals above a certain age, birthday cards poking fun at individuals on the basis of their age, or organizations denying promotions to individuals on the basis of their age.

History and Evolution of Definitions

Early research on age discrimination took place during the 1950s and focused exclusively on attitudes toward older adults (i.e., individuals advanced in chronological age). In what was perhaps the very earliest study of the phenomenon, Tuckman and Lorge (1952) examined age discrimination against older workers by graduate students. Other early researchers studying age as a facet of group identity in the 1950s, 1960s, and 1970s likewise followed suit and studied only older adults and workers. The term "ageism" was first introduced by Robert Butler to describe this topic of study in the mid-twentieth century (Butler 1969, 1975, 1980). Over two dozen formal definitions of ageism have since appeared in the extant literature. A comprehensive review of all definitions of ageism, excepting the newest definitions, such as those provided by Bal et al. (2011) and Posthuma et al. (2012), may be found in Iversen et al. (2009).

Target Age

Perhaps as a result of the early focus in the mid-twentieth century on exclusively older adults

and workers, Butler's (1975, 1980) definitions indicated ageism as applying only to "older adults" and the "elderly." Surprisingly, Butler's original 1969 definition recognized ageism as existing toward all age-groups, but his later definitions became, for no apparent reason, narrower. Concomitantly, conceptualizations of age discrimination have been mixed with regard to the operationalization of age, with some authors defining age discrimination as applying to both younger and older adults (e.g., Finkelstein et al. 2012) and some authors defining it as the exclusive province of older adults (e.g., Iversen et al. 2009; Posthuma et al. 2012).

To an extent, this inconsistency may reflect debate within the scientific community itself, with the result being that the question of whether age discrimination applies only to older adults, or to both younger and older adults, remains unsolved. The definition provided in this chapter argues for the latter, by specifying no particular age-group as being the sole target of age discrimination, for categorical membership is the immediate precursor of prejudice (Gaertner and Dovidio 2000), and because the category of age logically includes members within all categorical points.

Age Operationalization

All extant definitions of ageism and age discrimination, both the earliest and the latest, narrowly constrict age to only the realm of objective chronological age, either explicitly through reference only to chronological age or by way of omission with regard to perceived (subjective) age. This is an unfortunate omission, because chronological age fails to represent the life-span perspective on aging, which is better represented by other subjective facets of age, such as psychosocial or psychological age (see Kooij et al. (2008) for a review). Recent advances in the theory of aging have expanded the definition of age to include four subjective facets in addition to chronological age, including functional age (the extent to which chronological age limits the capabilities of any particular individual), psychosocial age (the age that one is socially perceived to be), organizational age (the extent to which an individual is considered old given the normative distribution of age in a particular institution), and life-span age (an individual's current life stage or family cycle; Kooij et al. 2008).

All of these latter definitions of age may be conceptualized as subjective age, by way of reference to subjective perceptions regarding an individual or group's physical capabilities, physical appearance and social conduct, normative age within an institution, or normative age within the life-span standards of a given society. It is thereby necessary to explicitly address the fact that age discrimination may occur on the basis of either actual (objective/chronological) or perceived (subjective) age. The definition provided in this chapter addresses this gap in the literature, by clearly defining age as being both objective and subjective.

Outcome Valence

Butler's original definitions of ageism incorporated only negative attitudes on the basis of age. Most authors defining ageism in the 1980s and 1990s followed suit and discussed only negatively valenced outcomes, until the seminal work of Palmore (1999). On the basis that ageist attitudes could be either hostile or patronizing (benevolent ageism and age discrimination), Palmore (1999) first defined age discrimination as a phenomenon that could be either positively or negatively valenced. Following him, Cuddy and Fiske (2002) and Fiske et al. (2002) categorized older adults as falling into the incompetent but warm quadrant of the stereotype content model and similarly recognized the existence of both hostile and benevolent ageism. Thereby, most researchers studying ageism within the last decade (as of this writing) have recognized the existence of both positive and negative age discrimination. The current definition follows these recent advances in the study of ageism and recognizes that age discrimination may be valenced either positively or negatively.

Measurement

Almost all definitions of ageism and age discrimination are explicit; work on implicit ageism was largely lacking until the seminal work of Becca

Levy, Mahzarin Banaji, and colleagues (cf., Levy and Banaji 2002). Nevertheless, some recent definitions of ageism have begun to recognize the role of unconscious and implicit attitudes in directing human behavior (e.g., Iversen et al. 2009). The definition provided in the current chapter follows these recent advances and defines age discrimination as occurring both implicitly and explicitly.

Level of Expression

Perhaps resultant of a lack of computer technology to statistically model multilevel relations between phenomena, early work on age discrimination focused only on the individual level of analysis and failed to incorporate the possibility of ageism occurring at the broader institutional level. More recently, beginning in the late 1990s, and carrying forward to the current decade, researchers have begun to largely recognize the existence of age discrimination at the institutional level. The current definition follows suit and expresses age discrimination as occurring at both the microlevel of the individual and at the broader level of societal, sectoral, industrial, and organizational institutions.

Nomological Net

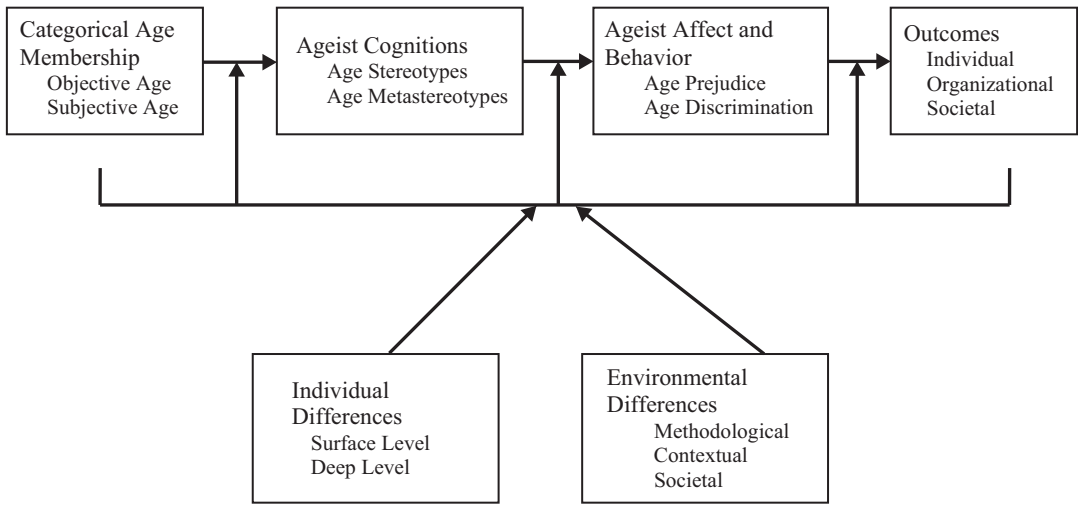
A nomological net depicting the relations between age discrimination and its antecedents, consequences, moderators, and mediators is displayed in Fig. 1. The figure does not causally distinguish between age prejudice and age discrimination, as these latter components of the broader attitudinal variable that is ageism are commonly understood to occur together, with age prejudice representing emotive responses that go hand in hand with the countervailing behavioral responses that represent age discrimination.

Antecedents

Prejudice begins with group membership, whereby membership in a devalued or out-group category gives rise to prejudice in the form of affective, cognitive, and behavioral responses (Gaertner and Dovidio 2000). Categorical age membership, be it objective or subjective, is thereby understood to be the ultimate antecedent of age discrimination.

Mediators

Ageist cognitions, including age stereotypes and age meta-stereotypes, represent the mediating mechanisms between categorical age membership and age prejudice/discrimination. Meta-analytic evidence indicates that relative to their younger counterparts, older adults and workers are viewed more stereotypically in general and are stereotyped as being less competent, less motivated,



Age Discrimination, Fig. 1 Nomological net of age discrimination

less trusting, more vulnerable to work-family imbalance, having less potential for training and professional/career development, being less adaptable, less interpersonally skilled, less healthy, more reliable, and more stable (Bal et al. 2011; Gordon and Arvey 2004; Kite et al. 2005; Ng and Feldman 2012). The prime dimensions of stereotypes for older adults include perceived incompetence and perceived warmth (Fiske et al. 2002), and these two prime dimensions have been identified to significantly mediate relations between categorical age membership and age prejudice/discrimination (Krings et al. 2011). Less is known about age meta-stereotypes, but the interested reader is referred to Finkelstein et al. (2012) for a discussion.

Age Prejudice and Age Discrimination

For age prejudice, meta-analytic evidence indicates that relative to their younger counterparts, older adults and workers are evaluated as less attractive and are given more negative overall evaluations (Bal et al. 2011; Gordon and Arvey 2004; Kite et al. 2005). For age discrimination, meta-analytic evidence indicates that relative to their younger counterparts, older adults and workers are more likely to be recommended professional evaluation after experiencing memory failure, are less likely to be helped, are given poorer assessments based on observed interactions, experience more adverse selection outcomes, and are given poorer performance evaluations (Bal et al. 2011; Kite et al. 2005). Less is known about age prejudice and age discrimination specifically targeted toward younger adults and workers, indicating the need for future research to investigate ageism at the lower end of the age spectrum. Less is also known about age prejudice and age discrimination based upon purely subjective age. For example, would an older adult who looks young experience similar outcomes related to age prejudice/discrimination? Future research is needed to disentangle the effects of objective vs. subjective age on ageism.

Outcomes of Age Discrimination

Individuals who are the targets of age discrimination experience detrimental affective, cognitive, and behavioral outcomes (Marcus and Fritzsche 2015). These may include, but not be limited to, lowered life and job satisfaction, less positive and more negative affect, higher turnover, reduced job and organizational commitment, lower self-esteem and self-efficacy, greater incidence of job burnout, reduced well-being, reduced standards of living, limitations in career advancement, lower income, limitations in personal and professional development, isolation, and poorer mental health. At the institutional level, age discrimination may result in the economic and social marginalization of age-stigmatized groups.

Individual Difference Moderators

Individual differences include surface-level moderators and deep-level moderators. Surface-level moderators include all demographic variables, including sex, gender, tribe (defined as those groupings of individuals based upon communal affiliation, such as race, religion, and ethnicity; Marcus and Fritzsche 2015), education, marital status, socioeconomic status, and disability status. Additionally, subjective age may also be conceptualized as a moderator of relations between objective age and outcomes. Deep-level moderators include all psychological variables, such as affectivity, attitudes, cultural orientation, and personality. As depicted, individual differences may moderate relations between age and ageist stereotypes ("upstream moderators"), ageist stereotypes and age prejudice/discrimination ("downstream moderators"; Posthuma et al. 2012), or age prejudice/discrimination and outcomes of ageism.

Very little is known about the confluence of age and other surface- or deep-level moderator variables in predicting outcomes; the study of age discrimination sorely needs research on disentangling complex relationships, interactive effects, and effects of multiple group memberships (Posthuma and Campion 2009). To that end, recent theoretical advances identify the existence of unique archetypes for different types of older adults and workers (e.g., older White females vs. older White males) and specify differing patterns of outcomes for older adults and workers depending upon multiple group memberships (Marcus and Fritzsche 2015).

Environmental Difference Moderators

As depicted, environmental differences may also moderate relations between age and ageist stereotypes ("upstream moderators"), ageist stereotypes and age prejudice/discrimination ("downstream moderators"; Posthuma et al. 2012), or age prejudice/discrimination and outcomes of ageism. Environmental differences may be broadly divided into three classes of moderators: moderators stemming from differences in sampling, design, measurement, and analysis (methodological), moderators stemming from the larger study context (contextual), and moderators stemming from overarching societal cultures and institutional policies (societal).

Meta-analytic evidence is plentiful when it comes to methodological moderators. The largest effect sizes of age discrimination are observed when ratings are provided by middle-aged respondents, older women rather than older men are targets, job applicants rather than job incumbents are targets, within-subject designs are utilized, negative information is presented, potential for development ratings is considered, lab rather than field studies are conducted, minimal information is presented, and the overall generalizability of the data decreases (Bal et al. 2011; Gordon and Arvey 2004; Kite et al. 2005).

The prime contextual moderator variable in relations between age and outcomes has been identified to be contextual age salience. In terms of older workers, contextual age salience includes the extent to which the current job matches one's prior work experiences, the age type of the job, the level of the job, and the normative age distribution in the job (Marcus and Fritzsche 2015). The role of context remains an emerging area of research on age discrimination – although well-grounded theory exists, there is not much empirical evidence on the issue, indicating the need for future research.

The least amount of theory and evidence exists for societal moderators. Very little is known about the ways by which national culture moderates the relations between age and age discrimination (Posthuma and Campion 2009). Likewise, very little is known about the moderating role of broader institutional-level policies on relations between age and institutional level outcomes. Hence, future research examining the roles of societal culture and other macrolevel variables on relations between age and outcomes would benefit the study of age discrimination.

Conclusion

It has been almost half a century since Robert Butler first coined the term "ageism." On the positive side, consensus now exists on the notion that age discrimination refers to the behavioral component of the broader attitudinal variable that is ageism, with ageist stereotypes and age prejudice representing the accompanying cognitive and affective components, respectively (Bal et al. 2011). Yet, half a century on, debate still seems to persist within the scientific community regarding the exact nature of the concept of age discrimination itself, with no consistency found in specifications regarding its valence, measurement, level of expression, potential targets of ageism, and even the nature of age as a construct itself. The definition provided in this chapter addresses this issue and represents the most comprehensive definition of age discrimination within the extant literature, incorporating all of the key concepts and components. Such a definition is arguably needed in order to expand the study of age discrimination to individuals of varying stripes and across the life cycle and to gain a nuanced understanding of the phenomenon as it occurs across methods, contexts, and cultures.

Poorer still is our understanding regarding the mediating processes and boundary conditions of age discrimination. Little research on age discrimination has been done to investigate mediating age-stereotype processes (see Krings et al. (2011) for initial evidence); no research has been conducted to investigate mediating age–meta-stereotypes processes; no research has investigated more complex mediating relationships such as mediated moderation or moderated mediation. Despite a wealth of meta-analytic evidence, concomitantly little research has investigated the moderating roles of either individual or environmental differences, with all meta-analyses to date

on the issue largely focusing on methodological variables and ignoring broader societal or contextual variables. To an extent, this may reflect a lack of primary studies on interactive relations between variables within the nomological net of age discrimination.

Summarily, primary and secondary research is pressingly needed in order to advance the study of age discrimination beyond crude main effects at the individual level and that are largely obtained via self-report. It is the hope here that explication of these and other related issues within this chapter, via clarification of the definition of the term and its accompanying nomological net, will help push the study of age discrimination forward and into a less obfuscated tomorrow.

Cross-References

- ▶ Age Diversity at Work
- ▶ Age Stereotypes in the Workplace
- ▶ Age Stereotyping and Discrimination
- ▶ Age Stereotyping and Views of Aging, Theories of
- ▶ Age, Self, and Identity: Structure, Stability, and Adaptive Function
- ▶ Age-related Changes in Abilities
- ▶ Individual Differences in Adult Cognition and Cognitive Development
- ▶ Job Attitudes and Age
- ▶ Recruitment and Selection of Older Workers
- ▶ Technology and Older Workers
- ▶ Training at Work and Aging

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Age Diversity at Work

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Synonyms

Age differences; Age heterogeneity; Multigenerational workforce

Definition

In general, diversity is defined as difference, or a composition of, different elements. Age diversity at work, therefore, refers to differences in age distribution among employees and is used to describe composition of the organization as a whole or composition of workgroups within an organization.

Diversity is often described using social identity theory (Tajfel 1974) and social-categorization theory (Turner 1985). These frameworks explain how people categorize themselves and others according to prominent demographic characteristics (e.g., age, race, gender), aligning themselves with similar others and distinguishing themselves from dissimilar others.

In the age and work literature, age groups are usually discussed in terms of "younger," "middle-aged," and "older" workers. Categorization is not dependent on chronological age alone; numerous contextual factors influence the designation of an employee into these categories. Conceptualizations, in addition to chronological age, include subjective age, relative age (age in comparison to work context), cultural and professional norms, and societal regulations (Truxillo et al. 2014).

Key Concepts

Globally, there is an upward trend in the percentage of older employees in the industrialized workforce. Explanations include increased mortality, decreased fertility rates, and economic conditions, requiring older workers to delay retirement (Eurostat 2013; Toossi 2012). This has led to increased age heterogeneity within organizations and teams, meaning that people of different ages are now working side-by-side more than ever before. This trend has important implications, as research indicates both positive and negative effects of diversity at all organizational levels.

This entry will focus on the theoretical explanations and current research relating to age diversity at work. Future directions will also be recommended.

Theoretical Frameworks and Current Research

Although some research has consistently demonstrated effects related to age diversity, such as increased turnover and absenteeism, studies examining the direct effects of age diversity on other outcomes, including performance, have revealed conflicting results (Williams and O'Reilly 1998). This has highlighted the need to examine the processes through which age diversity influences outcomes and under what conditions positive (or negative) effects occur.

As discussed above, social identity theory (Tajfel 1974) and self-categorization theory (Turner 1985) are two key frameworks for understanding diversity. Expanding on this, and with application of the similarity-attraction paradigm (Byrne 1971), *relational demography* research investigates how individual differences relating to age (and other demographic characteristics) influence attitudes and behaviors. The similarity-attraction paradigm helps explain why individuals are more likely to have a favorable bias to similar others (positive evaluations, increased attraction) and an unfavorable bias to dissimilar others (negative evaluations, decreased attraction). Age diversity has the largest impact on employees who are most different from the group. For example, employees with greater age differences in relation to the rest of the team have reported higher

absenteeism and turnover and have received lower supervisor ratings of performance and promotability (Truxillo et al. 2014; Williams and O'Reilly 1998).

Group Processes. Related to relational demography, research on *fault lines* investigates subgroup divides that occur when multiple personal attributes are shared among team members (e.g., similar in age and race, similar in age and gender). Divides are perpetuated by desires to achieve balance between belonging (to the in-group) and distinction (from the out-group). Attempts to achieve this balance encourage positive interactions among group members and negative interactions between groups. The most commonly studied constructs in relation to fault lines include results indicating increased conflict, decreased team cohesion, reduced team performance, and diminished team satisfaction (Thatcher and Patel 2011).

Fault line strength depends on a variety of factors including the number of shared characteristics (e.g., similar across multiple categories), how the particular similar characteristics align among group members (e.g., percentage of each demographic representation within the group) and group size, and the number of potential subgroup possibilities. Characteristics other than demographic information can influence formation of fault lines. However, because demographic attributes such as age are immediately visible, these have a stronger influence on categorization (Thatcher and Patel 2011), at least initially.

Stereotypes (generalized characteristics assumed to be true of someone based on their group membership) are also used to classify and categorize others and thus influence how employees of different ages work together. Although research on middle-aged stereotypes is limited, this group is generally considered the referent to which young and old are compared. Older worker stereotypes include perceptions that they are resistant to change but also that they are dependable (Posthuma and Campion 2009). Younger stereotypes include perceptions that they are lazy and unmotivated but also that they are enthusiastic and energetic (Finkelstein et al. 2013). Although stereotypes are often inaccurate, they persistently influence attitudes and behaviors.

Currently researchers are investigating stereotypes through a variety of lenses. One method investigates stereotype content on the dimensions of perceived warmth and perceived competence (stereotype content model; Fiske et al. 2002), in which older people are perceived to be warm but not competent; however, what is meant by "older" in this framework may be in very late life, beyond when most people are typically working. This model articulates that stereotype content can fall into one of four categories, and according to the behavior from intergroup affect and stereotypes (BIAS) map, the category a stereotype is associated with then predicts how others behave toward individuals in that group. Resulting behaviors are active facilitation (high on warmth, e.g., helping) active harm (low on warmth, e.g., harassment), passive facilitation (high on competence, e.g., cooperation), or passive harm (low on competence, e.g., neglect). These dimensions also influence affect. For example, evaluations of low warmth and low competence trigger contempt, perceptions of high warmth and low competence elicit pity, appraisals of low warmth and high competence cause envy, and appraisals of high warmth and high competence foster admiration (Cuddy et al. 2008).

Building on stereotype research, another developing framework for investigating intergenerational relationships is metastereotypes. *Metastereotypes* refer to how a person believes others perceive them based on their group membership (Vorauer et al. 1998). For example, older workers may believe others stereotype them as out-of-touch, and younger workers perceive they are stereotyped as unreliable (Finkelstein et al. 2013). When framed around older and younger age groups working together, these beliefs, positive or negative, are likely to influence interactions and group processes. However, workplace research on metastereotypes is scant, and thus the outcomes of these workplace age metastereotypes are unknown.

Fortunately, research based on *intergroup contact theory* (Allport 1954) has demonstrated how negative attitudes associated with intergroup bias

(e.g., stereotypes and prejudice) can be reduced through increasing the positive interpersonal contact between members of different groups. This effect is enhanced when the contact is structured according to four optimal conditions: equal status among groups/members, common goals, intergroup cooperation, and institutional support. Over time, as more information becomes available, surface-level (demographic) assessments of others become less important, and categorization becomes based on deeper-level traits (e.g., personality, skills; Harrison et al. 2002). Although the optimal conditions outlined do boost this effect, they are not absolutely necessary. The positive effects of contact over time have been demonstrated across a wide range of contexts and generalize beyond just those out-group members involved in the contact scenario (Pettigrew and Tropp 2006). Specifically relating to age differences, intergenerational contact positively impacts stereotype content and facilitation behaviors and reduces intentions to quit. Dual identity, which refers to categorization according to two different attributes, such as a group identity (e.g., age group) and collective identity (e.g., common goals), has been shown to be the linking mechanism. When two identity-related categorizations intersect, one is more likely to have a stronger influence; therefore, promoting a collective identity can help reduce negative intergroup relations (Iweins et al. 2013).

Information and decision-making theories are also important contributions for examining interactions within age-diverse groups. Diverse individuals contribute a broad range of knowledge, skills, abilities, information, experiences, and networks that help strengthen team and organizational processes. Numerous factors influence the likelihood that a diverse team will be able to capitalize on this diversity. First, information and resource-sharing is most relevant when teams work on tasks that are complex and/or nonroutine. Second, age differences may lead to avoidance behavior, misunderstandings, or conflict, thereby mitigating the possible benefits of having diverse resources available. Finally, levels of task- and goal-interdependence influence the likelihood that team members will develop a collective identity that allows them to overcome differences in age (Williams and O'Reilly 1998).

Individual Differences Due to Age. Investigating changes across the life span is another important element of workplace age diversity research. This includes changes in cognitive and physical capabilities, motives, and personality. It is important to note that numerous factors (e.g., genetics, personal experiences, generation) influence the aging process, so although research looks at statistical averages, there is a great deal of variation between individuals in how quickly they age and in what ways.

Aging is generally associated with physical and cognitive declines. *Physical changes* that have been reported include eyesight and hearing loss, reduced muscle strength and flexibility, and decreased immune response. Age is also related to clinical health indicators, including elevated blood pressure and cholesterol levels; however, meta-analytic results have revealed no declines in mental health, or self-reported physical health problems, and there is limited research linking physical declines to changes in work performance (Truxillo et al. 2015).

In general, *cognitive abilities* related to crystallized intelligence increase across the life span and, on average, only begin to decline around age 60. Between age 60 and age 80, modest losses occur, but substantial differences are not exhibited until after age 80. These abilities include inductive reasoning, spatial orientation, verbal ability, and verbal memory. Losses in numerical ability begin somewhat earlier, starting to decline in the 50s. Abilities associated with fluid intelligence, such as processing speed and working memory, begin to decline much earlier in life, with loss beginning around age 25. It is interesting to note cognitive decrements associated with age are significantly attributed to changes in perceptual speed (Schaie 1994). These effects can be minimized for older employees through consideration of workplace and goal conditions, especially time pressure.

Personality traits are commonly studied in work literature and are related to outcomes including performance and social interactions (Barrick

and Mount 1991). Although personality traits have historically been considered stable over time, research demonstrates mean-level changes do occur across the lifespan. Conscientiousness, emotional stability, and social dominance (a dimension of extraversion) show an increase between age 20 and age 40; agreeableness begins to decline in the 50s. Openness to experience and social vitality (another dimension of extraversion) increases throughout adolescence and then begins to decrease in the 60s (Roberts et al. 2006).

One theory used to explain how these changes influence behavior is *selective, optimization, and compensation (SOC) theory* which posits that older adults react to age-related changes by reallocating their resources toward minimizing losses and maximizing gains (Baltes and Baltes 1990). Selection occurs when individuals prioritize specific goals that best match utilization and maintenance of current resources. Optimization indicates strategies used to allocate effort and resources toward goal achievement, and compensation involves processes aimed at off-setting age-related losses. For example, an aging worker may reduce their number of tasks to focus on those for which they have the greatest skill and that can be most efficiently attained with current resources.

Another commonly used framework for explaining differences across the life span is *socioemotional selectivity theory* (SST; Carstensen et al. 1999). This theory describes how the salience of social goals fluctuates over time according to one's perception of time, thereby influencing motivational and behavioral change. Younger individuals perceive time to be limitless. They are more likely to spend energy-building knowledge and networks, focus efforts on expanding their experiences, and work toward accomplishing goals such as work-related advancement and achievement. Work behavior is more strongly related to growth- and extrinsic motives. Older individuals perceive their time to be more limited. As a response, energy and efforts are more likely allocated toward maintenance of close relationships and having meaningful experiences. At work, motivation becomes more intrinsically linked (Kooij et al. 2011).

Higher-Level Influences on Age Diversity

As previously discussed, context has a critical impact on the processes and outcomes associated with age diversity at work. This includes influences beyond the group and individual level, including organizational-, occupational-, and industry-related factors. At these levels, categorization and stereotypes again come into play. *Job or industry stereotypes* develop when a specific workforce is comprised of primarily one demographic group (e.g., young-typed or old-typed) and employees not in the majority group face negative biases. This occupational demography also influences the boundaries of age group categorization. For example, a middle-aged person in an industry or occupation that is primarily young (e.g., high-tech gaming) will be perceived as "old" in comparison. The same middle-aged person working in a setting dominated by older workers (top management in a corporation) would be perceived as "young." Fortunately, job-age stereotypes are fairly susceptible to change (Truxillo et al. 2014).

Organizational age climate also has a significant effect on determining if diversity operates as a strength or weakness. Organizational age climate refers to the shared perceptions about an organization's diversity-related attitudes and expectations, as communicated through policies, procedures, and rewards. If human resource (HR) practices communicate that differences are valued, benefits such as information- and resource-sharing are more likely to occur. Researchers have only recently begun to examine age diversity climates specifically, but initial findings are encouraging. Age diversity climate has been demonstrated as a linking mechanism between age-inclusive HR practices and both company performance and collective turnover intentions (as explained by collective perceptions of social exchange; Böhm et al. 2014b). Additional empirical evidence links diversity climate and workgroup performance through the effects of diversity climate on discrimination (Böhm et al. 2014a).

Age diversity climate is therefore important not only for business-related outcomes but also

for preventing discrimination and the accompanying litigation. Despite laws protecting older workers, research reveals they still face discrimination related to hiring and layoff decisions, training opportunities, and performance appraisals (Truxillo et al. 2014). In 2013, monetary payouts related to the Age Discrimination in Employment Act totaled $97.9 million (Equal Employment Opportunity Commission 2014) in the USA. Although research on younger workers is less common, it is likely that younger employees experience bias, and due to lack of protections, this discrimination may be even more blatant.

Conclusion and Future Directions

In conclusion, workplace age diversity has important implications for individual, group, and organizational processes and outcomes. However, as noted earlier, results are not always consistent, and thus more research is needed to identify the conditions under which age diversity is most likely to have an impact and through what mechanisms these effects occur.

As described above, fault lines provide a useful framework for examining group processes and outcomes. Given the complexity involved, there are many opportunities for further investigation. A clarified understanding of how group composition promotes fault line formation and strength would be useful. For example, how does the number of shared attributes (in addition to age) and the alignment of age with other non-demographic attributes factor in? Additionally, differences in the distribution of power among groups may help explain inconsistent findings in relation to outcomes. Further, it is likely that certain conditions promote or discourage fault line formation. Developing a collective identity and encouraging positive diversity attitudes are two possible strategies that may hinder subgroup divides and facilitate intergenerational collaboration. Initial research relating to this looks promising (Iweins et al. 2013).

Stereotype research can also help to explain how age diversity operates in the workplace. Researchers should continue to explore the content and accuracy of stereotypes. According to the stereotype content model, older people are perceived to be warm and incompetent. However, this content appraisal may be more directly related to older people beyond working age who fall into the category "elderly." Stereotype content is likely to differ within a work context; research in this area suggests that older workers are seen as having a number of positive attributes (Truxillo et al. 2012; Bertolino et al. 2013) such as higher conscientiousness and organizational citizenship. Additionally, little attention has been paid to stereotypes about younger or middle-aged workers (Truxillo et al. 2014). Future research should examine these and also explore how content impacts processes and outcomes. These contributions would aid in understanding age-diverse workers and their interactions.

Metastereotypes research is one area that has begun to explore younger and middle-aged stereotypes, as well as older stereotypes (Finkelstein et al. 2013). Understanding how an employee's behavior is influenced by how they believe others perceive them provides an exciting new lens for which to examine workplace relationships. This nomological net is still being developed and thus provides bountiful opportunities for future research. Investigations into if, how, and when metastereotypes impact intergroup behaviors and outcomes would be very informative. For example, a belief that others hold negative stereotypes could result in avoidance and conflict, thereby influencing performance.

Although most stereotype research examines explicit attitudes, there is a growing interest in exploring implicit stereotypes (automatic responses of which an individual may not be cognizant of). Implicit responses can be measured using a range of indirect self-report assessments including word fragment completions, response latency measures of association (e.g., the Implicit Association Test, IAT; Greenwald et al. 1998), and even by examining brain activity responses (e.g., functional magnetic resonance imaging). At this point, very little research has examined implicit age stereotypes at work, and such research into unconscious age stereotyping may

provide guidance for how to promote positive outcomes related to workplace age diversity.

Future research should continue to explore how to structure the workplace and develop training programs to best address motivational and cognitive differences among an age-diverse workforce. Environmental factors that influence personality and motivational changes should also be examined. Further, efforts should be made to answer the call for advancement in measures assessing the various dimensions of motivation (e.g., achievement motivation, motivation to retire; Kanfer et al. 2013; Kooij et al. 2011).

As the workforce continues to become more age-diverse, identifying the best strategies for managing diversity will become increasingly relevant. As discussed above, promoting a positive age diversity climate can be beneficial and should be researched further. One suggestion is to investigate which HR practices and policies are most influential on both diversity climate and desired outcomes (cf. Böhm et al. 2014b). Researchers should also consider how individuals, groups, and the organization differentially relate to age diversity climate as both antecedents and outcomes. Finally, leadership is likely to relate to age diversity climate in multiple ways and should be included in the research as age diversity climate continues to be explored.

Leadership, in general, warrants more attention in the age diversity arena. Given that leaders are often the most common targets for creating change within the workplace, there is surprisingly little research looking at how leadership and age diversity interact to influence outcomes. Studies that have looked at this relationship reveal age differences between leaders and followers are associated with role ambiguity (Tsui and O'Reilly 1989) and decreased perceptions of leader effectiveness (Zacher et al. 2011). Additionally, when transformational leadership is low, a negative relationship between age diversity and performance has been found. When transformational leadership is high, age diversity is associated with increased collective identity and, through this, increased sharing of information and resources (Kearney and Gebert 2009). These findings have important implications for management of an increasingly age-diverse workforce. More conclusive research and a wider scope are needed.

A

Cross-References

- ▶ Age Stereotypes in the Workplace
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- ▶ Age, Self, and Identity: Structure, Stability, and Adaptive Function
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- ▶ Leadership and Aging
- ▶ Motivational Theory of Lifespan Development
- ▶ Organizational Strategies for Attracting, Utilizing, and Retaining Older Workers
- ▶ Recruitment and Selection of Older Workers
- ▶ Selection, Optimization, and Compensation at Work in Relation to Age
- ▶ Training at Work and Aging
- ▶ Work Design and Aging
- ▶ Work Motivation and Aging

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Age Stereotypes in the Workplace

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Synonyms

Age bias; Ageism

Definition

Age stereotypes refer to overgeneralized expectations and beliefs about the characteristics and traits of individuals on the basis of age. In the workplace, age stereotypes often take the form of distorted and usually inaccurate perceptions of worker characteristics on the basis of age.

As the workforce becomes more age diverse, interpersonal exchanges between members of this multigenerational workforce will become more frequent. Considering this, understanding the mechanisms that contribute to positive and negative interpersonal interactions between individuals at different stages of the work-life span is essential (Rudolph and Zacher 2015). In this vein, a great deal of scholarship has focused on how work-related age stereotypes affect the success of the interpersonal interactions between different age groups and the treatment of individuals across the work-life span. Understanding the nature, function, and effects of age stereotypes in the workplace is important for both individual level and organizational level outcomes, as stereotype endorsement and application can lead to age discrimination and negatively impact employees by creating barriers to employment, promotion, and training opportunities (Bal et al. 2011).

In general, stereotypes refer to the overgeneralized expectations and beliefs about the characteristics and traits of social outgroup members (Fiske 1998). Stereotypes represent negative, distorted, and usually inaccurate perceptions of individuals due to their membership in a particular group, and the inference that all members of that group hold or display these same characteristics. From a cognitive perspective, age stereotypes represent mental schema through which characteristics and expectations of a particular individual are based on his or her age group membership (Hamilton and Sherman 1996). Stereotype endorsement can lead to biases in information processing (e.g., biased judgments that lead to discriminatory behavior during decision-making processes in selection, promotion decisions, and training identification (Bal et al. 2011). A great deal of research on age stereotypes in the workplace focuses on beliefs and expectations about older workers rather than middle-aged or younger workers (Posthuma and Campion 2009; Ng and Feldman 2012; Hassell and Perrewe 1995). Moreover, research typically examines overgeneralized beliefs about the abilities of older workers in comparison to those of younger workers (Posthuma and Campion 2009; Finkelstein et al. 1995). In addition to evidence for age stereotypes that characterize older workers, research has also begun to focus on characteristics indicative of younger workers (Perry et al. 2013).

Defining Age in the Workplace

Before reviewing the literature on the content of common age stereotypes that characterize older workers, it is important to define the term *older worker*. Age can be conceptualized in a chronological sense or as a continuous stage in one's lifespan or careerspan. Lifespan perspectives on age argue that young, middle, and older ages represent unique stages of development, which include distinct events that shape identity, as well as personal and professional relationships. Moreover, each stage is marked by its own set of challenges and goals. As experiences occur and shape these stages at different chronological time points for individuals, there is not one set age range to define these stages (Kooij et al. 2008). Thus, there is a reluctance to establish or place boundaries on specific chronological ages when examining groups of individuals from different

life stages (e.g., when studying characterizations of younger, middle-aged, or older workers). However, in past research, age ranges for older workers vary from 40 years and above (Ng and Feldman 2012; Hassell and Perrewe 1995) to 55 and above (Finkelstein et al. 1995).

Common Workplace Age Stereotypes

Recent scholarship has reviewed the most common age stereotypes against older workers relative to younger workers, presented evidence refuting some of these beliefs as mischaracterizations, and discussed boundary conditions surrounding the endorsement of age stereotypes (e.g., the presence of job relevant information, perceived "correct age" for a job position, and supervisory status, (Posthuma and Campion 2009; Finkelstein et al. 1995). One of the more common age stereotypes is that older workers are poorer performers relative to their younger coworkers (Ng and Feldman 2012; Posthuma and Campion 2009). Considering this stereotype, related miscategorizations suggest that is commonly expected that older workers are less capable, productive, motivated, and competent than their younger counterparts, resulting in lower average job performance. However, a great deal of evidence has been presented to refute the notion that performance declines with age (Posthuma and Campion 2009). On the contrary, empirical evidence suggests that job performance ratings increase with age, any decreases in cognitive ability are not significantly related to performance due to various compensation and coping strategies, and that health and well-being are more important indicators of performance than chronological age (Posthuma and Campion 2009).

Another common age stereotype is that older workers are resistant to change. Related stereotypes characterize older workers as harder to develop, less flexible, and more difficult to train (Posthuma and Campion 2009; Ng and Feldman 2012). Moreover, older workers are perceived as being less willing to participate in training and/or career development programs (Ng and Feldman 2012). This can lead to the belief that older workers represent a lower return on investment in terms of training efforts (Posthuma and Campion 2009). Despite this belief, research suggests that there is no empirical evidence to support the notion that older workers are more resistant to change (Ng and Feldman 2012). However, there is some evidence to suggest that older workers may be less willing to partake in training and career development opportunities (Ng and Feldman 2012).

Older workers are commonly perceived as having a lower ability to learn, develop themselves, and master new skills and concepts required of their jobs than younger workers (Posthuma and Campion 2009). Evidence for the validity of this perception is inconsistent. For example, some research indicates that older workers need no more training than their younger coworkers and do have the ability to learn and develop (Broadbridge 2001), while other research supports the belief that older workers are slower at mastering skills and concepts (Kubeck et al. 1996). However, it is important to note that research supporting this belief reports relatively small effects (Kubeck et al. 1996).

Another common age stereotype towards older workers is the belief that older workers will retire or turnover faster resulting in shorter job tenure (Posthuma and Campion 2009). This belief is based on the notion that older workers are, by definition, later in their careers than younger workers. Relatedly, it is often incorrectly assumed that older workers are less healthy, more at risk for work/family conflict, and closer to retirement than their younger counterparts. As a result, it is assumed that older workers possess lower potential return on investment for training, development, and retention initiatives (Hedge et al. 2006; Ng and Feldman 2012). In line with this stereotype is the belief that due to higher wages, increased need for health benefits, and later career stage, older workers are more costly to the organization (Posthuma and Campion 2009). However, evidence suggests that older workers are less likely to turnover than younger workers, refuting the idea that they represent lower returns on investment (Hedge et al. 2006).

It is important to note that not all age stereotypes of older workers are inherently negative

(Posthuma and Campion 2009; Hassell and Perrewe 1995; Broadbridge 2001; Bal et al. 2011). Older workers are frequently perceived as being more dependable, honest, reliable, loyal, trustworthy, and committed to the organization and job (Hassell and Perrewe 1995; Broadbridge 2001). There is some research to support these stereotypes as evidence does suggest that older workers are less likely to engage in counterproductive work behaviors such as overt theft and absenteeism (Broadbridge 2001; Hedge et al. 2006). Additionally, older workers are often characterized as possessing higher levels of institutional knowledge and accrued wisdom associated with extended tenure and job experience.

While a majority of research has focused on stereotypes towards older workers, there is some evidence for stereotypes towards younger workers (Perry et al. 2013). This evidence suggests these stereotypes are not merely the opposite of the stereotypes against older workers (Perry et al. 2013). For example, common age stereotypes that characterized younger workers are that they tend to be more productive, creative, ambitious, eager, and efficient. Additionally, younger workers as seen as better able to cope with job stressors more likely to seek immediate feedback on performance (Perry et al. 2013). Overall, there is an abundance of evidence examining stereotypes towards older workers with comparatively little focusing on the beliefs against individuals in other age groups such as younger and middle-aged workers (Perry et al. 2013; Posthuma and Campion 2009).

Research suggests that the extent to which workplace age stereotypes are endorsed and influence decision-making processes is affected by a number of factors (Hassell and Perrewe 1995; Posthuma and Campion 2009). For example, research indicates that hourly workers hold more positive attitudes towards older workers than supervisors, and that these attitudes become increasingly positive with age (Hassell and Perrewe 1995). Additionally, research has found that age and supervisory status interact, such that as supervisor age increases so do the negative stereotypes held against older workers (Hassell and Perrewe 1995). This research also underscores the influence of ingroup bias on the strength of age stereotypes. Evidence suggests that older workers who identify with and consider themselves a part of their own age group hold more positive beliefs about themselves than do younger workers. On the other hand, some older workers hold the same beliefs about members of their own age cohort and these judgments can affect their decision making (Hassell and Perrewe 1995; Posthuma and Campion 2009). Again, the effect of negative stereotypes is ameliorated when older workers identify with these individuals as part of their ingroup (Posthuma and Campion 2009).

The extent to which age stereotypes bias information processing in the workplace is also diminished when job-relevant information is present and used during decision-making processes. Evidence suggests that stereotype endorsement is reduced when information about the job is used to evaluate applicants during employment interviews (Kite et al. 2005). When information specific to the qualifications and abilities of the applicant and aspects of the job position are available and used during selection processes, the effects of age stereotypes towards older workers are less likely to affect employment decisions (Fiske and Neuberg 1990). Lastly, research suggests that the effects of age stereotypes are stronger when there is a perceived "correct age" of an applicant for a job role (Hassell and Perrewe 1995; Posthuma and Campion 2009). Thus, applicants are viewed negatively if there is an inconsistency between the age of the applicant and the "correct age" of the job (Finkelstein et al. 1995; Hassell and Perrewe 1995; Posthuma and Campion 2009). Moreover, evidence suggests that there are particular jobs, professions, and industries that seem more appropriate for different age groups (Finkelstein et al. 1995; Posthuma and Campion 2009).

Contemporary Perspectives on Stereotyping

Descriptive Versus Prescriptive Stereotypes

Age stereotyping in the workplace represents a socialcognitive process in which cognitive

schemas guide beliefs and judgments about older workers based on their membership in a particular age group. Moreover, due to the inherent inaccuracies of stereotypes, endorsement of these mischaracterizations can lead to discriminatory workplace behavior. In line with social-cognitive perspectives, recent scholarship has made a distinction between descriptive and prescriptive age stereotypes and explicated more relational mechanisms behind perceptions and beliefs towards older workers on the basis of their age (North and Fiske 2013). Traditional perspectives on age stereotypes focus on the descriptive perceptions about what older individuals typically do. Prescriptive age stereotypes, on the other hand, describe beliefs about what older workers should do in regard to their use of social resources (North and Fiske 2013). Theory would suggest that there are three ways in which younger workers expect their older coworkers to use social resources (North and Fiske 2013): (1) *succession* of their employment position, political influence, and wealth, (2) limitation of their *consumption* of public and shared resources (e.g., pension and social welfare funds), and (3) prevention of *identity* transgressions (e.g., older workers acting in ways typically conceptualized as "young").

This age-specific prescriptive stereotype model proposes that younger workers may judge older workers more harshly if they act in ways that are at odds with these prescriptive stereotypes. In regards to the succession prescriptive stereotype, older workers delaying retirement may pose a threat to younger workers, as this limits their own progress toward professional goals and opportunities (Hassell and Perrewe 1995). Additionally, older workers would violate the consumption prescriptive stereotype if they abused their access to pension funds (North and Fiske 2013). In summary, individuals may become biased in their judgments and evaluations of their coworkers based on these descriptive or prescriptive age stereotypes (North and Fiske 2013).

Metasterotyping

While the majority of research focuses on other-referenced stereotypes towards older workers (i.e., perceptions of the characteristics and behaviors of a member of a certain group), recent scholarship has examined metastereotypes and their presence and rate of endorsement in the workplace (Finkelstein et al. 2012). Age metastereotypes refer to expectations that individuals feel other age groups hold about people of their own age (Finkelstein et al. 2012). This is a relational concept, which arises from the tendency to be concerned about how individuals are viewed by others. As humans, we tend to think more about our social reputations and behavior from other people's point of view rather than our own (Finkelstein et al. 2012). Much like research suggesting the inaccuracy of aging stereotypes in general, research suggests that metastereotypes might not be indicative of what individuals in the referent outgroup actually think about individuals in the ingroup (i.e., age metastereotypes are themselves likely to be quite inaccurate; (Finkelstein et al. 2012).

The content and accuracy of age metastereotypes in the workplace has been examined empirically (Finkelstein et al. 2012). Evidence suggests that older workers are viewed positively by both younger and middle-aged workers (i.e., both age groups report age stereotypes towards older workers that are mostly positive; (Finkelstein et al. 2012). In regards to metastereotypes towards younger and middle-aged workers, older workers are more likely to report negative characteristics (i.e., older workers tend to believe workers from other age groups view them negatively; (Finkelstein et al. 2012). Additionally, research indicates that younger workers tend to believe others (in particular, their middle-aged coworkers) will stereotype them negatively. Evidence also suggests that middle-aged workers are more likely to report negative characteristics towards younger workers. Moreover, younger workers' metastereotypes about middle-aged workers reflect these findings – younger workers expect middle-aged workers to list few positive traits when describing their age group and hold expectations in line with negative stereotypes more often (Finkelstein et al. 2012). However, research indicates that despite evidence that older workers view younger workers in terms of both negative and positive

stereotypes, younger worker metastereotypes towards older workers are generally negative (i.e., younger workers tend to expect older workers to describe them in terms of negative stereotypes).

Some important conclusions can be drawn from this evidence. For example, it could be that younger workers expect middle-aged workers to view them negatively based off of social consensus cues in their work environment. Middle-aged workers may feel threatened by the potential for competition with younger workers for similar jobs and may endorse these negative stereotypes to protect themselves psychologically (Finkelstein et al. 2012). On the other hand, older workers may not feel as threatened by younger workers as they rarely compete for similar jobs or roles. Additionally, older workers may have children the same age as younger workers and due to their more frequent exposure to that age group, view younger workers in a more positive light (Finkelstein et al. 2012). Moreover, older workers seem to be unaware that younger workers see them in a positive light due to the evidence that suggests their metastereotypes of younger workers are negative (Finkelstein et al. 2012).

There are several unanswered questions with respect to the nature of age metastereotypes at work. For example, it is necessary to understand how age metastereotypes affect cross-age group interactions in the workplace. Similar to the bias inherent within age stereotypes, age *metastereotypes* could similarly affect information processing and communication between individuals of different age groups (Finkelstein et al. 2012; Posthuma and Campion 2009). Additionally, more research is needed to examine how these metastereotypes increase the presence of confirmation bias (i.e., the tendency to seek, interpret, and/or recall information in a way that serves to egoistically confirm one's beliefs or hypotheses) and its influence on job performance and interpersonal interactions. There is also a need to examine contextual factors that have been previously considered as boundary conditions to the influence of stereotypes to examine their corresponding effects on metastereotypes (e.g., the presence of job-relevant information, supervisory status, level of exposure to different age groups, possible "correct age" for a position; (Posthuma and Campion 2009). As the age composition of the workforce continues to diversify, it is necessary to better understand the nature of both other-referenced age stereotypes and age metastereotypes in an effort to facilitate effective interpersonal interactions.

Generational Stereotyping

Another emerging area of research examines other-referenced stereotypes surrounding the three generational groups that make up the current workforce. While there is a substantial research on age stereotypes, there is relatively little research on the nature and content of generational stereotypes in the workplace (Perry et al. 2013). A generation refers to a group of people who have similar "birth years, age, location, and significant life events at critical developmental stages" (Kupperschmidt 2000, p. 6). Researchers also make distinctions between generations and cohorts, which generally refer to generations by their range of dates in which members were born (Parry and Urwin 2011). The three main cohorts identified in previous research and theory include: (Bal et al. 2011) Baby Boomer (1943–1960) (Broadbridge 2001), Generation-X (1961–1981), and (Finkelstein et al. 1995) Generation-Y/Millennial (1982–present). Previous research in this domain focuses on the differences between generational groups in terms of their values, preferences, and behaviors in the workplace (Twenge 2010). Moreover, the majority of scholarship on generational differences exists in practitioner literature focusing on the perceived differences in beliefs, attitudes, and behaviors. Indeed, there is very little compelling evidence to support the notion of generational differences across a variety of work outcomes and research indicates that perceived differences between generational cohorts likely arise from stereotypes that overgeneralize characteristics of different generational groups (Rudolph and Zacher 2015).

Recent evidence from systematic examinations of the academic and practitioner literatures has uncovered common stereotypes to describe each generational group (Perry et al. 2013). Evidence

suggests that stereotypes between Generation-X and Generation-Y are not clearly differentiated. However, there are distinct differences in generational stereotypes between the Generation X and Baby Boomer cohort as well as between the Millennial and Baby Boomer cohort (Perry et al. 2013). Evidence suggests that Baby Boomers are commonly described as hardworking, loyal, not technology savvy, resistant to change, and valuing monetary rewards from their jobs. Workers from Generation-X were most commonly described as lazy, technology savvy, valuing work/life balance, disloyal, hardworking, and well educated. Lastly, recent scholarship indicates that common stereotypes towards workers from Generation-Y suggest these workers are seen as technology savvy, preferring to use technology to communicate, multitaskers, valuing work/life balance, and entitled (Perry et al. 2013).

Lastly, evidence reveals both similarities and differences between the common older worker and younger age stereotypes with the above generational stereotypes (Perry et al. 2013). Stereotypes towards Baby Boomers overlap the most with those towards older workers (e.g., dependable, resistant to change, lower ability to learn; (Posthuma and Campion 2009) although Baby Boomers are also perceived as career driven, achievement oriented, hardworking, competitive, and having a strong work identity (Perry et al. 2013). Additionally, stereotypes towards Generation-X are different from younger worker stereotypes (e.g., feedback seeking, eager, productive) as workers from Generation-X are seen as lazy, self-centered, socially responsible, and having more balanced work needs than younger workers (Perry et al. 2013). Lastly, younger worker stereotypes typically focus these workers' ability to do work and openness to learning while the content of stereotypes towards Generation-Y seems to focus on technology (e.g., the use technology and knowledge new technology), impatience (e.g., the desire or need for instant gratification and short attention spans), and negative traits (e.g., entitlement and arrogance; (Perry et al. 2013). While recent scholarship helps uncover the content of stereotypes towards generations, more evidence is needed to further clarify the characteristics with which individuals use to describe generations and how these stereotypes affect workplace processes.

Conclusions

Here, current theories and empirical evidence on age stereotypes in the workplace were reviewed and several overarching conclusions were drawn. Age stereotypes in the workplace are largely conceptualized as the overgeneralized beliefs and expectations of the behaviors and characteristics of an employee based on his or her age. Additionally, evidence suggests there is a coherent set of common age stereotypes towards older workers (e.g., poor performers, resistant to change, shorter tenure, more costly, dependable) and younger workers (e.g., productive, efficient, creative, feedback oriented, entitled) present in the workplace. Despite their prevalence and ubiquity, there is very little evidence to suggest that workplace age stereotypes are valid generalizations. Moreover, evidence suggests that contextual and workplace factors can affect the extent to which age stereotypes are endorsed (e.g., supervisory status, exposure to age groups, in-group bias, job relevant information, positions with "correct age" bias).

Contemporary perspectives suggest that age stereotypes are both descriptive (i.e., describing what individuals actually do) and prescriptive (i.e., describe what individuals of a certain age should do) in nature and it is likely that both processes can affect the evaluations and judgments made of workers (North and Fiske 2013). Recent scholarship on the nature of metastereotypes (i.e., beliefs that individuals expect members of other age groups hold about their own age group) provides opportunities for further research on the content and effect of workplace age stereotypes on work-related variables. Lastly, research suggests age stereotypes also exist towards different generational groups (Perry et al. 2013). While there exists myriad

research on the topic of age stereotypes in the workplace in general, future research is needed to clarify the nature and influence of age stereotypes and the factors that mitigate the effects of stereotypes on cognitive, affective, and behavioral outcomes in work contexts. As the workforce continues to age and diversify in its age composition, understanding the mechanisms that prevent workplace age stereotypes from affecting information processing, affective reactions, and overt behavioral expressions of age bias is integral to creating and maintaining a workplace environment that supports its individuals across the lifespan.

Cross-References

- ▶ Age Diversity At Work
- ▶ Affect and Emotion Regulation in Aging Workers
- ▶ Age-Related Changes in Abilities

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Age Stereotyping and Discrimination

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Synonyms

Age prejudice; Ageism; Stigma

Definition

Researchers distinguish between stereotypes, prejudice, and discrimination. Stereotypes are defined as the mental representations people have about different social groups. Stereotypes have been described as "beliefs and opinions about the characteristics, attributes, and behaviors of members of various groups" (Whitley and Kite 2006, p. 6). In contrast, prejudice is depicted as the feelings people have toward different social groups. Prejudice is "an attitude directed toward people because they are members of a specific social group" (Whitley and Kite 2006, p. 7). Discrimination is conceived of as the behavior people enact toward members of different social groups. It has been defined as "treating people differently from others based primarily on membership in a social group" (Whitley and Kite 2006, p. 8). Note that stereotypes, prejudice, and discrimination can be either positive or negative in valence, as people may have positive or negative mental representations and feelings and act positively or negatively toward others based on their social group membership. The majority of research on this topic, however, has focused on negative stereotypes, prejudices, and discrimination directed at different social groups.

Ageism was first defined as age-based stereotyping, prejudice, and discrimination (Butler 1969). In its original conception, age bias was conceptualized as bias directed at older adults, but prejudice toward young people also exists. The present entry focuses on ageism directed toward older people. Compared with research on other types of bigotry (e.g., racism, sexism), far less research exists on ageism (Chasteen et al. 2011; North and Fiske 2012). The majority of research that has been done on ageism has focused on negative age stereotypes, prejudice, and discrimination.

Age Stereotypes

One of the primary features of age stereotypes is that they are complex, consisting of both positive and negative elements. This complexity was first proposed by Neugarten in 1974 (Neugarten 1974). It was suggested that there are at least two age groups of older adults: the young-old and the old-old. The young-old are conceived of as relatively active, healthy, and educated and the old-old as less active and healthy. Since that time, the complexity of age stereotypes has been further characterized by a number of researchers. For example, Hummert (2011) found a total of seven specific age stereotypes of older people that were shared by young, middle-aged, and older adults. The seven stereotypes consisted of four negative – severely impaired, despondent, shrew/curmudgeon, recluse – and three positive – golden ager, perfect grandparent, and John Wayne conservative. Kornadt and Rothermund (2014) suggest that there is even greater complexity to age stereotypes, such that the content and valence vary as a function of context, specifically, the life domain in which older people are being considered at that time. They found evidence that evaluations of older adults could vary across eight different life domains: family, friends, religion, leisure, lifestyle, money, work, and health.

Other researchers also contend that stereotypes of older adults are not simply negative but consist of positive and negative components. The stereotype content model (SCM) suggests that most groups are evaluated along two fundamental dimensions: warmth and competence (Cuddy et al. 2008). Stereotypes about groups are based on the degree to which members of those groups are seen as warm and as competent. In the case of

older adults, they are viewed as warm but incompetent. According to the SCM, this combination of perceptions can lead to feelings of pity toward older people and to paternalistic prejudice.

Most of the research on the content of age stereotypes has been done in Western cultures such as the United States and Europe. Studies that have compared Eastern and Western cultural perspectives have produced somewhat inconsistent findings. Some research found that individuals from Eastern cultures held more positive views of older adults, whereas others found that age stereotypes of older adults were more negative in Eastern cultures, such as in Asia (Hummert 2011). Despite these inconsistencies, however, there has been some agreement across Eastern and Western samples about the general content of age stereotypes, such that the age stereotypes found in some cultures (e.g., stereotypes about age-related cognitive and/or physical impairment) have also been identified in others (North and Fiske 2012; Hummert 2011). Instead, culture seems to influence what domains people emphasize within the general content of age stereotypes, such that individuals from Western cultures tend to focus more on age stereotypes about mental and physical traits, whereas individuals from Eastern cultures focus more on social and emotional traits (Hummert 2011). Overall, though, there is a great deal of convergence between Eastern and Western perspectives on the content of age stereotypes.

As noted earlier, context can determine how older people are stereotyped and perceived. Most of the research on age stereotypes has focused on descriptive stereotypes, or depicting the content of people's beliefs about how older people are. More recent work has shown that prescriptive age stereotypes are also applied toward older people. Prescriptive stereotypes refer to beliefs about how older people should behave and involve expectations that are used to control what older people do (North and Fiske 2012). Three types of prescriptive age stereotypes have been posited to exist: *succession, identity, and consumption* (North and Fiske 2012). For *succession*, the prescriptive age stereotype is an expectation that older adults will relinquish resources such as jobs to younger generations, who wish to succeed them. A prescriptive stereotype about *identity* pertains to the expectation that older adults "act their age" and engage in age-appropriate behavior. For *consumption*, the prescriptive stereotype refers to concerns that older adults will consume more than their fair share of resources such as health care or pensions. The researchers suggest that when older adults violate any of these three prescriptive age stereotypes, they are more likely to face hostile prejudice rather than paternalistic prejudice, as posited by the SCM (North and Fiske 2012).

Age Prejudice and Discrimination

Several reviews and meta-analyses have been conducted on attitudes toward older adults. The majority of studies have found that older adults are viewed negatively more often than positively (Chasteen et al. 2011; Hummert 2011; Kite et al. 2005). The context surrounding the assessment of age-related attitudes, however, can make a difference. For example, within-subject designs in which young and older adults are directly compared tend to produce more negative assessments of older adults than when a between-subject design is used. As well, when older adults are depicted as behaving in stereotypically consistent ways, such as being forgetful, they are rated more negatively (Hess 2006).

Consistent with the results for explicit evaluations described above, results of studies that have used implicit assessments of attitudes toward older adults have also found more negative than positive reactions (Hummert 2011). For example, research using the implicit association test (IAT) found that people implicitly preferred younger over older adults. Respondents demonstrated these preferences not only in Western countries but in Eastern nations as well (Hummert 2011).

Although a great deal of research has found negative attitudes toward older adults, expressed both explicitly and implicitly, findings from the SCM suggest that there should be instances in which attitudes toward older adults are ambivalent. Based on the SCM, Cuddy and colleagues developed the BIAS (behaviors from intergroup affect and stereotypes) map in order to capture the

different types of prejudice and discriminatory behaviors that various social groups might face (Cuddy et al. 2008). They propose that discriminatory behaviors can be predicted systematically from both the stereotypes and emotions (prejudices) perceivers hold of various social groups. In their BIAS map, Cuddy and colleagues contend that two dimensions explain a wide scope of discriminatory behaviors toward various groups, including older adults: (1) the intensity of the behavior (i.e., active or passive) and (2) the valence of the behavior (i.e., facilitative or harmful) (Cuddy et al. 2008). The intensity dimension refers to the amount of effort a person puts into a behavior. Active behaviors are straightforward, explicit, intense, and purposeful, whereas passive behaviors are indirect, implicit, and relatively less intense and purposeful. The valence dimension helps to explain whether the intended consequences of active and passive behaviors will be positive or negative. Facilitative behaviors are prosocial and help others achieve their goals, thus leading to positive outcomes. In contrast, harmful behaviors are antisocial and impede others from reaching their goals, thus leading to negative outcomes for the target group. In combination, these two bipolar dimensions produce four categories of discriminatory behaviors:

1. *Active facilitation*. Behaviors that fall under this category are overtly intended to benefit members of a group. Examples of these are providing aid or offering an older adult a seat on public transportation.
2. *Active harm*. Behaviors classified in this category are overtly intended to disadvantage a group. Examples include physical or verbal abuse.
3. *Passive facilitation*. Behaviors categorized this way involve cooperating with another group with the intention of benefitting the self. Notably, however, both groups benefit from this behavior. An example would be providing companionship to an older family member in order to receive an inheritance from him or her.
4. *Passive harm*. Behaviors falling under this category involve hurting another group by distancing oneself from that group. This is achieved by ignoring or socially excluding others. An example is choosing not to hire an applicant because of his or her age.

In order to predict whether individuals will act in an active or passive manner that is either helpful or harmful, Cuddy and colleagues argue that the perceived warmth and competence of a particular group must be considered. Importantly, they contend that the warmth dimension is more important than the competence dimension, because the warmth judgment is based on the extent to which people believe that a target group's goals threaten the self. Thus, the level of warmth attributed to a group predicts whether perceivers will act in an active facilitative or in an active harmful manner toward that group. That is, groups stereotyped as high in warmth evoke active helping behavior from others and groups stereotyped as low in warmth evoke active harmful behavior from others. Conversely, competence stereotypes of a group are predictive of whether others will act in a passive facilitative or in a passive harmful manner toward members of that group. People will behave in a passive facilitative way toward groups perceived as highly competent and in a passive harmful way toward groups perceived as low in competence. Findings supporting the SCM show that older adults are stereotyped as warm but incompetent and are often treated in active facilitative and passive harmful ways (Cuddy et al. 2008). For instance, institutionalization can be intended to help an older adult; however, it also isolates that individual from society and can lead to neglect.

Emotions mediate the link between combinations of the warmth and competence stereotypes and behavior. *Admiration*, based on the stereotype that a target group is high in both competence and in warmth, leads to both active and passive facilitation. *Contempt*, based on the stereotype that a target group is low in both competence and in warmth, leads to both active and passive harm. *Envy*, based on the stereotype that a target group is high in competence but low in warmth, leads to active harmful and passive facilitative behaviors. *Pity*, based on the stereotype that a target group is

low in competence but high in warmth, leads to active facilitative and passive harmful behaviors. Given that older adults are stereotyped as highly warm yet not very competent and are a pitied group, they are often treated with paternalistic or benevolent prejudice (Cuddy et al. 2008). Such behaviors convey the message that older adults are subordinate, weak, and incapable.

While pity is the default emotion associated with older adults, there are instances in which they may face other kinds of discriminatory behavior. As noted earlier, when older adults violate prescriptive age stereotypes, they are more likely to face hostile forms of prejudice. For example, when older adults violate age prescriptions about succession (i.e., yielding desired resources like jobs to younger age groups), they are more likely to face envious prejudice (North and Fiske 2012). If older people violate the prescriptive age stereotype concerning consumption (i.e., using only one's fair share of common resources such as health care), feelings of contempt and anger may ensue. But if older adults violate age prescriptions about identity and do not "act their age," they will likely face distancing and rejection. When any of these three prescriptive age stereotypes are perceived to be violated, it is more likely that older people will face some types of hostile ageism (envy, contempt, rejection) than paternalistic or benevolent ageism.

Examples of Age Discrimination

Patronizing speech. Benevolent ageism is often manifested through people's communication patterns with older adults. Patronizing speech, called elderspeak, is often used with older adults in order to attempt to actively facilitate communication and is characterized by over-accommodation and baby talk (Whitley and Kite 2006; Bugental and Hehman 2007). People unconsciously over-accommodate when communicating with elders by being excessively polite and expressive while speaking in a loud and slow manner with great enunciation. Baby talk is an extreme form of overcompensation in which a person uses simplified language, a higher register, and exaggerated intonation when communicating with older adults as well as physical behaviors such as patting older adults on the head (Whitley and Kite 2006; Bugental and Hehman 2007). Both the verbal and the physical behaviors involved in baby talk convey assumptions about older adults' limited cognitive and hearing abilities as well as situate older adults as subordinate (Whitley and Kite 2006; Bugental and Hehman 2007). Importantly, this form of ageism is used by a variety of communicators such as nurses in nursing homes, strangers, and family members (Whitley and Kite 2006).

Elder abuse. Hostile ageism, including elder abuse, can often be seen within the family. The most common forms of elder abuse within families include physical abuse, neglect, financial exploitation, and discrimination in the area of sexuality (Palmore et al. 2005). These forms of abuse are especially common when older adults live with their children and are seen as a burden (Palmore et al. 2005). During physical abuse, physical force is used and may result in bodily harm. Neglect involves a lack of attending to older adults' needs. Financial exploitation includes misusing older adults' money, property, and other assets. Finally, when older adults express a desire for sexual intimacy, they may face criticism from younger family members because such desires are seen stereotypically as abnormal for an older population. This can have negative implications for relationships both within and outside of the family, leaving older adults vulnerable to social isolation.

Ageism in health care. Medical professionals may express ageist behaviors and attitudes, which can be observed early on in medical professionals' careers. For instance, medical, nursing, and social work students have reported that they think more positively about the idea of interacting with younger adults and more negatively about interacting with older adults (Carmel et al. 1992). Consequently, these students find that they are least likely to want to work with older adults compared to other age groups and compared to other types of patients (such as drug addicts, heart disease patients, psychiatric patients, etc.) (Palmore et al. 2005; Carmel et al. 1992). This can have

implications for the quality of service that doctors, nurses, social workers, and other health-care professionals provide to older adults. For instance, believing the stereotype that illness is natural in old age may lead students and doctors to misdiagnose physical and psychological ailments and can affect communication with older patients (Whitley and Kite 2006; Hess 2006; Palmore et al. 2005). Doctors and other medical professionals may appear to be less respectful, less informative, and less responsive and to afford less time to older patients than to young and middle-aged patients (Whitley and Kite 2006; Hess 2006).

Ageism in the workplace. The workplace is another area in which people may behave in discriminatory ways toward older adults. Many older workers report experiences of being ignored, being excluded from important decisions, and being talked down to by coworkers and bosses (Blackstone 2013). Additionally, younger workers may socially exclude older adults and make offensive jokes about their age (Blackstone 2013). A strong bias exists in the hiring, promoting, and termination processes that favors younger adults. This bias is driven by the incompetence stereotype that people tend to hold of older adults. People prefer to hire and to promote younger candidates, perceiving them as more competent than older candidates. At the same time, people are more likely to terminate jobs filled by older workers, who are more likely to have higher salaries (Whitley and Kite 2006; Palmore et al. 2005). These decisions are often justified with the stereotypic view that older adults are unproductive and less capable in the workplace (Whitley and Kite 2006). Older adults are often encouraged to retire and some are asked to continue to perform the same services voluntarily that they did when they were being paid (Palmore et al. 2005).

Ageism in the media. Older adults are underrepresented in the media but are portrayed narrowly when they do appear (Whitley and Kite 2006; Palmore et al. 2005). Generally, the media primarily targets younger audiences and neglects older audiences, thus conveying the message that older adults are of low importance. Even in magazines which target older adults, such as AARP's *Modern Maturity*, older adults appear in less than half of the advertisements (Whitley and Kite 2006). When older adults are included in the media, negative images primarily depict them as unattractive, out-of-date, and having poor health (Bugental and Hehman 2007). For instance, in a number of magazines, such as *Time*, older adults primarily appear in pharmaceutical advertisements (Whitley and Kite 2006). Magazines and advertisements illustrate aging as an unwanted process and offer a number of solutions to reverse the process, such as Botox injections to smooth wrinkles. Other forms of media, such as comedy shows and birthday cards, insult and make fun of older adults, thus reinforcing negative age stereotypes (Palmore et al. 2005). Furthermore, most people are not aware that such comments may unconsciously intensify people's negative attitudes toward older adults and aging (Palmore et al. 2005).

Experiences and Effects of Age Stereotypes and Discrimination

As discussed earlier, older adults are stereotyped on negative (incompetent, curmudgeon) and positive (warm, perfect grandparent) dimensions. This complexity of age stereotypes creates multiple ways in which ageism can manifest, as highlighted in the BIAS model (Cuddy et al. 2008). Almost all older adults in Canada and the United States experience ageism (Palmore 2004). In fact, 91% of older adults surveyed from Canada and 85% of older adults from the United States reported experiencing at least one form of ageism. Ageist experiences range from severe (e.g., being victimized) to mild (e.g., receiving a birthday card that pokes fun at one's age). Encouragingly, the severe forms of ageism are far less common than milder forms. Only 5% of older adults report experiencing victimization vs. 70% who have experienced jokes based in age stereotypes. However, it is not uncommon for older adults to be patronized (46%), to be ignored (43.5%), or to be met with assumptions of incompetence (35.5%).

Although we know that most older adults will experience ageism, we know relatively little about the effect of ageism on older adults. There is an imbalance in the extent to which the perspectives of those who display prejudice are understood compared with the perspectives of those who experience it. Specifically, more is known about expressions of age stereotypes and prejudice than about what it is like to be the target of those age biases. Of the small amount of research that has documented older adults' ageism experiences, it has been shown that benevolent ageism, such as being patronized, and hostile ageism, such as social exclusion, both have negative impacts on older adults' psychological well-being, cognitive functioning, and health (Hess 2006; Bugental and Hehman 2007). Examples of the deleterious impact of age stereotypes and ageism on older adults include research on the provision of unwanted help (specifically, patronizing speech), age self-stereotypes, and stereotype threat.

The effects of patronizing speech on older adults. It is intuitive that hostile ageism will have a negative impact on older adults. It is somewhat less intuitive why benevolent ageism, manifested in helping behaviors, can also negatively affect older people. Patronizing speech, as discussed above, is commonly used when people communicate with older adults. The manner in which older adults experience and respond to patronizing speech depends on their cognitive and functional abilities. Older adults whose functional ability is low are responsive to over-accommodating speech. However, this communication method is often applied to older adults with little or no cognitive decline and is experienced as condescending and patronizing. Specifically, over-accommodation is both insulting and harmful to older adults. It is insulting in that it assumes that all older adults have similarly low cognitive abilities and is a condescending behavior. It is harmful because it is associated with several negative outcomes among older adults including a loss of self-esteem, motivation, and confidence and a loss of feeling in control (Hess 2006). Stereotype-based helping behaviors like this can lead to dependency in older adults by creating a self-fulfilling system of expectations. Over-accommodation is predicated on beliefs of lowered competency in older adults. With repeated exposure, these beliefs are internalized by older adults and come to be accepted as valid. Once these beliefs are perceived as valid, older adults' expectations about their own abilities are lowered, leading to lower performance, which serves to reinforce the original beliefs of lowered competency (Bugental and Hehman 2007). Thus, the behavior of older adults who experience over-accommodation may not reflect their actual cognitive abilities, but instead be a reflection of the expectations of their caregivers.

Age self-stereotypes and stereotype embodiment theory. The extent to which older adults internalize and endorse negative age stereotypes predicts a variety of age-related outcomes, such as for memory function and health. The manner in which this occurs is explained through stereotype embodiment theory (Levy 2009). Stereotype embodiment theory has four main components. The first component explains that age stereotypes are internalized throughout a person's lifetime, forming self-stereotypes among older adults. This highlights a unique aspect of older adults' experiences of ageism (vs. other minority experiences of prejudice). The age group to which a person belongs changes over the life span, with younger adults expecting to age and eventually join the age group of older adults. Thus, over time, older adults go from being outgroup members to ingroup members as people grow older. In contrast, other group identities, such as race, remain constant and membership is stable across one's life span. For most of their lives, people do not perceive older adults as members of their ingroup and are not motivated to challenge age stereotypes (Levy 2009). Thus, when people are first exposed to age stereotypes, often in childhood, they are not motivated to reject these stereotypes like they would be if the stereotypes are applied to an ingroup. Age stereotypes are consistently reinforced throughout adulthood and are internalized after repeated exposure. This process results in age self-stereotypes, whereby older adults apply internalized age stereotypes to their own aging expectations and experiences.

The extent to which age stereotypes influence older adults does not rely on explicit activation or endorsement of these stereotypes. This is the second component of stereotype embodiment theory (Levy 2009), and it is supported with a large body of literature demonstrating that subliminal activation of negative age stereotypes influences older adults' performance on a variety of tasks. Even tasks that are not under conscious control can be affected by subtle activation of age stereotypes. For example, older adults who complete a writing task after exposure to subliminally presented negative age stereotypes have shakier and less steady handwriting than those exposed to positive age stereotypes.

The third component of the stereotype embodiment theory explains that the effects of age stereotypes are only present among people for whom the stereotype is self-relevant. That is, older adults are impacted by internalized and primed age stereotypes but younger adults, for whom the stereotypes are not relevant, are not.

The fourth component of stereotype embodiment theory explains the pathways through which behavioral assimilation to age stereotypes occurs. There are three pathways: psychological, behavioral, and physiological (Levy 2009). The psychological pathway functions through expectations founded in age stereotypes. These internalized stereotypes guide expectations about the aging experience and create self-fulfilling beliefs about the aging process. These expectations limit older adults' ability to perform mental and physical tasks. A second pathway is the behavioral pathway. The behavioral pathway functions primarily through healthy behaviors. A common stereotype about aging is that it is associated with poor health. Internalizing this stereotype leads to the belief that declining health is inevitable and beyond control. This belief prevents older adults from engaging in behaviors to minimize health decline. Thus, the perception that declining health is inevitable prevents older adults from engaging in behaviors that would contradict this belief and a reinforcing pattern of beliefs and behavior is formed. The third pathway, through physiology, is founded in the relationship between stress and various health outcomes. For example, older adults primed with negative age stereotypes demonstrate larger cardiovascular responses to a stressful situation. Thus, stress, a predictor of health, is a more common experience among older adults holding negative views of aging, leading to more serious health declines, including cardiovascular issues.

Stereotype threat. Stereotype embodiment theory (Levy 2009) emphasizes the unconscious relationship between age stereotypes and age-relevant outcomes. A second theory, stereotype threat, focuses on the effects of being aware of age stereotypes (Steele 1997). The extent to which older adults have internalized negative age stereotypes will impact the effect that reminders of their age have on their subsequent performance on age-relevant tasks, including tests of memory (Chasteen et al. 2011). This phenomenon is known as stereotype threat (also conceptualized as social identity threat (Steele et al. 2002)), and it states that concern about confirming a group-relevant stereotype will lead an individual to perform worse on the associated task, thus confirming the stereotype (Steele 1997; Steele et al. 2002). Stereotype threat has been found for memory and cognitive function in tests involving older adults (Hess 2006). When older adults are given instructions emphasizing the memory component of a task, their subsequent memory performance is reduced compared to those who do not experience instructions with this emphasis and compared to younger adults who receive the same instructions. Similar effects are found for recall tasks following a reminder that older adults have poor memory skills.

Stereotype threat functions through multiple pathways to create performance deficits. One path works through reducing older adults' use of memory strategies, such as clustering (Chasteen et al. 2011). A second path functions through reduced performance expectations such that lowered expectations lead to poorer performance. This is similar to what is seen after exposure to benevolent ageism, although the cause of lowered expectations varies. Older adults who value the domain in which they are being evaluated and those who are strongly identified with their age group experience larger stereotype threat deficits (Chasteen et al. 2011).

Overcoming Age Stereotypes

Age stereotypes contain negative and positive content and are internalized by people across their lives. The impact of negative age stereotypes is demonstrated through stereotype embodiment theory and stereotype threat; however, there are several methods to alleviate these effects. Priming positive stereotypes can facilitate positive outcomes (Palmore 2004; Levy et al. 2014) as can priming incremental (vs. entity) beliefs (Plaks and Chasteen 2013). Successfully completing an age-relevant task can also improve performance on subsequent tasks (Geraci and Miller 2013).

Positive age stereotypes. Just as negative stereotypes about aging can lead to poor outcomes for older adults, so can positive age stereotypes facilitate positive outcomes (Levy 2009; Levy et al. 2014). Older adults presented with positive age stereotypes implicitly (subliminally) on a weekly basis for four weeks experienced a variety of positive outcomes. These included increases in the extent to which they endorsed positive age stereotypes, the extent to which they applied positive age stereotypes to their own aging process and their own physical function (Levy et al. 2014).

Incremental mind-sets. People who endorse incremental beliefs espouse the view that personal qualities are malleable and that people can improve with effort. In contrast, people who endorse entity beliefs endorse the view that personal qualities are fixed and cannot be improved, regardless of a person's motivation or effort (Plaks and Chasteen 2013). Those who endorse entity beliefs tend to rely more on stereotypes than those who endorse incremental beliefs; they also tend to engage in more self-stereotyping. The extent to which people self-stereotype is particularly relevant to older adults, given the relationship between self-stereotypes and age-associated outcomes discussed in stereotype embodiment theory (Levy 2009). Older adults who endorse incremental beliefs perform better on memory tasks than do older adults who endorse entity beliefs (Plaks and Chasteen 2013). Theories on change may be successfully applied to improve older adults' performance on age-relevant tasks. Older adults primed with incremental beliefs outperform older adults primed with entity beliefs on measures of free recall and reading span, both measures of memory performance.

Performance expectations. The priming effects of exposing older adults to either positive age stereotypes or incremental beliefs operate at an unconscious level to improve older adults' performance on age-relevant tasks. A third means through which the effects of negative age stereotypes can be reduced functions by explicitly changing older adults' expectations about their performance (Geraci and Miller 2013). As discussed above, older people's expectations about age-related outcomes (e.g., memory, health, etc.) impact the extent to which they engage in behaviors to achieve the desired outcome, thus reducing the likelihood of success and ultimately supporting the relevant age stereotypes. Changing older people's expectations can break this feedback cycle. Performing a cognitive task successfully improves older adults' performance on a subsequent memory task by reducing the anxiety associated with the memory task (Geraci and Miller 2013). Interestingly, failing a task produces the same subsequent performance as not performing a prior task: Violating the expectation of failure, not experiencing failure, influences subsequent performance. When older adults expect to succeed, they are more likely to succeed, and it is possible to enhance perceptions of future success through an unrelated prior success.

Conclusion

Age stereotypes consist of the mental representations people have about older adults. These stereotypes are complex, consisting of both negative and positive content and varying across life domains. Viewing older adults as stereotypically warm but incompetent can lead to patronizing behavior in which older adults face benevolent ageism. When older adults violate prescriptive age stereotypes and do not exhibit expected behaviors, they may face hostile ageism. Benevolent and hostile ageism have been shown to occur in a variety of life domains for older people

and to worsen older adults' emotional, cognitive, and physical well-being. Moreover, older adults may fall prey to aging self-stereotypes because they might have internalized negative age stereotypes earlier in life. Exposing older people to negative age stereotypes, either implicitly or explicitly, can worsen their cognitive and physical function. Fortunately, the deleterious impact of negative age stereotypes on older people can be mitigated through exposure to positive age stereotypes or incremental beliefs about the ability to change or by altering older adults' performance expectations through previous experiences of success.

Cross-References

- Age Stereotypes in the Workplace
- Age Stereotyping and Views of Aging, Theories of
- Age, Self, and Identity: Structure, Stability, and Adaptive Function
- Attitudes and Self-Perceptions of Aging
- Cognitive Control and Self-Regulation
- Emotion–Cognition Interactions
- Self-Theories of the Aging Person
- Social Cognition and Aging

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Age Stereotyping and Views of Aging, Theories of

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Synonyms

Age stereotypes; Ageism; Explicit stereotypes; Implicit stereotypes; Stereotype threat; Working memory

Definition

Stereotypes are beliefs regarding the characteristics of people within the same demographic, cultural, or social group. These beliefs influence social interactions with and perceptions of others based on their membership in a stereotyped group. Such generalizations of a group of people can have negative consequences.

The Importance of Stereotypes

Stereotypes are cognitive representations – or schemata – of beliefs regarding the characteristics of a group of people that are typically shared by individuals within a culture or social group. These representations play an important role in social interactions by influencing our perceptions of others based upon their membership in stereotyped groups, thereby allowing us to draw inferences about their behavior. Of course, the accuracy of such inferences is dependent upon the accuracy of the stereotype and its appropriate application to a specific target individual. Given the relative inaccuracy of many social stereotypes, however, their influence often leads to biased perceptions of others. The information contained in these representations is also evaluative in nature, and thus stereotypes form the basis for attitudes that we may have toward members of specific social groups. In other words, the content and evaluative components of stereotypes can play an important role in how we perceive and respond to others in social situations, which in turn can influence the nature of social interactions and the behavior of others. Although most early social psychological theory and research focused on such effects, more recent work has addressed self-stereotyping influences reflecting the degree to which stereotypical beliefs or situational activation of stereotypes affects an individual's behavior independent of the behavior of others. Research on self-stereotyping effects forms the bulk of much recent aging research and thus is the focus of this section.

Nature of Aging Stereotypes

Stereotypes can be examined in many different ways, and researchers studying aging have used a variety of methods. For example, stereotypes can be examined explicitly by asking people to identify the characteristics associated with a specific group or implicitly through devices such as the Implicit Association Test (Greenwald et al. 1998). They can also be assessed directly through the specific assessment of group attributes or indirectly through trait sorting or by examining inferences about individuals and their behavior that are assumed to reflect stereotypical beliefs. It is important to note that each of these methods may offer unique insights about stereotypes and the contexts in which they emerge. For example, consistent with many other studies of stereotypes, research has demonstrated a mismatch between implicitly and explicitly assessed attitudes about aging (e.g., Hummert et al. 2002).

So, what does research on aging stereotypes tell us? Based upon casual observation and attention to media, one might expect that such stereotypes will be rather negative. Although there is much data consistent with such a view, the ultimate picture is more complex. This complexity is illustrated in research examining the content and structure of age stereotypes in which individuals sorted pictures, descriptors, or traits into

categories (e.g., Brewer et al. 1981; Brewer and Lui 1984; Hummert 1990; Hummert et al. 1994; Schmidt and Boland 1986). Based on the results of these studies, Hummert (1999, 2015) identified specific stereotypes of older adults that were relatively consistent across age groups: golden ager, perfect grandparent, John Wayne conservative, severely impaired, recluse, despondent, and shrew/curmudgeon. Whereas the majority of these categories do represent somewhat negative depictions of older adults in our society, they also illustrate two important points. First, aging stereotypes are multifaceted, indicating that the superordinate category of "older adult" does not do a good job of characterizing people's cognitive representations. Second, and perhaps more importantly, the schemata used for categorizing older adults are not invariably negative. Of further note is the finding that increasing age was found to be associated with a greater number of subcategories (e.g., Hummert et al. 1994), suggesting that the complexity of our representations of aging is influenced by our own experiences as we move through the life span. This last point relates to the somewhat unique status of old age in that most of us will experience this category as both an out-group in young adulthood and as an in-group later in life, perhaps leading to the expectation that our stereotypes of old age will become less severe as we ourselves age. Interestingly, whereas there may be some tempering with age, there is still much consistency in the nature of such stereotypes across adulthood.

Although the existence of some positive subcategories suggests a somewhat more positive view of later life, their consideration within the context of the stereotype content model (Fiske et al. 2002) may qualify this perspective. This model proposes that stereotypes of out-groups can be characterized in terms of their placement along the independent dimensions of competence and warmth. The in-group tends to be perceived as being high on both dimensions, whereas out-groups are viewed as being higher along one dimension than the other based on perceptions of status and competition relative to the in-group. Research based on this model (e.g., Cuddy et al. 2009) suggests that the general stereotype of older adults is characterized as high in warmth – reflecting low competition to the in-group (i.e., young adults) – and low in competence – reflecting low perceptions of status. Cuddy and Fiske (Cuddy and Fiske 2002) further suggest that the shared stereotypes identified by Hummert (1999) and others can also be characterized in terms of these two dimensions with only one – the *golden ager* – appearing to be high in both warmth and competence. (Notably, the *golden ager* subcategory is seen primarily in studies where the sample generating stereotypes includes middle-aged and older adults.) Other subcategories can be characterized as being low on at least one of the dimensions of competence (*perfect grandparent*, *severely impaired*, *recluse*) or warmth (*John Wayne conservative*, *despondent*, *shrew*/*curmudgeon*). Thus, whereas the research on stereotypes does indicate that our conceptions of older adults are not all negative, this structural analysis suggests an underlying negative component to most subcategories of older adults.

In addition to examining the perceived characteristics of older adults, researchers have also examined beliefs regarding the nature of change of specific aspects of behavior across the life span as another means for understanding aging stereotypes. For example, Heckhausen and colleagues (Heckhausen and Baltes 1991; Heckhausen et al. 1989) assessed beliefs about the sensitivity of personal traits to change along with the timing and controllability of such change. They found that, regardless of age, adults expected behavioral losses to dominate over gains with increasing age and that desirable, controllable traits were more likely to emerge and cease development earlier in adulthood than were undesirable traits. In other words, the general characterization of the aging process is rather negative in terms of the losses of desirable traits, the advent of undesirable ones, and the perceived inability to control the latter. Similar types of studies that have focused on more specific domains (e.g., memory, language) have obtained results consistent with these (e.g., Camp and Pignatiello 1988; Hertzog et al. 1998; Ryan and Kwong See 1993; Ryan et al. 1992). Although the characterization of aging from this research is

rather gloomy, these studies also demonstrated that not all beliefs regarding aging and cognition are negative, with differences in attitudes being observed as a function of domain. Thus, for example, while old age might be associated with declining physical and cognitive skills, it is also thought to be associated with growth or maintenance of other aspects of functioning, such as those associated with expressive behavior or wisdom (e.g., Heckhausen et al. 1989; Slotterback and Saarino 1996).

Stereotypes have also been assessed in a somewhat indirect fashion using person perception paradigms that focus on observers' responses to the behavior of others. Inferences about aging stereotypes are made based on different interpretations of and attributions for this behavior as a function of the age of the individual performing the behavior. For example, an identical memory failure is typically judged as more serious in an older adult than in a younger adult (Erber 1989) and is more likely to be attributed to internal stable causes (e.g., ability) in older adults, whereas attributions based on internal, unstable causes (e.g., effort) were more prevalent for younger adults' failures (Erber et al. 1990; Parr and Siegert 1993). Another example can be seen in the realm of language performance, where Kwong See and Heller (2004) examined perceptions of different-aged adults who exhibited high and low levels of language performance. They found that poor-quality language performance in older adults was judged less negatively than it was in younger adults, whereas high-quality performance was judged relatively more positively. This variability in judgments across age groups is assumed to reflect age-based stereotypic expectations (i.e., good performance in young adults, poor performance in older adults). Such findings are consistent with the shifting standards model of stereotype-based judgments (Biernat 2003).

These studies of person perception are not only valuable in examining stereotypes but also in illustrating how they are translated into actual responses to other people. Although the stereotypic traits implied in these studies often have a basis in reality (e.g., impaired memory), the responses to these traits are typically somewhat extreme. Of even greater interest are situations where stereotypes are incongruent with reality, resulting in potentially inappropriate – as opposed to merely condescending – responses to older adults in relevant contexts. For example, several investigations of perceptions of older workers suggest that aging-related biases are conveyed in judgments regarding their capabilities. Relative to younger workers, older workers are perceived as less physically capable, less healthy, lower in productivity, inflexible, resistant to new ideas, and less capable of being trained. These attitudes are subsequently reflected in institutional behaviors that result in, for example, older workers being given fewer opportunities for training and learning of new skills (e.g., Capowski 1994; Finkelstein et al. 1995). The disturbing aspect of such findings is that these attitudes typically fly in the face of reality. There is little relationship between age and job productivity, and absenteeism is actually lower in older than in younger workers (McEvoy and Cascio 1989; Schmidt and Hunter 1998). What is equally disturbing is that these negative perceptions of older workers occur at an earlier age (e.g., 50–65 years) than commonly associated with more general aging attitudes, suggesting that the time frame typically associated with perceptions regarding the development of negative aging-related characteristics is compressed in the workplace.

In summary, several general conclusions can be reached about stereotypes of aging and older adults. First, our views of aging are multifaceted, with the notion of a general stereotype of old age clearly receiving little support. Second, although there are some positive aspects associated with these stereotypes, they tend to paint a rather negative picture of later life. As suggested by the stereotype content model, this negativity could even be seen to underlie some of the more positive stereotypes of aging. Third, as in many cases, the stereotypes that we hold of older adults are not completely accurate. This may bias how we respond to older adults, with such biases being particularly consequential in situations where there is a clear disconnect between the stereotype and reality. Fourth, developmental context does modify our stereotypes somewhat, with older

adults having more complex views of their group. However, these differences are not as strong as one might expect. In a related vein, although there is some variation across cultures in views of later life, a recent review of the literature concluded that there is ". . .broad cross-cultural agreement on the general nature of age stereotypes that subsumes culturally specific beliefs about individual components of those stereotypes" (Hummert 2011, p. 251). For example, although cultures that value filial piety (e.g., China, Japan, Korea) may treat older adults with more respect than those that do not, individuals in these same cultures often express negative views of aging that are similar to those held in Western cultures (e.g., Boduroglu et al. 2006; Yun and Lachman 2006). Finally, stereotypes of aging are sensitive to context (e.g., type of ability [e.g., Heckhausen et al. 1989], domain of functioning [e.g., Kornadt and Rothermund 2011]). For example, both young and older adults' perceptions of aging are influenced by the domain of functioning being considered (e.g., health vs. social relationships).

The Impact of Aging Stereotypes on Older Adults

An important question concerns the extent to which aging stereotypes affect our behavior. A growing body of research in the field of gerontology has shown that aging-related stereotypes have the potential to negatively affect older adults' functioning whether the negative stereotype is "in the air" in a performance situation or becomes internalized over many years.

Stereotype threat. How do stereotypes get "into the air"? Stereotypes become salient through situational cues, leading to harmful threat effects on the behavior or functioning of the stereotyped individual. These situational cues can be blatant, moderately explicit, or indirect and subtle (Nguyen and Ryan 2008). One way in which more explicit influences have been investigated is through examinations of stereotype threat. When reminded of negative, self-relevant stereotypes in a performance situation, the targets of these stereotypes often experience performance decrements on cognitive tests (Steele 1997). Performance disparities between members of stereotyped and non-stereotyped groups disappear, however, when the stereotype is de-emphasized or made irrelevant in a given situation. This phenomenon is called *stereotype threat*, and it has been observed in myriad situations with many different types of stereotyped groups of people.

Several studies have examined the possibility that stereotype threat may be operative in influencing older adults' behavior, particularly in contexts associated with negative views of aging. For example, Hess and colleagues (Hess et al. 2003) exposed younger and older adults to one of two different articles: one emphasized aging stereotypes and the other article de-emphasized age differences in memory ability. They found that the older group who had read the negative aging stereotype article recalled a smaller proportion of the words than younger adults exposed to the same article. This difference in performance was dramatically smaller, however, in the condition in which participants were exposed to more positive perspectives on aging. Moreover, the more highly invested the older adults were in the stereotyped domain (i.e., memory ability), the worse they experienced threat-related memory decrements. Related to this, older adults who identify strongly with their own age group are most vulnerable to stereotype threat effects on their memory performance (Kang and Chasteen 2009). Although in the gerontology field most stereotype research has focused on the stereotyped domain of memory ability, older adults have also shown threat-related underperformance in the math domain (Abrams et al. 2008) and in contexts such as the workplace (Buyens et al. 2009; Von Hippel et al. 2013). Importantly, there have also been demonstrations of enhanced functioning in situations where more positive images of old age have been activated.

How does stereotype threat lead to underperformance? Two different mechanisms have been explored in the literature. The first relates to the idea that self-relevant stereotypes spur evaluative concerns. These concerns lead to self-regulation processes, including monitoring of one's facial expressions and attempting to tamp down self-

doubt and worry (Schmader et al. 2008). The cognitive resources required to engage in self-regulation reduce the availability of resources for performing the task at hand, thus resulting in performance decrements. This working memory mechanism of stereotype threat effects has been observed in younger adults (Schmader and Johns 2003). An alternative perspective has a more motivational focus, centering on mechanisms associated with regulatory focus (Higgins 1997). The idea is that negative stereotypes activate a prevention focus, motivating stereotyped individuals to avoid confirming the stereotype about the group to which they belong. When in this prevention-focused state, threatened individuals tend to perform tasks slowly and cautiously. This approach may lead to apparent reductions in performance but in fact may represent differences in the approach to task. Seibt and Förster (2004) found support for this mechanism of threat effects in younger adults.

In research with younger adults, the working memory perspective has dominated much research. However, there is less evidence that the same mechanism is operating to degrade older adults' performance under stereotype threat. For example, Hess et al. (2009a) and Popham and Hess (2015) found little evidence of working memory impairments in older adults subjected to threat, whereas the latter study found evidence of threat-related working memory impairments in younger adults. Popham and Hess also found that emotion regulation abilities play a role in this working memory mechanism in younger adults. Specifically, younger adults with high emotion regulation abilities were less vulnerable to threat effects on working memory than their counterparts with lower emotion regulation abilities. Given that older adults reported high levels of emotion regulation ability, it leads to the question of whether age differences in the mechanism through which stereotype threat negatively impacts performance are rooted in age differences in reports of emotion regulation abilities. Consistent with this idea, several studies have suggested that performance decrements in older adults under threat may reflect adjustments in their performance. For example, Hess et al. (2009b) found that older adults under threat were more conservative in their approach. Popham and Hess (2015) also demonstrated that threat led older adults to respond more slowly but also with greater accuracy than their positively stereotyped peers. In the same study, younger adults who were exposed to a self-relevant stereotype showed a propensity toward a similar type of response under threat. However, working memory decrements under threat seemed to better characterize their response to the threat manipulation than regulatory focus.

Other research from the regulatory focus perspective has suggested that the degree to which older adults exhibit decrements in performance under threat depends on the match between task structure and focus. A prevention focus is most likely to result in performance decrements in situations where the task reward structure is focused on gains, whereas improvements in performance will be observed when the avoidance of loss is important. Research by Barber and Mather (2013) has shown that older adults are also sensitive to "regulatory fit," suggesting that the specific task context in interaction with stereotype activation will determine the degree and nature of threat-related effects on older adults' performance.

The investigation of the mechanisms underlying threat is important in better understanding how older adults respond to threat. Whereas there is not much support for diversion of resources from working memory (e.g., worry) accounting for threat influences on older adults' behavior, this does not negate the possibility that such a mechanism may be operative in some circumstances. For example, we might expect that evaluation concerns will be more likely to occur in important contexts outside the lab (e.g., work settings) and that certain characteristics of the individual (e.g., high neuroticism) may accentuate such effects.

Implicit stereotype influences. Research has also shown that aging stereotypes can influence older adults' cognitive and physical performance even when stereotypic cues are more subtle or even operate beneath conscious awareness. Priming is an indirect and subtle way in which stereotypes become relevant in a situation. For example, research has shown that implicitly priming

(i.e., activating concepts without the individual being aware) older adults with aging stereotypes negatively affects their performance on memory tasks (Hess et al. 2004; Levy 1996), decreases their walking speed (Hausdorff et al. 1999), reduces balance (Levy and Leifheit-Limson 2009), and increases physiological reactivity to the test situation (Levy et al. 2000). Thus, negative stereotypes can operate somewhat insidiously in affecting older adults' behavior.

Internalization. Negative stereotypes about older adults may become engrained at an early age, even though the stereotype does not yet apply to oneself (Bennet and Gaines 2010). As the person grows older, the internalization of aging stereotypes manifests itself in way that damages cognitive and physiological systems, as suggested by Levy's (2009) embodiment perspective on aging stereotypes. Levy et al. (2009) observed in a longitudinal study that people who had internalized negative aging stereotypes in middle adulthood were at increased risk of experiencing a cardiovascular event 20+ years later. The mechanism behind this link may relate to people who believe aging stereotypes also believing in the intractability of disability and disease with age, leading them to live a less healthy lifestyle over many decades. Other research has demonstrated similar long-term effects of negative stereotypes on mortality (Levy et al. 2002) and memory (Levy et al. 2012). Thus, negative perceptions of aging that may be operating relatively early in life may have long-lasting effects as they can become self-fulfilling prophecies (Levy 2009).

Conclusions

There is ample evidence from experimental and longitudinal studies of the harmful effects of ageism and aging stereotypes on older adults' health and behavior. First, aging stereotypes harm older adults when they lead older individuals to not participate in cognitive activities or engage their memory abilities because it seems pointless, thus becoming a self-fulfilling prophecy. Second, when aging stereotypes permeate a context, such as the workplace, threat-related decrements can start to occur in the stereotyped domain, and this could have consequences for job performance and career longevity. Given these implications, further research is needed to develop interventions aimed at mitigating such negative effects. Most promising are intervention programs which aim to improve the cognitive functioning or cardiovascular health of older adults through emphasizing positive older age stereotypes (Levy et al. 2000), as positive self-stereotypes can actually override implicit reminders of negative old age stereotypes.

Research on stereotype threat and implicit influences has important implications for older adults. There are potentially long-term consequences from exposure to threat in everyday life. Regardless of the level of awareness, older adults exposed to negative aging stereotypes in the workplace may experience unnecessary stress. In addition, when activation of negative stereotypes leads to underperformance outside the laboratory in real life, poor performance may be mistakenly attributed to an aging-related decline in ability rather than the situational and reversible phenomenon that it is. Such influences may also operate within the research setting. For example, investigators who study memory ability ought to be aware of subtle, inadvertent aging stereotype cues, as the test performance of older participants – and thus our inferences about aging-related changes in ability – may reflect stereotype threat effects rather than normative aging declines.

Cross-References

- ▶ Age Discrimination
- ▶ Age Stereotypes in the Workplace
- ▶ Age Stereotyping and Discrimination
- ▶ Age, Self, and Identity: Structure, Stability, and Adaptive Function
- ▶ Attitudes and Self-Perceptions of Aging
- ▶ Self-Theories of the Aging Person

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Age, Organizational Citizenship Behaviors, and Counterproductive Work Behaviors

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Synonyms

Discretionary behaviours; Positive extra-role behaviours, Prosocial organizational behaviours, Constructive contextual performance Synonyms for 'counterproductive work behaviours'; Negative work behaviours; Deviant work behaviours

Definition

This chapter reviews the relationships between age and both positive and negative extra-role work behaviors. The basic issue is whether older workers display more (or less) positive and negative discretionary work behaviors. The research evidence suggests that, overall, older workers are more likely to engage in positive work behaviors (citizenship) and are generally more likely to engage in fewer counterproductive behaviors than younger workers.

In recent years there has been considerable discussion of and research on the job performance of workers, along with the factors which contribute, either positively or negatively, to this performance, as well as the consequences of high and low job performance (for a recent review, see Dalal et al. 2014). From an organizational perspective, it is clear that worker performance is paramount to the overall productivity and effectiveness of the organization. Managers (in particular) are highly motivated to optimize worker performance. Performance on the job is also important to individual workers, as it is a salient contributor to their feelings of achievement at work, work attitudes (such as job satisfaction), and their overall sense of well-being. Numerous studies have illustrated the close association between individuals' job performance and a raft of relevant outcomes (Dalal et al. 2009, 2014).

In this literature, frequently work performance is categorized as being either "task" performance (i.e., enactment of tasks which are core to the person's job description) or "non-task" performance (additional activities that are important, albeit not central to the job description). The latter is sometimes referred to as "contextual performance" (Bergman et al. 2008). It is generally recognized, however, that both kinds of job performance are highly relevant to the overall productivity and effectiveness, of both the individual worker and his or her organization. In contrast to task performance, citizenship and counterproductive actions are viewed as "voluntary" behaviors (Fox et al. 2012), that is, they are not prescribed by the person's job description or formal rules or regulations within the organization.

This entry summarizes research on the relationship between worker age and two forms of non-task or contextual performance, namely, organizational citizenship behaviors (OCB) and counterproductive work behaviors (CWB). OCB are typically defined as behaviors which are helpful to the organization, such as assisting work colleagues, performing jobs that are not necessarily required but are advantageous to the firm or company, positively promoting the organization as being a good employer, and so on. Many empirical studies of citizenship behaviors in work settings have been based upon the typology of OCB dimensions proposed by Organ (1988), who identified five distinct, albeit interrelated, components of OCB – conscientiousness, altruism, civic virtue, sportsmanship, and courtesy. Although Organ did not further differentiate between person-oriented and organization-oriented OCB, there is a conceptual linkage between this distinction and the five components which he described. For instance, conscientiousness and civic virtue are clearly organization-oriented citizenship behaviors, whereas altruism and courtesy fall under

person-oriented OCB Stereotypes and threats. Sportsmanship might be viewed as belonging in both categories. In addition, while some studies have retained the five-component distinction, others have merged them into an "overall" or global index of citizenship, probably to avoid overcomplicating the data analysis and theory testing, although this procedure does result in some loss of information concerning the five components themselves.

Counterproductive work behaviors (CWB) ▶ aging and psychological well-being, on the other hand, are typically conceived as deliberate and intentional harm inflicted on the organization and/or individuals within the organization (Bruk-Lee and Spector 2006; Gruys and Sackett 2003; Jones 2009; Krischer et al. 2010; Ménard et al. 2011; Penney and Spector 2005; Spector et al. 2006). CWB are usually classified into two distinct behaviors: interpersonal deviance and organizational deviance (Krischer et al. 2010; Spector and Fox 2010). Interpersonal deviance includes undesirable behaviors aimed at other employees and includes gossiping, lying, physical or verbal abuse, and stealing from other employees (Berry et al. 2007; Robinson and Bennett 1995). Organizational deviance refers to transgressions resulting in production losses and property deviation and includes theft, intentional absenteeism, sabotage, poor job performance, lack of cooperation, passing out confidential information, and/or withholding task information (Berry et al. 2007; Ménard et al. 2011; Ones 2002; Penney and Spector 2005; Shantz et al. 2014; Spector 2012).

Despite the wealth of research which has been conducted on these OCB and CWB, there is considerable debate about whether they are in fact polar opposites, and recent articles have suggested that they are not necessarily negatively correlated with each other (see, e.g., Fox et al. 2012). That is, a person could engage in both OCB and CWB activities, and under certain circumstances OCB might be harmful and CWB could be beneficial to the organization. Mostly, however, these constructs have been treated separately in research. For this reason, the present entry presents separate discussions of their relationships with age.

There have been relatively few direct investigations of the association of age with OCB and CWB. Given the considerable debate over the relationship between age and task performance and effective work, this is surprising ▶ altruism and prosocial behavior. It would seem logical that the links of age with OCB and CWB would be of considerable interest, both theoretically and practically. Only recently, however, have researchers probed these associations. Below they summarize the major findings from these lines of research. The entry is structured as follows. First they examine the relationship between age and citizenship (OCB), followed by discussion of the age-CWB relationship. They conclude the entry with an overview of the implications of extant research findings and some suggestions for further research in this field.

Age and Citizenship (OCB)

As noted above, research on the relationship between age and OCB is relatively sparse, and the findings are not totally conclusive. An important and very relevant meta-analysis was conducted by Ng and Feldman (2008), who included the relationship between age and both task performance and contextual performance (organizational citizenship). These authors noted that research over the past two decades or more has obtained inconsistent findings on this relationship. For instance, several studies have found a negative correlation between age and job performance generally, which sometimes has included contextual performance and prosocial behaviors (OCB). The explanation for this negative association is typically that, as workers grow older, their physical and (to a lesser extent) cognitive functioning declines. In situations where these attributes are critical for job performance, it is clear that aging can have some negative impact on task performance. However, this does not necessarily flow over to contextual performance. Instead, growing older can enhance a person's motivation and willingness to engage in OCB, especially toward other people in their work environment (i.e., person-oriented OCB). In addition, older

workers may display more emotional stability and conscientiousness, both of which are associated with the display of citizenship behaviors (Ng and Feldman 2008).

In their meta-analysis of 380 empirical studies which had incorporated job performance as a criterion variable, age demonstrated relatively small but nevertheless statistically significant relationships with OCB, for both self-ratings and other-ratings of OCB. Ng and Feldman differentiated between three forms of OCB: person oriented, task oriented, and organization oriented. Relationships between age and OCB were somewhat higher for task-oriented citizenship. Ng and Feldman concluded that "older adults are more motivated to volunteer in general" (p. 4013) and that "older workers are good citizens, are more likely to control their emotions at work, and are less likely to engage in counterproductive behaviors" (p. 4013).

Some caution is needed, however, when interpreting the above findings. For starters, the relationships were quite low, .06 for person-oriented OCB, .08 for organization-oriented OCB, and .27 for task-oriented OCB. As suggested by Ng and Feldman, several other variables might function as moderators (buffers) of these relationships. One of these is the person's physical health status. Put simply, those with health difficulties might be less able to engage in helping and other prosocial behaviors. Secondly, and equally important, chronological age might not be the most salient attribute to evaluate. Ng and Feldman discussed both "subjective age" (how old the person feels) and "relative age" (their age relative to other people in their work environment). As they suggested, in a diverse age environment, older workers may tend to leave core tasks to their younger colleagues, especially if these tasks involve heavy physical activity or are more cognitively demanding, and perhaps engage in more mentoring and support activities. Similarly, there is evidence that career motivations among older workers sometimes shift from a focus on their personal career development to the enhancement of their younger colleagues' careers and progression within the organization (Lyons and Kuron 2014) ▶ Job Attitudes and Age. If this happens, it is likely that older workers would be more inclined to perform citizenship behaviors, especially in respect to their coworkers.

A more recent meta-analysis of OCB has been reported by Carpenter, Berry, and Houston (2014), although their focus was not specifically on the relationship between age and OCB, but rather on the connection between self-ratings and other-ratings of citizenship behaviors. Nevertheless, they did report the correlations between age and both self-ratings and other-ratings of OCB. Carpenter et al. found quite low relationships between age and the two ratings of OCB. Age was slightly positively related to self-rated OCB ($r = .03$) and slightly negatively related to other-rated OCB ($r = -.05$). The latter correlation might reflect the impact of stereotyping on workers' perceptions of their colleagues' levels of OCB, but the overall conclusion is that, at least in this meta-analysis, there was virtually no relationship between age and the two OCB ratings. Interestingly, self-ratings were more convergent with supervisor ratings than they were with coworker ratings of a person's OCB. Overall, however, the differences between self- and other-ratings were relatively small and not significant.

Bertolino et al. (2013) explored stereotypes of both younger and older workers in Italy. They argued that stereotypes are highly pertinent to people's job performance and especially expectations of their performance. Given the global aging of the workforce, the impact of age stereotypes will probably increase in the forthcoming years. These stereotypes are based only partially on actual differences in performance, such as those described by Ng and Feldman. In addition, people's perceptions are based on in-group versus out-group distinctions and a tendency to view members of one's own in-group as being superior (for instance, in terms of performance) to out-group members. For example, Finkelstein et al. (1995) found that younger workers rated members of their own age group more highly than older workers on several performance-related dimensions. Bertolino et al. discussed these differential perceptions in terms of *social identity theory* (Hewstone and Jaspars 1982),

which posits that favoritism toward one's in-group helps individuals to develop a social identity and protects them psychologically from feelings of inferiority.

As discussed by Bertolino et al., perceptions and stereotypes can be as important as objectively assessed performance differences, particularly in jobs where the "eye of the beholder" is highly salient. Their research examined the relationship between perceptions of personality characteristics, using the five-factor model (FFM; Digman 1990; Goldberg 1990) and ratings of organizational citizenship behaviors. They used the measure of OCB developed by Williams and Anderson (1991), which distinguished between person-targeted OCB (known as OCBI) and organization-targeted OCB (known as OCBO). Overall, the findings confirmed the researchers' expectations. Older workers were generally perceived in a more positive light than their younger counterparts, on most of the personality dimensions and on both measures of OCB (consistent with the meta-analytic findings reported by Ng and Feldman). However, these relationships were moderated, to some extent, by the age of the rater. Both younger and older workers tended to rate members of their own age group more positively, and the rater x ratee age interaction was fairly substantial.

Iun and Huang (2007) examined the relationship between age and job performance among hospitality employees in Hong Kong. These authors suggested that the nature of work (job type) and industry might have an effect on the age-OCB relationship. Specifically, work in the hospitality industry (e.g., restaurants, hotels) tends to be physically demanding and fast-paced, which may not suit older workers. Under these conditions, Iun and Huang predicted that older workers would have less energy and motivation to engage in citizenship behaviors than their younger colleagues. However, they also suggested that this negative relationship would be moderated by a highly relevant attitudinal variable, the person's affective commitment to their organization. Affective commitment (Meyer and Allen 1997) incorporates identification and belongingness with the organization plus a desire to promote the organization's best interests and success. There is evidence that older workers, particularly those who have been with the organization for a longer time period, are more likely to display high affective commitment to their organization (Costanza et al. 2012). This form of commitment can buffer (moderate) the negative effects of age on work performance. In a hospitality context, working long hours in difficult circumstances, rotating shifts, and under high pressure are common experiences for employees. Accordingly, Iun and Huang anticipated that affective commitment would function to alleviate the negative link between age and performance (including OCB) in this work context.

Their findings confirmed the interaction (buffering) effect of commitment, particularly in relation to altruism, which itself was negatively related to age. Older workers who had high affective commitment to their organization were more likely to self-report altruism toward their work colleagues than older employees with low affective commitment. The moderating effect of commitment was not so pronounced among younger workers however. The authors suggested that their results indicate that affective commitment to the organization might be a very salient factor to consider when endeavoring to increase citizenship behaviors among older workers and that management could focus on ways and means to enhance the levels of affective commitment among older workers, such as providing training opportunities for skill development and more support for the needs of these workers.

Other studies have not directly focused on the relationship between age and OCB, although they have incidentally reported the association between these variables. For example, Jain (2015) conducted a study of organizational commitment and citizenship among public sector managers in India, finding that age negatively predicted both person-oriented OCB and organization-oriented OCB. Although the regression coefficients for age were not substantial in these analyses, they were higher than coefficients for other demographic variables, such as education and job tenure, suggesting that age may indeed play some role in citizenship behaviors.

Jain noted, however, that participants in this research were all male managers, which limits the generality of the findings. Furthermore, Jain suggested that the work culture in Indian public sector organizations emphasizes the importance of democracy and collaboration; hence, citizenship scores may have been subject to some range restriction. The managerial nature of the sample might also have contributed to some lack of variance in citizenship scores. Nevertheless, the findings from this study confirm some other research using different samples, which has also noted a negative relationship between age and OCB. The precise reasons for these departures from the expectation that age and OCB will be positively related are not entirely clear and may well be linked with sample-specific characteristics (as noted above).

Some other studies have obtained no significant relationship between age and citizenship. An example of these findings is a study conducted by Lee et al. (2011) of sales representatives in Japan. The major focus of this research was performance-based pay, but age was also included as a predictor variable of altruism, one of the five dimensions of OCB postulated by Organ (1988). However, in this study the correlation between age and person-oriented OCB was negligible ($r = .01$). As with the Jain research described above, it is possible that this finding may be due to characteristics of the participants in the research. Over 80% of the sample was male, and the nature of their work may be a contributing factor in respect to displaying citizenship behaviors. The relatively low standard deviation for altruism scores suggested that there was little variance in OCB across the sample.

Another recent study which obtained positive, but nonsignificant, relationships between age and self-reported OCB was reported by Macsinga et al. (2015), who were concerned with the association between personality factors (such as extraversion and conscientiousness) and various positive work outcomes (work engagement, affective commitment to the organization, and organizational citizenship behavior). This research was conducted in three different types of organization in Romania. As anticipated, OCB was significantly related to both work engagement and affective organizational commitment, but hierarchical regression analysis revealed that age did not contribute significantly to any of the three key variables (engagement, commitment, or citizenship). In this case, it was clear that the two personality variables plus feelings of empowerment were much stronger predictors of these outcomes. This may indicate that, while age can be a factor in relation to organizational citizenship, its influence is small relative to other potential contributors.

A third example of positive but nonsignificant linkages is a study reported by Turnipseed and Vandewaa (2012) in the USA. These researchers examined both person-oriented and organization-oriented OCB, as well as what they referred to as "aggregate" OCB (derived from combining scores on the two forms of OCB), and reported near-zero correlations between age and all three OCB scores. As with the Macsinga et al. research described above, regression analysis illustrated that age was not a significant predictor of OCB in this study. Rather, emotional intelligence emerged as the most substantial predictor variable. Interestingly, age was negatively associated with emotional intelligence, although the authors did not posit possible reasons for this negative relationship, except to say that one of their samples (university professors, who were substantially older than the other sample, of students) may have displayed less variability in emotional intelligence scores.

Overall, therefore, the jury is still out on whether age is a major contributor to organizational citizenship behaviors, and the evidence is very mixed and inconsistent. One clear implication is that research on age effects needs to examine the possible reasons for a relationship between age and work performance, including citizenship. Even studies which have obtained a significant relationship (mostly positive) between these variables have concluded that the effects of age are likely to be indirect, that is, that there are intervening (mediating) variables in the relationship between age and citizenship. Rioux and Penner (2001) conducted a study which did not focus on age as a predictor of OCB but nevertheless raised

an interesting possible explanation for this relationship. Rioux and Penner examined the potential motives for enacting citizenship behaviors in a work context. They suggested three general motives – concern for the organization, prosocial values, and impression management – which may be pertinent to the display of citizenship, along with empathy and helpfulness (which they labeled as prosocial personality factors) and perceptions of distributive and procedural justice in the organization.

In their research, the three motives were predictors of all five of Organ's (1988) citizenship dimensions, especially altruism, civic virtue, and sportsmanship. As noted, Rioux and Penner were not directly concerned with age as a predictor of OCB, but it is reasonable to expect that older workers would score more highly on motives such as concern for the organization and prosocial values. Although other investigators have also noted that younger and older workers may differ in terms of their work motivations, further research is needed to explore this possibility.

As well as motivational differences, it is also possible that younger and older workers have differing perceptions of the nature and importance of citizenship behaviors at work. Citizenship is typically placed under the rubric "contextual performance" and is considered to be voluntary behavior that is not linked with the organizational reward system (e.g., pay or promotion), in contrast to "task performance," which is mandated by the individual's job description. That is, citizenship behaviors are not (normally) considered to be part of the in-role performance of workers. However, Wanxian and Weiwu (2007) argued that older workers may believe that citizenship is expected of them, and they may feel some obligation to enact these behaviors. Wanxian and Weiwu reported an interesting study in North China which examined this proposition. They predicted differences between the perceptions of younger and older workers of the centrality of OCB to job performance, with older workers more likely to view OCB as a component of their in-role performance. This expectation was confirmed, with a significant positive correlation between age and all five of Organ's OCB dimensions. In addition, older workers were significantly more likely to rate citizenship behaviors as being part of their job. The authors attributed these findings to Chinese cultural changes over the past two decades, with younger workers now more likely to express individualistic rather than collectivistic values and to place more emphasis on self-interest and self-achievement rather than the more traditional (collectivistic) values of interpersonal harmony and overriding concern for their employing organization. Whether these differences would be obtained in other cultural settings is a matter for further empirical research.

So far we have discussed the potential direct relationships between age and organizational citizenship, and most studies have focused on this direct relationship. It is also possible, however, that age may be a moderator of relationships between OCB and other variables. Few studies have investigated this potential moderation effect. Wagner and Rush (2000) suggested that older workers typically exhibit greater job satisfaction than their younger counterparts and tend to have lower need for achievement and higher need for affiliation. They argued that these differences "lead to different salient motives for altruistic OCB among younger and older employees" (p. 382). Specifically, older workers may have more belief in the moral imperative of helping other people and hence a greater propensity for altruism in their work environment. Based on this logic, Wagner hypothesized that age would moderate relationships between OCB (altruism) and various work attitudes, including job satisfaction, organizational commitment, trust in peers and management, and moral judgment.

For their research, Wagner and Rush administered questionnaires to nursing staff from two hospitals in the USA. Their results demonstrated no direct relationship between age and citizenship, but age significantly moderated the relationship of several predictor variables (including trust in management, job satisfaction, and commitment) with OCB (altruism). Specifically, older workers displayed a stronger relationship between moral judgment and self-reported altruistic OCB, whereas relationships of OCB with job satisfaction and organizational commitment were

stronger among younger workers. The authors concluded that "dispositional tendencies to behave in an altruistic manner may have been better predictors of behavior for the older workers" (p. 388). Furthermore, the inherent value of helping behaviors may be more internalized among older workers. These interpretations coincide with the suggestions proposed by Rioux and Penner.

Age and Counterproductive Behaviors (CWB)

As they noted earlier, there has been relatively little research on the relationship between age and both OCB and CWB, and the attention given to CWB is far less than that accorded to OCB. It is well established that CWB cost organizations billions of dollars every year especially in terms of lost productivity, lost or damaged property, increased insurance costs, and increased turnover (Krischer et al. 2010; Penney and Spector 2005). Additionally, CWB result in loss of job satisfaction, increased job stress, burnout, increased somatic tension, and fatigue (Spector and Fox 2002; Penney and Spector 2005). While there continues to be a lack of empirical understanding of the antecedents of CWB, it has been suggested that they may be the result of job conditions such as stressful work, job conflict, role ambiguity, organizational injustice, and perceived lack of job control (Fox et al. 2001; Jones 2009; Spector 2012). These contribute to employee negative emotions, and thus, engagement in CWB can be viewed as a way to restore psychological equilibrium. Some research suggests that engagement in CWB allows employees to cope with work demands (Allen and Greenberger 2013). Indeed Spector and Fox (2002) speculated that CWB may reduce negative feelings, enhance positive feelings, and serve no other purpose than to "even the score" (p. 274).

While stressful or unjust organizational and/or job-related experiences contribute to our understanding as to why people may engage in CWB, little research has focused on person-centered explanations. Some research has indicated that specific personality traits (e.g., anger, anxiety, agreeableness, and conscientious) are associated with CWB (Fox and Spector 1999; Fox et al. 2001; Spector 2012). However, far less research has focused on age as an antecedent to CWB (Ng and Feldman 2008).

The aging workforce has seen an increase in negative stereotypes of older workers (Ng and Feldman 2008; Spector 2012). For example, there tends to be a belief that older workers lack motivation, show reluctance to engage in training and development programs, and are resistant to change (Ng and Feldman 2008). However, there is no empirical evidence to support these stereotypes. In fact, research has indicated that some of these stereotypes are totally inaccurate (Ng and Feldman 2008). Specifically in relation to CWB, empirical research has found that as individuals age, they are *less likely* to engage in deviant behaviors such as poor job performance, absenteeism, and theft (Gruys and Sackett 2003; Lau et al. 2003; Mangione and Quinn 1975; Ng and Feldman 2008; Shantz et al. 2014).

In the Ng and Feldman (2008) meta-analysis discussed above, these authors found that age was significantly and negatively related to CWB, with results indicating that older workers were less likely to exhibit workplace aggression, on-the-job substance abuse, lack of punctuality, and absenteeism. Moreover, Lau et al. (2003) in their meta-analysis found that particular CWB (theft, production deviance, poor punctuality, and absenteeism) also decreased with age.

In a much earlier study, Mangione and Quinn (1975) examined the relationship between job satisfaction, CWB, and drug use in the work setting. They found that CWB were less prevalent in older employees, than those who were younger than 30 years old. This finding was supported by Shantz et al. (2014), who examined several workplace variables (work engagement, perceived organizational support, turnover intentions, and deviant behavior). Post hoc analyses found a significant negative relationship ($r = -.33$) between age and deviant behavior, indicating that older workers were less likely to engage in CWB than younger workers.

Typically, research tends to indicate that the relationship between age and CWB is negatively related (Hollinger 1983; Lau et al. 2003). While there is little understanding of the reasons for this, it has been suggested that older workers have greater satisfaction and commitment toward their job than their younger counterparts and are, therefore, less likely to engage in CWB (Hollinger 1983; Mangione and Quinn 1975). Hollinger (1983) suggested that younger workers have less commitment to their organizations, are less likely to view CWB negatively in relation to social norms, are less emotionally mature, and feel "less social risk if detected" (Hollinger 1983, p. 67). On the other hand, even though older workers are less likely to engage in CWB, they tend to be more secure and more socially aware; thus, they may see counterproductive behavior as appropriate action to take if there is a lack of organizational justice (Fox et al. 2001). For instance, older workers may be more likely to engage in retribution or "whistle-blowing" (Miceli and Near 2005) if they perceive unfair work conditions and procedures. However, this proposition has not been fully explored to date.

Overall, research demonstrates that older workers are less likely to engage in CWB (Gruys and Sackett 2003; Lau et al. 2003; Mangione and Quinn 1975; Ng and Feldman 2008; Shantz et al. 2014). While more research is needed in this area to uncover and understand why this is so, researchers have found that older workers are more likely to contribute to their organizations and more consciously engage in positive actions (such as OCB), rather than negative work behaviors (Ng and Feldman 2008). Thus, while some negative stereotypes of older workers continue to exist, it is acknowledged that, despite being in its infancy, research examining older workers and CWB has uncovered significant findings and that older workers are less likely to engage in counterproductive work behavior. These findings add to notions that older workers are key to organizational success and hopefully will encourage employers to rethink the roles and contributions of these workers (Shantz et al. 2014), who will be important assets to workplaces in the future.

Conclusions and Implications

In this entry we have overviewed the link between age and two forms of contextual behavior – citizenship and counterproductive work behavior. Overall, the picture which emerges from the (relatively sparse) research is that relationships of age with these two contextual behaviors are somewhat indeterminate, although the research findings suggest that age may be (slightly) positively associated with OCB and negatively linked with CWB. Other factors, however, can also play a major role in the expression of these behaviors, and these need to be taken into account when examining the possible effects of age. We have highlighted that personality and motivational factors in particular may be especially relevant to the impact of age on OCB and CWB.

Two important implications of the extant research findings are that (a) negative stereotypes of older workers need to be counteracted and (b) older workers need appropriate types and amounts of support to contribute their knowledge, skills, and abilities to enhance organizational performance. The research on OCB and CWB therefore has significant implications for organizational managers and HR practitioners, who need to be aware of the potential for stereotyping to affect older workers' performance and well-being and also of the importance of appropriate forms of social support for older workers.

Clearly, more systematic research is needed on these topics, especially longitudinal studies which control for the effects of other variables which contribute to OCB and CWB when examining age relationships with these variables. As the population in general and the working population grow older over time, research on the relationships of age with OCB and CWB will increase in importance.

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Age, Self, and Identity: Structure, Stability, and Adaptive Function

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Synonyms

Adaptive self; Age identity; Personal identity; Possible selves; Self-concept; Self-construal; Self-continuity; Self-definition; Self-esteem; Self-regulation; Self-representation; Views of self

Definition

The *self* is a cognitive structure that involves representations and evaluation of an individual's past, present, and future (Brandtstädter and Greve 1994; Diehl et al. 2011). The structure of the self is typically described along three dimensions (Asendorpf and van Aken 2003): A *content dimension* that involves context-related and domain-specific knowledge of one's internal states, motives, and behaviors. The contents of self-knowledge are also described with respect to their verifiability and veracity (i.e., realistic or illusionary) (Baltes 1997). A *temporal dimension* that reflects knowledge about one's past or future self, and about change of the self over time (Bluck and Alea 2008). An *evaluative dimension* that reflects emotional responses to one's self-representation. In addition, there is a debate regarding whether the self in adulthood should be defined as a process (i.e., regulating one's thoughts and actions), or whether the self reflects an outcome of the aging process. Structures of the aging self are defined as outcomes of age-related change, while the self also involves processes that regulate age-related change. Theories of *personal identity* in old age often do not differentiate between structures and processes in the formation or maintenance of identity across adulthood.

In this vein, maintaining a sense of personal *identity* across adulthood and continuity of identity typically involves effort in response to a change or to discontinuity in the aging process.

Introduction

This entry focuses on two pertinent issues in the literature on self and identity across adulthood.

(A) What is the structure of the aging self? How stable is the aging self?
(B) What are the regulatory functions of the self across adulthood?

The first issue addresses the contents and the *structure of the self* across adulthood as an outcome of aging-related challenges. Typically, the structure and stability of the aging self involves information-processing, temporal, and affective components. The second issue addresses the *regulatory self* as a process across adulthood. The process of self-regulation pertains to the pursuit of goals, to the accomplishment of developmental tasks, and to the maintenance of continuity or stability. At present, the theoretical and empirical research on self-regulation in the aging process remains vague with respect to whether the regulatory self is the target (i.e., *regulating one's internal states*), or the origin of regulatory efforts (i.e., *producing a cognitive, affective, or behavioral output*). Much of the literature pertains to the regulatory self in the latter perspective, while the first perspective is sometimes referred to as coping, or as emotion regulation. There exists a plethora of theoretical and empirical work on self-representations across adulthood (Brandtstädter 1999; Diehl et al. 2011). Consequently, and for reasons of parsimony, this entry focuses on the self across adulthood from a lifespan psychology perspective with regard to the following five fundamental principles of development (Baltes 1997):

First, the aging process typically entails *not only loss but also gains* until very late in life. The aging self entails a changing ratio of loss and gain experiences across adulthood. More importantly, the meaning of what is a gain and loss is malleable. Any loss experience may be subjectively construed as reflecting or involving an experience of gain, or of personal growth. For example, coping with a severe health problem may also entail a sense of mastery and control (Heckhausen 1999).

Second, there is a *multidimensionality of change* across adulthood. That is, aging-related change in one domain of functioning may differ from change in another domain. For example, how one perceives oneself in professional life may differ from how one develops in the context of family life. Such domains of the self may be differentially interrelated across adulthood depending on age. Accordingly, self-representations show considerable domain specificity, and domain-specific changes in old age (Diehl et al. 2011; Freund and Ebner 2005).

Third, there is much behavioral and cognitive *plasticity* across adulthood, even very late in life. Individuals are able to learn and develop new knowledge, skills, and behaviors at all phases of adulthood. Consequently, there is also malleability of the aging self that appears to respond in flexible and adaptive ways to contextual changes in old age (Brandtstädter 1999).

Fourth, the course and direction of the aging process depends on *social and cultural contexts* (Baltes 1997). For example, findings of research on age differences in interdependent versus independent self-construal in various cultures suggest that with increasing age, there is an increasing correspondence between cultural values and an individual's self-representation as a member of the culture (Diehl et al. 2011). For example, older adults in China tend to show a more interdependent self-construal, while older adults in the US tend to promote values that reflect stronger independent self-construal (Fung 2013).

Fifth, the human lifespan reflects a finitude of personal resources, and involves a limited future lifetime. Thus, individual differences in resources and remaining time in life strongly

impact the course, direction, and outcome of one's development across adulthood (Carstensen 2006; Heckhausen 1999; Lang et al. 2011). Accordingly, the aging self may positively adapt to a shrinking of one's remaining time in life and to limited resources in old age. Even when experiencing much physical and psychological change, many older adults manage to maintain a sense of continuity of self and identity throughout the aging process, and even into very late life. There is robust evidence that when confronted with the finitude of life, and with limited resources, the regulatory self displays flexibility, resilience, and malleability that contributes to experiences of continuity, or even stability of the self (Brandtstädter 1999; Carstensen 2006).

The Structure of the Aging Self: Stability and Change Across Adulthood

A fundamental distinction in the structure of the self pertains to the duality of the *self as agent* (*"I"*) versus the *self as known* (*"Me"*) in the tradition of the works by William James (James et al. 1890). In the "*self as agent*"-perspective, the term self typically reflects the origin or target of an individual's conscious thought or action. Examples of this perspective pertain to concepts such as self-regulation or self-monitoring. In the "*self as known*" perspective, the self pertains to contents that account for a person's self-representation. The terms self, self-concept, views of self, and self-representation are used interchangeably to reflect the *self-as-known* perspective. Mostly, the structure of the self is described along three major dimensions: (Asendorpf and van Aken 2003) a content dimension (e.g., *"Who am I?"*), (Baltes 1997) a temporal dimension (e.g., *"How did I change? How shall I change?"*), and (Bluck and Alea 2008) an affective or evaluative dimension (e.g., *"How satisfied am I with myself?"*). Such dimensions are strongly interrelated. Evaluation of the self typically occurs in a temporal frame involving one's past and future, while reflecting domain-specific and contextual contents. These dimensions of the self operate jointly to both stabilize the self and to promote continuity of personal identity across adulthood (Brandtstädter and Greve 1994; Diehl et al. 2011; Troll and Skaff 1997). Accordingly, a critical question is to what extent the stability and change in content, temporal, and affective dimensions of the self reflect age-related adaptation processes. Lastly, although the three dimensions of the aging self are closely connected in the representations of adults, it is not yet well understood how these dimensions work together to form an adaptive, resilient, and proactive self in old age (Brandtstädter 1999; Freund and Ebner 2005).

The Content of Self-Representations Across Adulthood

Representations of the self typically refer to a person's knowledge about his or her attributes that he or she believes to be relevant or meaningful (Diehl et al. 2011; Filipp and Klauer 1986). This typically involves all aspects of an individual's self-related knowledge, such as one's physical appearance, personality, behavior, values, attitudes, and motives. The structure of such knowledge is embedded in an individual's developmental context, thus reflecting individual differences related to cohort and chronological age. For example, there exist substantive age differences in self views: Older adults' self views as compared to those of young adults' are typically found to be made up of more issues related to current interests, life circumstances, health, and chronological age. Findings from such studies are corroborated in research on the contents of self-definitions that found much similarity in contents of self-definitions between old and very old adults (Diehl et al. 2011; Freund and Ebner 2005). Self-definitions in old age appear to reflect challenges and contexts of old age that revolve around issues of health, social roles, and meaningful activities in everyday life. Accordingly, it is a robust finding that a more flexible or multifaceted self-definition is often associated with more adaptive functional outcomes in late life (Brandtstädter 1999; Brandtstädter and Greve 1994; Diehl et al. 2011; Freund and Ebner 2005).

To date, few studies have examined the change in the contents of self views in old age from a longitudinal perspective, and those that have often provide data based on short time intervals only. Therefore, findings on the temporal stability of self-descriptions are not consistent and contradictory. There are several possible explanations to help explain the inconsistent findings regarding the stability and change of the aging self.

(a) Findings vary depending on the *measurement* approach. For example, methods using a free response format show less stability than self-descriptive ratings (Diehl et al. 2011).
(b) *Context- or domain-specific self-knowledge* (e.g., "I am quite amused about this new movie") is different than universal self-descriptions (e.g., "I am a humorous person") that are known to be shared by many individuals (Snyder and Shenkel 1975). Consequently, universal contents of self-definitions are likely to show greater stability over time. The self views of older adults may reflect greater domain-specificity and context-relatedness, and are thus less stable.
(c) *Core* self-representations differ from *surface* knowledge about self (Asendorpf and van Aken 2003). While the core self reflects stable knowledge about one's personality (e.g., related to Big Five personality traits), surface self-representations reflect contextual influences that may depend on specific tasks or activities. Accordingly, Diehl and colleagues (Diehl et al. 2011) report that temporal stability of the self is positively associated with a measure of perceived authenticity.
(d) *Veracity* and *verifiability* of self-related knowledge may also affect stability and change. Some contents of self-definition may be more objectively testable (e.g., "I am a skilled lawyer") when related to physical appearance, health, skills, competence, and cognitive abilities, while some contents of self-definitions are not observable or difficult to verify (e.g., "I am trustworthy"). This typically pertains to self-views of internal or past states of self, to motives, and to preferences. Typically, the contents of self-definition are not checked with regard to their veracity. Objectively testable views of the self (e.g., "I am intelligent") may show greater stability because they are less context-specific. There may be aging-related shifts with regard to veracity of self-representations (e.g., becoming more accurate with age; 14).

In sum, findings on the stability and change of self-views in old age vary depending on what contents of the self are examined and on how such contents are assessed. More research is needed to explicitly address issues related to veracity, verifiability, idiosyncrasy, and context- and domain-specificity of self-representations across adulthood. In addition, multimethod measurement approaches are recommended in the assessment of self-representations across adulthood (Diehl et al. 2011).

The Temporal Dimension of the Aging Self

The passing of time is a central dimension in descriptions of the aging self. The temporal dimension of the self reflects adaptation, maintenance, and continuity of identity across adulthood. The passing of time in self has been described with concepts such as personal identity (Troll and Skaff 1997), autobiographical memory or remembered self (Bluck and Alea 2008), and possible selves (Hooker 1999). For example, an older person's view of his or her current self may result from a reflection of his or her past (e.g., "*I am wise now, and I learned many lessons in life*"), his or her present (e.g., "*I am as happy today as I was last year*"), or from thoughts related to one's future (e.g., "*I feel old because there is not much left to do in life for me*"). There is a paucity of integrative views on how the temporal components of the aging self relate to the structure and stability of the self. In general, findings suggest that the self-representations of older adults are mostly present-oriented, and more likely to refer to the past than to the future (Diehl et al. 2011; Filipp and Klauer 1986; Freund and Ebner 2005). It has also been suggested that this may be reflective of the narrowing of future time that results in a process of seeking meaning in those domains and contexts that are of immediate centrality and relevance of the self (Brandtstädter 1999; Carstensen 2006).

A critical issue pertains to the adaptive function of the temporal perspective in views of the self. There is agreement in the literature that the temporal perspective in self-representations serves to stabilize the present view of the self (Brandtstädter 1999; Staudinger et al. 2003). Temporal perspectives may contribute to such stabilization in several ways:

(a) Comparing one's current self with a less positive view of the self in the past (e.g., "*I have become more wise now*"). Such downward temporal comparisons may protect one's current view of his or her self (Staudinger et al. 2003). One implication is that typically, with increasing age, the veracity in representations of one's past self is difficult to prove.
(b) Anticipating one's future self in humble ways provides a positive frame of reference for views of the self in the future (e.g., "*My life is much better than I had expected*"; 14).
(c) Focusing on one's present internal state of self may provide a meaningful experience when perceiving a narrowing of one's remaining time in life (Carstensen 2006).

In sum, the temporal perspective is critical for understanding the *adaptivity*, the *plasticity*, and the *malleability* of the aging self. The temporal perspective reflects one of the fundamental experiences that also relates to a flexibility of aging identity in old age (Weiss and Lang 2012). Accordingly, there may be two processes responsible for promoting a flexible aging identity, where one process is related to a dissociation of the self from one's age group, and a second process pertains to one's identification with his or her generation or birth cohort as a resource of social identity. In old age, perceiving one's past self in terms of mastery and competence, while expecting one's future in humble ways, and finding meaning in one's current self appears to reflect a resilient and adaptive self (Lang et al. 2013).

The Evaluative Dimension of Aging Self

The emotional component of self-representations is reflected in positive and negative evaluations of the self. The evaluative dimension of the aging self is strongly associated with two psychological constructs, namely self-esteem (Wagner et al. 2014) and possible selves (Hooker 1999).

Self-esteem is defined as a positive evaluation of one's self, and has been shown to decrease over time with respect to both mean levels, and rank-order stability (Wagner et al. 2014). Currently, it is an open issue to what extent the expression of self-esteem in old age depends on age-specific resources, where age-specific resources are not fully understood. For example, self-esteem in old age may depend more strongly on how well older adults manage to lower their expectations towards their future self. Developing more modest and prevention-oriented frames of self-evaluation may protect, and at times even provide a positive attitude toward the self in old age (Brandtstädter 1999).

Possible selves involve an evaluative frame of the self in the aging process. Hoped-for selves and feared selves reflect an individual's strivings and goal-pursuits. That is, fears indicate what one wants to preserve and maintain, and hopes pertain to aspects of the self that one would like to change or achieve. In this vein, possible selves constitute a motivational dimension in the structure of the aging self (e.g., "*What am I up for?*"; 9). While hopes pertain to a striving for growth and goal achievement, feared selves reflect a preventive orientation, and strive to maintain the present state of self. Thus, hoped-for and feared selves may pertain to distinct processes in the evaluation of the aging self.

Generally, future expectations are robustly observed to be relatively low and modest among the oldest-old adults. Discrepancies between the ideal self and the current self are reported to be relatively low in old age (Diehl et al. 2011). It remains an open question as to what extent age-related changes in discrepancies of possible and current selves also reflect a positive or negative evaluation of the self. Theories of positive versus negative self-perceptions of aging are not always precise with regard to whether the positive or negative affective valence involves a unidimensional (i.e., bipolar), or a two-dimensional structure. In addition, the time perspective of affective evaluations of the self is still not well understood.

Positive evaluations of one's past self, one's present self, and one's future self may have age-differential functions (Brandtstädter and Greve 1994; Bluck and Alea 2008; Hooker 1999; Staudinger et al. 2003). Also, social comparisons with other people may age-differently influence one's self-evaluation in old age (Heckhausen 1999). More research is needed to clarify the age-differential temporal dimensions of self-evaluation in the aging process. Finally, positive self-evaluation is robustly found to contribute to positive aging outcomes such as health and longevity (Wagner et al. 2014).

The Regulatory Self Across Adulthood: Adaptive Functions

In lifespan psychology, the individual is typically viewed as a co-producer of his or her own development (Baltes 1997). The notion of co-produced aging implies that there are active processes involved that reflect responses to age-related challenges such as limitation, loss, or environmental change. This implies that individuals engage in interactive processes between their internal states and the external world. Hence, individuals may either bring about a change of their internal self or a change in the external world. Processes of adapting the aging self as well as processes related to changing one's contexts in the aging process are typically referred to as self-regulation or developmental self-regulation (Brandtstädter 1999; Heckhausen 1999). Regulation processes may differ depending on chronological age, available resources, and time limitations remaining in life. For example, studies show that individuals actively choose meaningful contexts and social roles across adulthood when they perceive to have limited time left in life (Carstensen 2006; Fung 2013). In this vein, individuals invest resources in activities and goal pursuits that they prioritize, while disengaging from other less prioritized domains of life.

Regulation of the aging self reflects age-associated efforts and activities that emerge in response to age-specific challenges across adulthood (Baltes 1997). Typically, challenges that require regulatory efforts involve limitations or constraints of the older individual's resources. In the aging process, there are typically two main sources for an increased need of self-regulatory effort.

First, limitations of resources in old age, and the finitude of time in life both challenge self-representations in later adulthood. The biology of the aging organism typically relates to increased loss experience, declining health, and limited physical or mental functioning (Baltes 1997). In addition, only humans are capable of anticipating their future self and to perceive the ending of their time in life (Carstensen 2006; Lang et al. 2011). Thus, older adults are typically confronted with biological deterioration and with a nearing end of their lives. Taken together, these objective conditions of human existence can be expected to threaten or even erode the stability and continuity of the aging self. Surprisingly however this is not observed. Consequently, one may expect powerful and strong self-regulatory forces that contribute to the maintenance, continuity, and stability of the self until very late in life.

Second, in later adulthood compared to earlier phases of adulthood, there are fewer social norms that structure one's activities, tasks, and social roles (Heckhausen 1999). At the same time, negative views of aging and age stereotypes prevail. However, in old age there is much heterogeneity and variability in all domains of functioning, including the self (Baltes 1997). Consequently, the potentials of the individual reflect a wide array of biographical, contextual, and biological resources. This implies that there do not exist general guidelines or rules on how challenges related to old age may be mastered in positive ways. Generally, there is not one uniform trajectory of change in old age; on the contrary, the course and direction of an individual's aging process may strongly reflect a life-long history of individual decisions. Again, this involves that individuals may have to invest regulatory effort in response to challenges, but there is not one single solution on how to find an adaptive person-environment fit.

In sum, both biological and societal constraints challenge the plasticity and the malleability of the

regulatory self in old age. There are several theoretical perspectives that have elaborated and advanced assumptions of processes involved in the adaptive regulation of the aging self. For reasons of space, two exemplary models of self-regulation in old age are addressed here: the dual-process-model of assimilation and accommodation of the resilient self (Brandtstädter 1999; Brandtstädter and Greve 1994), and the model of selective optimization with compensation (Baltes 1997; Lang et al. 2011). Descriptions of related models such as the life-span theory of primary and secondary control can be found elsewhere (Heckhausen 1999).

Dual-Process-Model of Assimilation and Accommodation

Throughout adulthood, individuals are confronted with processes of change of internal or external resources. Such aging-related change may result from discrepancies between the desired and the actual self in old age. According to the dual-process model, there are two ways of coping that individuals can utilize to reduce, resolve, or eliminate self-discrepancies in old age. These coping strategies are referred to as assimilation and accommodation processes (Brandtstädter 1999; Brandtstädter and Greve 1994), and are assumed to operate antagonistically, that is, when accommodative processes are activated, assimilative regulations are inhibited.

Assimilation involves intentions that aim to transform a situation such that the situation is in greater accordance with the individual's self-representation or personal goals. Assimilative activities target the direction and regulation of one's behavior, and pursuits that are of personal relevance to one's self concept. Thus, assimilation involves activities that stand in the service of continuity of one's self and identity. For example, according to the dual-process model, older adults may engage in assimilative actions that involve prevention of future self-discrepancies (e.g., *preparatory activity*), correction of ongoing behaviors (e.g., *choosing a more healthy diet or engaging in sports*), or compensation (e.g., *use of a hearing aid*). However, it is suggested that assimilative activities are relinquished when it is not in the service of self-continuity (Brandtstädter 1999).

Accommodation, in contrast, is activated when assimilative efforts are obstructed and when the continuity of self is challenged. Accommodation involves efforts to restructure and reframe one's self-representation and goal pursuits, for example, by lowering expectations and restructuring priorities and preferences. Brandtstädter (Brandtstädter 1999) argued that the accomodative process – once activated – "*overrides assimilative tendencies*" (Brandtstädter 1999, p. 128) by eliminating and reinterpreting any prior thought or pursuit that is in the service of such tendencies. For example, when goals are blocked, one may disengage from, devalue, or redefine a goal in more flexible ways.

In addition, some depictions of the assimilation-accommodation model also refer to an additional process that has been suggested to protect the self from realizing any potential discrepancies between desired and actual states. This process has been described as immunization (Brandtstädter 1999; Brandtstädter and Greve 1994). Immunization involves a preconscious and automatic avoidance or neglect of self-discrepant information. It is not quite clear to what extent such immunization may be separated from automatic, unconscious self-regulation related to either assimilation or accommodation (Freund and Ebner 2005). Immunization may pertain to perceptual and attentional cognitive processes of the aging self. More empirical evidence is needed to better understand the specific ways in which immunization may be empirical differentiated from assimilative and accommodative processes.

Overall, the dual-process model posits that assimilation and accommodation contribute in fundamental ways to the continuity and to the positivity of self-representations in the aging process. While operating in antagonistic ways, all three processes are relevant to successfully adapt to the challenges of the aging process. There is robust empirical evidence that with increasing age, accommodative strategies such as flexible goal-adjustments prevail over more assimilative

self-regulation strategies (e.g., tenacious goal pursuits). Moreover, it has been shown that a shift from an assimilative to an accommodative self-regulation is associated with more positive aging outcomes and psychological resilience (Brandtstädter 1999).

Self-Regulation Model of Selection, Optimization, and Compensation

The self-regulation model of selection, optimization, and compensation (SOC) reflects the multidimensionality of the developmental dynamics of gains and losses across adulthood (Baltes 1997). According to the model of SOC, any developmental process reflects the joint interplay of three fundamental principles, namely: selection, optimization, and compensation. These principles operate within and across all domains of behavior and cognition throughout the human life course. SOC principles furthermore substantively contribute to positive developmental outcomes (Baltes 1997; Lang et al. 2011), including the stability, continuity, and resilience of the aging self. All three principles (i.e., selection, optimization, and compensation) have been shown to be involved in adaptive self-regulatory processes of changing gain-loss dynamics across adulthood (Freund and Ebner 2005; Lang et al. 2011).

Selection involves choosing meaningful goals, tasks, or contexts in the aging process. This implies that any decision to pursue specific goals, tasks, or contexts involves gains (in the chosen domain) and losses in not chosen cognitive or behavioral domains. Generally, selection is a necessary developmental process because of limited life time and the finitude of resources. Thus, selection typically involves a narrowing of behavioral options over time.

Optimization pertains to the refinement, investment, or enhancement of resources to accomplish a goal or task in specific behavioral or cognitive domains. For example, individuals may invest their time and effort to improve their skills and abilities in a specific task. Optimization implies that costs of self-regulation are minimized while maximizing benefits.

The principle of *compensation* involves the substitution, repair, or restoration of resources in response to a loss or a limitation of the self. Compensation may occur in response to internal challenges to the self (e.g., memory decline), or in response to external challenges to the self (e.g., widowhood).

All together the three principles of selection, optimization, and compensation describe ways of how the self deals with internal and external challenges and opportunities in order to minimize loss while maximizing gains or growth experience. Thus, the SOC model involves an optimality criterion in the aging process. Optimality also refers to the concept of self-contentment in old age that may involve a focus on maintenance rather than a focus on personal growth or self-improvement.

The model of selection, optimization, and compensation is in accordance with assumptions of the dual-process model of assimilation and accommodation. Both models are embedded in a lifespan theoretical framework and build on fundamental principles of lifespan psychology. A difference between these models pertains to what is viewed as the salient motive that drives the regulatory effort of the aging self. The dual-process model emphasizes the effort of eliminating discrepancies between the desired and the actual self. Theories of selection, optimization, and compensation typically emphasize the ever-changing dynamics of gains and losses across adulthood as a central motive of regulatory effort that involves minimization of losses and maximization of gains (Baltes 1997; Freund and Ebner 2005). Therefore, the selection, optimization, and compensation model is explicit in addressing the fundament impact of internal and external resources that protect the flexibility, resilience, and malleability of the aging self. Once again, both models should be seen as complementing each other at different levels of analysis of self-regulatory processes across adulthood. While the processes of selection, optimization, and compensation more explicitly address the dynamic transactions between a person and their environment across all domains of functioning (including the self), the dual-process model underscores the

steering function of the continuity and consistency of the self as a cognitive structure.

Conclusion

As people grow old, individuals typically show stability and continuity in the structure of their self-representations. The principles that contribute to the stabilization and stability of the aging self have been reported to be associated with an adaptive choice of contents of one's self concept, with an adaptive use of temporal perspectives regarding one's past, present, and future, as well as with self-serving selection of evaluative information about one's self. Taken together, the stability and continuity of self-representations may reflect a powerful psychological and cognitive adaptation of the human mind that functionally operates even in the face of dramatic loss and health decline until very late in life.

Findings providing evidence for the robustness, and the resilience of the aging self have generated a wealth of theoretical accounts on the underlying psychological mechanisms of such stabilization processes (Brandtstädter 1999; Brandtstädter and Greve 1994; Carstensen 2006; Freund and Ebner 2005; Heckhausen 1999). Such mechanisms of self-stabilization typically represent two broad classes of self-regulation: The first class targets internal states of the self, and the second class targets executive functions of the self directed at the external world. Internal self-regulation involves psychological adaptations such as adjusting one's expectations, disengaging from goals, or restructuring one's priorities. Executive self-regulation pertains to mechanisms that are typically associated with investment of resources to improve or enhance one's functioning such as physical exercises, cognitive training, choosing new friends, or soliciting help in a difficult life situation. Both types of regulatory efforts may complement each other in the process of stabilization of the self as people grow older.

Cross-References

- ▶ Life Span Developmental Psychology
- ▶ Resilience and Aging
- ▶ Selection, Optimization, and Compensation at Work in Relation to Age
- ▶ Self-Theories of the Aging Person

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Age-Friendly Communities

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Synonyms

Age-friendly communities

Definition

A variety of definitions of what constitutes an "age-friendly" (or elder-friendly) community have been proposed over the past decade. Common to all definitions is that factors that span the physical and social environment impact older adults' lives and are important to consider (Lui et al. 2009). In recent years, the World Health Organization's (WHO) conceptualization of an age-friendly community has been gaining increasing traction among both policy makers and researchers. According to the WHO, an age-friendly community is one in which "policies, services, settings and structures support and enable people to age actively" (World Health Organization 2007a), with the notion of "active aging" broadly defined in terms of health, participation, and security (World Health Organization 2002). Fundamental to the notion of age-friendly communities is that older adults must be respected, valued for their contributions, and included in decisions that affect their lives. More specifically, the WHO highlights the importance of eight domains in making a community age-friendly: outdoor spaces and buildings, housing, transportation, respect and inclusion, social participation, civic participation and employment, communication and information, and community supports and health services (World Health Organization 2007a).

Why the Need for Age-Friendly Communities?

The interest in age-friendly communities on the part of policy makers and researchers in recent years is, in part, due to several interrelated factors:

First, the world is aging. There were approximately 524 million people aged 65 or older in 2010; this number is expected to increase to nearly 1.5 billion in 2050 (World Health Organization 2011). Population aging is occurring as a result of declining fertility rates, lower infant mortality, and increasing longevity. Population aging is not restricted to developed countries; indeed, the speed at which populations are aging is particularly rapid in

less developed countries. From 2010 to 2050, the number of older people aged 65 years or older is projected to increase more than 250% in less developed countries. In comparison, the increase in developed countries is projected to be 71% (World Health Organization 2011). Given the lack of supports for older adults, such as pension systems, in less developed countries, these demographic trends can be expected to present major challenges in the absence of appropriate policy responses (Bloom et al. 2014).

Second, there is growing concern about the sustainability of healthcare and social welfare systems. As people age, the likelihood of health problems increases; consequently, healthcare use also increases with age. Concerns have also been raised over the effects of a retiring workforce on countries' productivity and economic viability. Effective programs and policies are, therefore, needed to promote healthy, active aging and reduce pressures on healthcare and social systems.

Third, healthcare needs have shifted from acute problems to chronic conditions, such as arthritis, diabetes, and dementia, with the co-occurrence of multiple chronic conditions being common. This means that there is a need to move away from healthcare systems that emphasize acute care for time-limited health problems, reflective of a "cure" approach, to systems that focus on "care" over an extended period of time (Chappell and Hollander 2011). Older people require a continuum of care in appropriate settings, such as at home with supports to allow them to remain in their homes as long as possible, to assisted living where some services are provided (e.g., meals), and to long-term care for individuals with extensive care needs.

Apart from these macro reasons for making communities more age-friendly, enhancing the health and quality of life of older adults is a worthy goal in and of itself. What resources and opportunities are available to them in their community, what gaps exist, and how to enhance the community environment to maximize quality of life become important questions to address. Given its holistic nature, the notion of age-friendliness provides a community development framework for examining these questions.

Aspects of an Age-Friendly Community

The WHO started to promote the concept of age-friendly communities in 2006 with the launch of its Global Age-Friendly Cities project (World Health Organization 2007a). As part of this project, focus groups were conducted in 33 cities in 22 countries around the world to identify specific aspects of what makes a community age-friendly and what barriers and challenges exist for older adults within each of the eight age-friendly domains: outdoor spaces and buildings, housing, transportation, respect and inclusion, social participation, civic participation and employment, communication and information, and community supports and health services. In each city, eight focus groups were conducted: four with older adults (aged 60 or older), one with caregivers of seniors, and three with service providers (e.g., representatives of governmental organizations, volunteer organizations, and business).

This research provided a rich description of a wide range of features and barriers to making communities age-friendly, with results compiled in an age-friendly guide *Global Age-Friendly Cities: A Guide*, in order to help communities around the world become more age-friendly (World Health Organization 2007a). For instance, in terms of outdoor spaces, focus group participants identified a clean, safe environment and green space as assets and, conversely, uneven sidewalks and unsafe pedestrian crossings as barriers. As another example, within the "community supports and health services" domain, issues identified included the need to have health and social services conveniently located and accessible by all means of transportation and that the delivery of services be coordinated and administratively simple. Additional examples of age-friendly features identified in the project are provided in Table 1.

Age-Friendly Communities, Table 1 Examples of age-friendly features

Age-friendly domain	Examples of features
Outdoor spaces and buildings	Clean and pleasant public areas Good street lighting to promote safety Good signage on buildings
Housing	Sufficient affordable housing Well-constructed housing Availability of home modification options
Transportation	Reliable and frequent public transportation Availability of specialized transportation for disabled people Well-placed and visible traffic signs
Respect and inclusion	Helpful and courteous service staff Recognizing older adults for their contributions Portraying older adults in the media in a positive way and without stereotyping
Social participation	Affordable activities Conveniently located and accessible venues for events and activities Wide range of activities to appeal to diverse groups of older adults
Civic participation and employment	Flexible and diverse volunteer options for older adults Workplaces adapted to meet the needs of disabled workers No discrimination on the basis of age in the work place
Communication and information	Regular and widespread distribution of information Printed information adapted to the needs of older adults (e.g., large lettering) Public access to computers and the Internet
Community supports and health services	A range of health and community supports to promote health Home care services that include health and personal care and housekeeping Respectful, well-trained staff

Note: Examples are adapted from *Checklist of Essential Features of Age-Friendly Cities* (World Health Organization 2007b)

Age-Friendly Communities and Healthy, Active Aging

Making communities more age-friendly is expected to promote healthy, active aging and the quality of life of older adults (World Health Organization 2007a). The age-friendly domains proposed by the WHO are consistent with existing, established determinants of health and active aging frameworks. These frameworks highlight the importance of a range of factors within the social and physical environment in people's lives (World Health Organization 2002; Evans and Stoddart 1990).

Research evidence also provides support for specific age-friendly features and their relationship to health-related outcomes. For instance, a large number of studies have examined the relationship between specific environmental features in relation to health-related outcomes such as physical activity, obesity, disability, and mental health (Annear et al. 2014; Saelens and Handy 2008). For instance, a recent systematic review included 83 quantitative and qualitative studies, with the authors concluding that a number of environmental features show promise in terms of contributing to health and activity level in older adults, including accessibility of green space, proximity and density of amenities, and low levels of pollution and environmental degradation (Annear et al. 2014).

Evidence regarding the impact of age-friendly policy initiatives on the health and quality of life of older adults are not yet available. This is not surprising given that the age-friendly movement is relatively new, and implementing specific projects to make communities more age-friendly would take considerable time, particularly large projects like developing housing for older adults. Moreover, health impacts would not be expected to be immediate as there may be a substantial lag time between implementing age-friendly projects and demonstrating health benefits. In the context of the healthy cities movement, Draper et al. (1993) proposed that there is a 5–10-year time lag

between becoming part of such an initiative and observing health benefits.

Age-Friendly Initiatives

The Global Context

The age-friendly communities' conceptualization is fundamentally a community development approach targeted at local governments. The WHO Global Age-Friendly Cities project initiated in 2006 included 33 cities from 22 countries, indicative of a substantial interest in the concept on the part of local decision makers. The number has, to date, grown to 210 communities from 26 countries that have joined the *WHO Global Network of Age-friendly Cities and Communities* (http://agefriendlyworld.org/en/). The network was established in 2010 by the WHO to provide a forum for communities to exchange information and learn from each other. Belonging to the network does not mean a community is certified as being age-friendly but rather that there is a commitment to becoming more age-friendly and following the four steps of the network cycle: (1) establishing a mechanism to involve older adults, (2) developing a baseline assessment of the age-friendliness of the community, (3) developing a 3-year action plan based on the assessment, and (4) identifying indicators to monitor progress in relation to the action plan.

Indicators to assess a community's age-friendliness are currently being developed and piloted (World Health Organization Center for Health Development 2014). Consistent with the findings from the Global Age-Friendly Cities project (World Health Organization 2007a), they focus on issues such as accessibility of buildings, affordability of housing, and positive social attitudes toward older adults.

Regional Age-Friendly Initiatives

While the *WHO Global Network of Age-friendly Cities and Communities* is composed primarily of local governments that individually join the network, some countries have established countrywide or regional networks of communities (Plouffe and Kalache 2011; Plouffe et al. 2013). Canada is at the forefront of the age-friendly movement, with most provincial governments having launched age-friendly initiatives. Over 800 communities across Canada are currently part of such provincially led initiatives.

Leadership in Canada is also provided at the national level through the Public Health Agency of Canada (PHAC), which has developed national guidelines to help with implementation of age-friendly community initiatives at the local level (e.g., the Pan-Canadian Age-Friendly Community Milestones and the Pan-Canadian Age-Friendly Community Recognition Framework) and is helping to coordinate knowledge exchange in the area of age-friendliness. Consistent with the WHO's Network cycle steps, the Pan-Canadian Age-Friendly Community Milestones focus on the process communities should ideally use to become more age-friendly Public Health Agency of Canada (n.d.):

- Establish an advisory committee that includes the active engagement of older adults.
- Secure a local municipal council resolution to actively support, promote, and work toward becoming age-friendly.
- Establish a robust and concrete plan of action that responds to the needs identified by older adults in the community.
- Demonstrate commitment to action by publicly posting the action plan.
- Commit to measuring activities, reviewing action plan outcomes, and reporting on them publicly.

Because they are provincially led, the approaches taken to roll out age-friendly initiatives differ across provinces (Plouffe et al. 2013). By way of example, one of the longest-running Canadian age-friendly initiatives is the Age-Friendly Manitoba Initiative which was launched by the government of Manitoba in 2008. In several successive intake rounds, all 198 municipalities in the province have been invited to become part of the initiative. To date, 100 communities have joined the initiative, representing over 80% of the population of the province. Communities receive a small amount of

funding from the provincial government to help defray some of the costs associated with planning activities or to implement small projects. They are also invited to a 1-day orientation workshop that provides information on the concept of age-friendliness and identifies ways to get the initiative launched in the community (e.g., the importance of forming an Age-Friendly Committee). Moreover, workshops are held at regular intervals with representatives from participating communities to share experiences and problem-solve challenges.

A partnership with university researchers has provided a unique opportunity to underpin the Age-Friendly Manitoba Initiative with research. For example, it led to a formative evaluation, which was designed to assess the process of how the initiative was being implemented. The evaluation, conducted in 2011 (3 years after the initiative was first launched) with 44 participating rural and urban communities, demonstrated considerable progress (Menec et al. 2013). Virtually all communities had formed an Age-Friendly Committee to help guide the implementation of the initiative, and most of them had conducted a community assessment to identify priorities for action. The majority of communities had implemented one or more age-friendly projects. Major barriers to becoming age-friendly identified by participants included funding; lack of capacity, particularly in small communities; and lack of leadership or direction. The evaluation further identified several key issues in implementing age-friendly initiatives, including:

- Becoming age-friendly requires strong leadership at all levels of government (local, provincial, national).
- Communities (particularly rural ones) need support, such as resources to assist with planning and funding for projects.
- Linking the age-friendly community initiative to other initiatives is useful as it creates efficiencies in committee structures and planning processes and can facilitate accessing funding. It can, thus, help mitigate the two biggest challenges identified, namely, lack of financial and human resources to implement projects.
- To be sustainable, ongoing promotion of age-friendliness is important at the community but also at the provincial level to ensure sustained buy-in at the local level.
- Taking into account community characteristics is important as the trajectory and timeline of becoming more age-friendly may differ in rural versus urban communities.

A Model of Age-Friendly Housing

While the majority of older adults want to age in place in their own homes, many do eventually need some assistance with activities of daily living. Recently, the Health Minister for the Ontario government tabled a 10-point "road map" to include home care as an integral part of the overall healthcare system. By acknowledging that the care for thousands of families is currently "patchy, uneven, and fragmented," he signaled a need for policy changes that have been severely neglected for too long.

In advanced age, the challenges related to meal preparation, personal support, and therapy sessions grow exponentially. Consequently, remaining in the home may become impossible, and admission to a long-term care facility may be necessary. To accommodate the needs of older adults, there was a rapid development in seniors' facilities after 1950, growing to one million residents in 36,000 facilities in the USA (ALFA 2009) and 200,000 residents in 2,000 facilities in Canada by the early 2000s (Insight: Current demographics and trends in seniors' housing). The philosophy has been "bigger is better," especially as it translates not only to larger facilities and organizations but also to larger private bedroom suites compared to common spaces. The tendency has been to make the bedroom areas bigger at the expense of smaller "common" spaces. A competing philosophy might be to reverse this relationship so that the "common" spaces become an exciting hub to bring the resident out of his/her room.

Significant progress has been made in the design of long-term care facilities, countering the stigma of traditional "nursing homes" with their dozens of residents clustering in wheelchairs with no discernible engagement or distraction other

than a small television in an otherwise barren room. In addition, the emergence of CCRCs (continuum of care retirement communities) has redefined housing alternatives for the growing demographic of older adults.

Two dominant patterns prevail that can be characterized either as a "hospitality model" or a "healthcare model." The hospitality model is designed more like a hotel where you would be delighted to go for a vacation but would not like to live there. Meanwhile, the healthcare model is the antithesis of the hotel model by virtue of integrating as many "homelike" features as possible. Both models are necessary, but not mutually exclusive as all residents are looking for both comfort and medical safety. However, neither of these models seem to address the significant social needs of individuals who have grown up in more simple and community-oriented environments where everybody knew each other, with a main street and common meeting places.

The quest was to recreate that welcoming environment to the extent possible and produce a paradigm shift in the way older adults interact in a congregate setting. Leading this charge in 1989 was Dr. Ron Schlegel, academic, entrepreneur, and philanthropist. Schlegel has a PhD in social psychology and that knowledge of the interface between the environment and social living, combined with growing up in a small rural town in Ontario, led to the Schlegel Village Model. Although conceptualized well in advance of the current age-friendly movement, the Schlegel Village Model provides an excellent example of an age-friendly environment for older adults with care needs that incorporates many of the elements identified in the WHO model (World Health Organization 2007a).

This paradigm change is based on the simple concept of replicating the life experiences that people have had throughout their lifespan. The significant culture change associated with the Schlegel Village Model is to move away from a traditional institutional model of care to a *social model of living*. Thomas (Kaczynski and Sharratt 2010) captured some of this ambience with emphasis on small-scale "homelike" settings as part of "The Eden Alternative." This concept extols "well-being" as a much larger idea than quality of life and embraces an "elder" as one who should be seen as an active partner in his/her own case. According to Schlegel, "society was built around cars, streets, and neighbourhoods." The difference now is that the "walker" has replaced the car and intentional design can still emulate the environment a person would have experienced in past years.

Inspired by Ron Schlegel's thinking, architect Richard Hammond of Cornerstone Architecture Incorporated has taken the typical functions of dining, lounge, and activity spaces and translated these into an "urban village" setting to make this concept come alive in all 15 villages located across southwestern Ontario in Canada. These functions are reinterpreted as a variety of "storefront" buildings organized along Main Street, leading to the Town Square as the social hub of the community. Architectural detailing helps to reinforce the urban messaging through the use of traditional streetscape materials and canopies. The result not only looks like an age-friendly village, but it also functions that way with social interactions unfolding naturally.

A similar urban theme continues past Main Street into the residential areas of the community. These are conceived as "neighborhoods" with their own local common areas appropriate to the level of care being provided. Entrances to individual resident suites are designed as traditional "front doors," including a valance, street number, and mailbox, evoking a local residential street as opposed to an institutional corridor.

Age-friendly design is more than simply increasing accessibility by removing barriers. The real magic is design and function, which encourages people to take advantage of the easy access. For example, en route from the home area to the dining room, a person will travel along Main Street at least three times a day and encounter "common spaces" where they might interact with a fellow traveler. This intentional planning is analogous to a grocery store where one has to go

to the far end to get milk, passing all kinds of attractive features along the way.

The notion of a Schlegel Village is not a new invention. Precedents have been taken from observations about how small towns work and even the way urban neighborhoods function within cities. Schlegel has adapted the aphorism of "a doctor learns from his patients" to a congregate housing innovator who learns from his residents. Concepts are also drawn from the "place-making" principles of the New Urbanism (www.cnu.org), such as walkability, diversity of experience, familiar elements, easy orientation, and collective identity, elements that are also evident in the notion of age-friendly communities. Ironically, these principles are part of a larger set that guided development of an "outdoor" village (Williamsburg), which was initiated in 1990 on 52 ha within the city of Kitchener, Ontario. Essentially, it follows the meticulous and intentional design strategies of indoor villages, only with an outdoor Main Street, walkable amenities within 10 min of single-dwelling homes, and a wide array of functional common spaces. A survey of Williamsburg residents indicated that they actually appreciated the many strategies that were designed to create this village/neighborhood within a city (Thomas 1994).

In summary, the growing demographic of older adults demands that attention be given to housing choices and lifestyle opportunities that can preserve dignity and facilitate a sense of purpose to the very end. Fortunately, the WHO has taken this on as a global mandate with the launch of the Global Age-Friendly Cities project. Ideally, this movement should have national, regional, and local financial support. To that end, one demonstration of success has been evident at all three levels in Canada, starting with the Public Health Agency of Canada. Provincially and regionally, Manitoba has stepped up to the plate and engaged over 100 communities in its age-friendly initiative. Last but not least, a single entrepreneur, academic, philanthropist (Ron Schlegel) has touched over 4,000 older adults in congregate settings across southern Ontario with intentional design of the built environment to optimize social engagement.

Cross-References

- ▶ Aging and Psychological Well-Being
- ▶ Aging and Quality of Life
- ▶ Housing Solutions for Older Adults
- ▶ Retirement Villages
- ▶ Small-Scale Homelike Care in Nursing Homes

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Age-Related Changes in Abilities

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Synonyms

Aptitudes; Cognitive abilities; Intellectual development; Intelligence

Definition

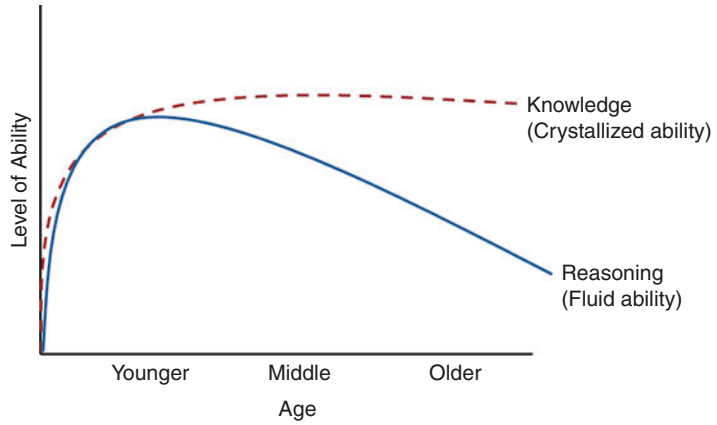
Cognitive abilities are defined as a person's mental capacity to do or act; broadly considered, cognitive abilities include attention, reasoning abilities, memory, and knowledge (Salthouse 2012).

Answers to questions about the development of cognitive abilities with age have implications for work performance, socioeconomic success (i.e., income and education, SES), and even mortality (the likelihood of mortality at earlier ages increases at lower ability levels, even after controlling for SES) (Salthouse 2012). Cognitive ability facilitates the execution of an array of tasks associated with a successful life, such as registering and completing courses in school, completing job applications and successful execution of job tasks, and simply getting from one place to another. Although not the only important factor, cognitive ability is a central determinant of life success.

Answers to questions about age-related changes in abilities are complex. For one, ability changes throughout the lifespan vary by person. For instance, two 50-year-olds may have extremely different intellectual profiles: one may have the same measured cognitive abilities as an average 30-year old and the other may resemble an average 70-year old. Moreover, within the same person, different abilities decline and/or grow at varying rates. These changes are a function of the continuous use of some skills, which serves to preserve skill-related abilities and the decay of unused skills. As such, there is significant between- and within-person variability in age and abilities. Because of this variability, there is not an agreement on the age at which a person becomes an "older" person. In this review, general changes in abilities are described. Research suggests that these changes are a function of regular aging (memory impairment that is a function of psychopathology such as dementia or Alzheimer's disease is not considered). Nonetheless, it is important to note that the trends described herein will not occur at the same age for every person (Hertzog et al. 2008). Moreover, ability is not a monolithic construct and different types of abilities have different patterns of growth and decline throughout the lifespan.

Cognitive Abilities

There are two categories of cognitive abilities most relevant to aging: one related to reasoning abilities associated with generating, transforming, and manipulating information and the other related to knowledge accumulated throughout the lifespan. These abilities have different names depending on theoretical orientation; they have



Age-Related Changes in Abilities, Fig. 1 Hypothetical trajectories of knowledge (crystallized abilities shown with the *dashed line*) and reasoning (fluid abilities shown with the *solid line*) by age group. The figure represents a compilation of research findings on age-related changes in abilities using an array of measures and both cross-sectional and longitudinal research designs (Ackerman 2014)

been referred to as *fluid* and *crystallized* abilities representing the reasoning and knowledge components, respectively, and the process (reasoning) and products (knowledge) associated with cognition (Carroll 1993; Horn and Cattell 1966). They are thought to represent, for example, a person's ability to acquire new information compared to the information already known (Salthouse 2010). For simplicity, the terms *reasoning* and *knowledge* are used to denote these different types of cognitive abilities.

Measures of reasoning and knowledge abilities are positively correlated in the general population; that is, a person who has relatively higher reasoning capacity is also likely to acquire more knowledge. This relationship reflects the idea that reasoning ability is a major determinant of learning and knowledge acquisition throughout the lifespan. Indeed, the development of knowledge and expertise within a domain is often described as a function of the investment of reasoning ability such as when a student works with full attention to complete a calculus problem in a unit he/she is learning or when an accountant learns a new spreadsheet program to increase his/her productivity (Ackerman 2014).

Despite this positive relationship, however, reasoning and knowledge have different trajectories over the lifespan. The trends differ slightly depending on how the abilities are measured and depending on the design of the research study (as discussed below), but both reasoning and knowledge increase up to early adulthood, when their paths begin to diverge. Reasoning abilities begin to decline early – some studies suggest as early as late adolescence or early adulthood – and continue the downward trend throughout older ages. The size of the effect varies by study, but generally research shows a decline of about 1.5–2 sample standard deviation units from when a person is in their 20s to when they are in their 70s in reasoning and related abilities (e.g., memory, speed, and working memory tests, Salthouse 2010). By contrast, knowledge levels remain stable and may even increase, up until age 70 or so (Salthouse 2010). Patterns of reasoning and knowledge abilities are shown in Fig. 1, which is derived from research conducted with thousands of participants using an array of measures and study designs (Ackerman 2014; Salthouse 2010). The dashed line represents the growth and stability of knowledge throughout the lifespan, while the solid line represents the growth and subsequent decline of reasoning abilities.

Some theoretical perspectives place a greater emphasis on reasoning abilities than knowledge as representative of intelligence (Spearman 1904). These perspectives either consider knowledge to be a product of intelligence, but not an essential component of it, or they ignore

knowledge completely. Given that reasoning abilities start declining relatively early in life and continue a downward trajectory, this perspective provides a relatively pessimistic view of intellectual development at middle and older ages. Furthermore, this view neglects compelling evidence – available through everyday encounters with smart and successful people – that intellectual abilities continue to develop throughout life. For instance, the overwhelming majority of CEOs of fortune 500 companies in the United States is between the ages of 45 and 70. Similarly, with few exceptions around the globe, heads of states are likely to be older versus younger. Given the ability trajectories shown in Fig. 1, these leaders would be considered long past their intellectual peak if reasoning were the sole or central cognitive ability important in adult intellect (Salthouse 2012). In the context of aging, theories that emphasize reasoning abilities over knowledge paint a relatively pessimistic picture of adult intellectual development; a picture that is not aligned with lay observations and common sense.

Theoretical perspectives that consider adult intellect to be comprised of both reasoning and knowledge give credit to adults for their knowledge and expertise (Ackerman 2014). And although there is little research on the topic of how adults might continually develop their knowledge and expertise even with declining reasoning abilities, it seems likely that people typically choose environments (i.e., for education, work, home, hobbies) that align with their established knowledge and skills. This strategy increases people's reliance on their vast repertoire of knowledge and expertise and also reduces the need for people to reason through every problem in their environment as if it were new. Indeed, research suggests that even though declining reasoning abilities with age can make learning novel information difficult, domain-specific knowledge facilitates the acquisition of new knowledge in that particular domain (e.g., an extensive understanding of investment products facilitates learning about managing investments within a retirement account) (Ackerman and Beier 2006). In this way, the age-related trajectories of abilities shown in Fig. 1 can be considered somewhat adaptive; that is, people have less need to reason through difficult problems as they age because they have developed vast stores of knowledge through experience that they can bring to bear on an array of adult situations. A middle-aged or older engineer, for instance, might work on a variety of projects during a year – learning something new from each of them – and this learning may not seem very effortful. Nonetheless, it would be more difficult, although probably not impossible given enough time and effort, for the middle-aged or older engineer to learn a completely new field, like psychiatry.

Assessment

There are a variety of methods used to assess reasoning and knowledge abilities, and a researcher's choice of measure will undoubtedly affect the outcome of the research. Reasoning abilities are typically measured with abstract problems such as pattern completion with figures and numbers (e.g., number series tests where test takers complete a pattern of numbers and Raven's advanced progressive matrices) (Raven et al. 1991). These tests are designed such that performance is relatively knowledge and context free (although it is certainly the case performance is affected by a person's familiarity with test taking and that practice in this regard can affect performance). Assessments of working memory capacity – also shown to be related to reasoning ability – are relatively free of knowledge and focus on a person's ability to simultaneously process and store information. Examples of such tests are the backward digit span test, which requires test takers to recall – in reverse order– a set of three or more numbers that are read aloud, and the operation span test, which requires test takers to make decisions about the veracity of an equation while remembering the equation's numerical outcome (Ackerman et al. 2002).

Because no individual measure is perfectly reliable – or a perfect reflection of a concept as complicated as cognitive ability – researchers typically use a battery of multiple measures to assess reasoning abilities (e.g., spatial,

numerical, symbolic). Reasoning ability is then estimated by aggregating – or averaging – people's scores on these multiple measures. This approach is similar in concept to factor analytic approaches, which derive an ability factor by pooling the common variance among measures (Ackerman et al. 2002; Carroll 1993). Aggregation helps control for the influence that the measurement error or content associated with any one test has on the assessment of reasoning ability, which can be substantial. For instance, if the only test used to assess reasoning ability is a number series test that is only somewhat reliable, a person's score on that test would be a function of their reasoning ability, but also a function of their numerical ability and the measurement error associated with the particular test used. It would also be impossible to separate the amount of variance associated with each of these factors (reasoning ability, numerical ability, and error). To avoid these issues and to get a reliable assessment of reasoning ability, scores derived from most commercially available intelligence assessments are a function of an aggregation of individual items and measures over a range of content (e.g., digit symbol, block design, matrix reasoning, and letter number series in the Wechsler Adult Intelligence Scale) (Wechsler 1997).

Knowledge is typically measured with vocabulary tests or general information tests that include questions about widely available information within a cultural context (e.g., *What is the capital city of France? Who was Benjamin Franklin?*). As discussed above, performance on general cultural knowledge tests remains relatively stable across the lifespan, but performance on these tests does not typically show increases in knowledge with age. This is somewhat puzzling given the expectation that knowledge will continue to grow as a function of professional and life experiences. One reason for this discrepancy is that, because knowledge develops in ways that are unique to a person's experiences, knowledge acquisition is idiosyncratic. As such, a complete picture of what a person knows would include a lot more than general cultural knowledge; it would include knowledge about his or her job, hobbies, and unique life experiences – essentially anything encountered and learned throughout the life course (e.g., the length of time a whole chicken needs to roast, when a child should be taken to the doctor, how to operate a forklift). As implied by these examples, capturing the whole of knowledge through the lifespan – giving adults credit for what they know – would require an impossibly elaborate knowledge battery. Indeed, researchers endeavoring to assess knowledge growth with age have measured knowledge across multiple academic (e.g., 20 academic domains including natural science, business, social science, and humanities) and nonacademic (e.g., current events, health, financial, and technology knowledge) domains (Ackerman 2014). In this research, age was positively correlated with knowledge possessed across all domains, with the exception of those domains most related to natural science (e.g., physics and chemistry). Nonetheless, these elaborate knowledge assessments will still underestimate what adults actually know because assessments can never account for the idiosyncratic nature of adult experiences that lead to knowledge and expertise.

Research Designs

Most research on age and abilities is cross-sectional in nature, meaning that people of different ages are assessed simultaneously. Inferences about age-related changes are made by examining the test scores for people of different ages (e.g., comparing performance on an ability battery for 20- versus 70-year-olds or correlating ability scores with age). Though informative, these studies are limited in that differences between age groups may not represent age-related changes within a person. A classic anecdote illustrates this point (Salthouse 2010). A scientist examining age-related changes who finds himself/herself in Miami in the year 2014 might observe that younger people are more likely to be of Hispanic/Latino or African-American descent, while older people are more likely to be of European descent. Based on this observation of an age-diverse cross section of the population, the researcher might conclude that people tend to become increasingly

European looking (i.e., white) with age. This is absurd of course, but it is meant to illustrate that cross-sectional studies may lead to erroneous conclusions about age-related changes because they do not actually assess the changes within a person that are a result of aging; rather, they assess differences between people and presume that these differences are a function of age. Moreover, these designs do not control for environmental, societal, or other extraneous factors that might affect people differently by age group.

Cohort effects are an example of a societal influence on cross-sectional studies in aging. A cohort is a generational group that presumably shares a cultural identity. Factors that affect one cohort differently than others can influence the development of abilities. For instance, millennials are generally defined as those people who reached young adulthood around the year 2000 (i.e., they were born around 1980 or so). In developed and developing countries, millennials have grown up with access to technology that allows them to communicate globally in minutes and that provides them access to a wealth of information at the press of a button. In this example, access to technology would affect the development of knowledge differently for millennials relative to older cohorts. As such, cross-sectional studies on aging and knowledge would capture differences in knowledge that are a function of age and cohort and importantly, the variance associated with each could not be separated (a researcher could not determine what differences between people were a function of age vs. cohort). In cross-sectional designs, cohort essentially introduces a third variable (or confound) in the study. For this reason, there is considerable debate about the value of cross-sectional studies for examining age-related changes in abilities, with some researchers taking the extreme position that the value of cross-sectional research in aging is limited (Salthouse 2010). Rather than discounting all cross-sectional studies, however, it is probably important to understand the influence of cohort vis-à-vis the constructs and variables in question. For instance, the discussion above highlights that cohort might be an important influence on knowledge development, particularly as related to millennials versus older generations. It is less clear, however, how cohort effects might influence the development (growth and/or decline) of reasoning ability.

In contrast to cross-sectional studies, longitudinal research tracks the development and decline of abilities within a person by administering the same (or similar) measures periodically over time. Most of these studies include the periodic inclusion of a new sample of younger participants to ensure a continuous sample given attrition and mortality. Examples of significant longitudinal studies in cognitive aging include the Seattle Longitudinal Study (Schaie 2013), which was started in the 1950s with a sample of about 500 people ages 20 to 69. Participants were assessed on a battery of reasoning and knowledge measures on 7-year intervals, and every 7 years until 2005, a new cohort was added to the study. The Victoria Longitudinal Study (Hultsch et al. 1998) is similar to the Seattle Longitudinal Study, but the sample is somewhat older (55–85) with new cohorts starting every 10 years or so. Each of these studies has assessed the abilities of literally thousands of participants.

Although longitudinal studies are rare because of the time and resources involved, they provide information about within-person change in abilities and can control for cohort or other influences. Fortunately, the results of longitudinal studies tend to echo those of cross-sectional studies; that is, most of this research shows the growth of both reasoning and knowledge until early adulthood, the subsequent decline of reasoning abilities, and the relative stability of knowledge. Longitudinal studies show a more optimistic picture of cognitive aging than do cross-sectional studies, however. That is, the decline of both reasoning abilities and knowledge tends to be relatively later in longitudinal research (e.g., reasoning abilities begin to decline closer to age 30 in longitudinal studies vs. around age 20 in cross-sectional studies) (Ackerman et al. 2002; Schaie 2013). In summary, the age-related trajectories of cognitive abilities shown in Fig. 1 reflect trends found in cross-sectional and longitudinal research designs.

Ability Preservation

Important questions have been raised about the factors that affect changes in cognitive abilities throughout the lifespan, and the answers to such questions can inform interventions to preserve abilities. To date, many possibilities have been investigated (e.g., gender, personality traits, initial levels of abilities, and environmental influences such as education and health, Ackerman et al. 2002), but there is generally little evidence that any one factor exerts a strong effect on the course of age-related changes in abilities. There is some research to suggest that a person's initial level of ability, overall health, and education will differentiate people by ability level throughout the lifespan (Salthouse 2010). For instance, a person who starts out with significantly lower scores on reasoning ability tests relative to others in the population of the same age will likely continue to have relatively lower scores compared to the same population throughout the lifespan; a person who is healthier will likely have higher reasoning ability and knowledge scores throughout their life compared to someone who is less healthy.

Recent research has focused on the preservation of abilities throughout adulthood (into older ages). This preservation is indeed important as most people will tend to experience some form of intellectual decline, even in knowledge and expertise, in late life (e.g., age 80 and beyond). The aging of the global population, coupled with the daunting prospect of the loss of cognitive abilities, has increased the urgency of finding remedies to age-related cognitive decline. Common ability preservation strategies include both cognitive (e.g., brain training) and physical (e.g., exercise) approaches.

Brain training. Brain training typically employs cognitive exercises to enhance a person's working memory. Based on models of physical fitness that target exercises to specific muscles for strengthening, brain training is designed to strengthen memories or reasoning abilities through mental drills. At least in the United States, brain training is developing into a profitable industry, with advertisements extolling the virtues of online brain training exercises for people of all ages. Unfortunately, little empirical evidence has shown brain training to be effective; meta-analytic studies examining training effectiveness found little benefit to using these programs (Melby-Lervag and Hulme 2013). Some research has shown that direct training on working memory measures can be effective for increasing cognitive performance. These effects have typically been small, temporary, and limited to already cognitively healthy individuals, however. Moreover, these short-term improvements tend to exist only for the specific working memory tasks practiced in training (or similar tasks), meaning that the effects of working memory training are relatively narrow and have not been found to transfer to more generally complex life tasks (Hertzog et al. 2008). Nonetheless, because of the importance of preserving cognitive abilities into older ages, many researchers continue to work on developing effective strategies for preserving mental abilities through brain training. The bottom line is that current brain training activities are not likely to improve general memory or mental functioning in a measureable way, but they may not do any harm either. Moreover, to the extent that remaining cognitively engaged leads to learning and skill acquisition (i.e., expertise in an area), these exercises may increase levels of knowledge.

Physical exercise. Research on physical exercise has shown promise for its effect on preserving cognitive abilities into later life. These findings extend to both short- and long-term exercise interventions and have been most compelling for aerobic exercises (i.e., those that increase heart rate such as brisk walking/jogging vs. stretching) (Hertzog et al. 2008). The key to cognitive benefit appears to be enhancing cardiorespiratory functions that lead to myriad health benefits related to increased tissue oxygenation (healthier muscles, heart, and brain). Studies examining short-term aerobic and high intensity exercise interventions suggest better performance at simple cognitive tests postexercise. Effects are largest for people with lower cognitive ability predating exercise interventions. Long-term effects of exercise are a

bit more complex to study. In younger cohorts, regular aerobic exercise has been shown to predict improvement in various tasks related to reasoning ability and working memory (Guiney and Machado 2013). For healthy older adults, however, regular physical activity does not appear to *improve* cognitive ability, so much as *maintain* it. That is, people who engage in regular aerobic exercise across the lifespan are expected to optimize cognitive ability when young and maintain ability longer and more effectively as they age.

Conclusion

Medical science has succeeded in expanding life expectancy across the globe. According to the World Health Organization, people born in 2012 can expect to live 6 years more, on average, than people born in 1990, and average life expectancies are now around age 80 for developed countries (such as Japan and the United States) (World Health Organization 2014). Cognitive abilities are essential for healthy aging – they permit people to travel, work, engage in hobbies, and enjoy life. Preserving abilities into late life will help ensure that people can take advantage of the additional years granted by medical science by remaining mentally active and engaged. Age-related changes in abilities are inevitable, and these changes will depend on myriad factors: the person, initial levels of ability, and the ability in question. There are well-established general trends, however, as shown in Fig. 1. As people age, they can expect a relatively early decline in reasoning abilities (and other related abilities such as working memory) and stability and even improvement in those abilities associated with the acquisition of knowledge and expertise.

Research in cognitive aging is moving toward an understanding of the outside factors – such as mental and physical exercise, lifestyle, and education – that influence the relationship between age and cognitive abilities. Research in this area promises the development and testing of interventions designed to help maintain and even increase cognitive abilities into old age. In this way, researchers are simply responding to the demands of a rapidly aging global population to stave off pending declines. Although the research is currently inconclusive, the best evidence suggests some promise for remaining mentally and physically active throughout the lifespan. The brain, after all, is an organ that benefits from physical activity just as do other organs in the body. And although the research on mental exercise is still inconclusive, brain training activities are unlikely to do any harm, especially if people refrain from spending excessively on unproven techniques (e.g., brain training software programs). There are, after all, plenty of relatively inexpensive ways to stay mentally engaged (e.g., crossword and other word puzzles, math games, reading a book). For both mental and physical health, however, cognitive benefits are most evident when people start early and remain consistently active.

Cross-References

- ▶ Canadian Longitudinal Study on Aging, A Platform for Psychogeriatric Research
- ▶ Cognition
- ▶ Cognitive and Brain Plasticity in Old Age
- ▶ Expertise and Ageing

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Age-Related Hearing Loss

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Synonyms

Deafness; Hard of hearing; Hearing impairment; Presbycusis

Definition

Hearing loss is a decrease in an individual's ability to hear. Hearing loss related to aging is called presbycusis.

Epidemiology

Hearing loss is a common sensory impairment in the older adult population. The US National Institute on Deafness and Other Communication Disorders (NIDCD) reports that almost 25% of adults aged 65–74 and 50% aged 75 and older have hearing loss to the level that they would benefit from an intervention such as a hearing aid (National Institute on Deafness and Other Communication Disorders 2015). Epidemiological data from US samples indicate that men are more likely to experience hearing loss than women and individuals of Native American and White races are more likely to experience hearing loss than individuals of Hispanic, Black, or Asian races (Schoenborn and Heyman 2008). Occupationally, individuals who work in louder environments, such as transportation or manufacturing, are more likely to experience hearing loss (Tak and Calvert 2008). Military service also increases an individual's risk for hearing loss, mostly due to noise exposure. In the USA, hearing loss is the most common disability related to compensation and pension benefits for WW2 and Korean era veterans and the second most common among Vietnam era veterans (Veterans Benefits Administration 2014).

Types of Hearing Loss

Hearing loss is categorized into two main types, conductive and sensorineural. Conductive hearing loss is due to problems in the outer and middle ear and is often correctable by surgical or medical interventions. A few examples of causes of conductive hearing loss include congenital malformations of the middle ear structures, fluid in the middle ear from colds, impacted earwax, benign tumors, and foreign bodies in the ear.

Sensorineural hearing loss is the most common type of hearing loss in older adults and is caused by damage to the inner ear and/or the nerve pathways between the inner ear and the brain. Common causes of this type of hearing loss are exposure to loud noises, head trauma, viruses, and ototoxic (i.e., "ear poisoning") medications. Though some causes are reversible, usually sensorineural hearing loss is irreversible. There is a third category, mixed hearing loss, which is a combination of conductive and sensorineural hearing loss.

Hearing Loss Health-Care Providers

Otolaryngology is the branch of medicine focused on issues of the ear, nose, throat, head, and neck. Otolaryngologists (sometimes called ear, nose, and throat or ENT physicians) diagnose and medically/surgically treat diseases and disorders that are causing or contributing to the hearing loss.

Audiology is the scientific study of hearing loss, balance, and related issues. Audiologists have either a Master's degree or Doctorate (Au.D. or Ph.D.) in Audiology/Communication Sciences and Disorders. They perform hearing evaluations, diagnosis type, and severity of hearing loss, recommend and fit hearing aids, and conduct other clinical activities related to prevention, treatment, and management of hearing loss.

Degree and Experience of Hearing Loss

Hearing loss is categorized as mild, moderate, severe, and profound. These descriptors are based on the decibels (dB), a measurable unit of volume, the individual is able to hear. Most cases of hearing loss are in the mild to moderate range. A person with mild hearing loss (25–40 dB) has trouble hearing softer noises and often has difficulty hearing speech in a loud environment (e.g., talking to a dinner partner in a loud restaurant). A person with moderate hearing loss (40–70 dB) has trouble hearing soft and moderately loud noises, and it is very difficult to hear when there is background noise. With moderate hearing loss, individuals often have trouble on the phone. When a person has severe hearing loss (70–90 dB), one-on-one conversations in quiet settings need to be conducted loudly, and when someone has profound hearing loss (90 dB and louder), only very loud noises are heard.

Hearing loss can occur in the high-frequency (e.g., birds singing, higher-pitched voices) or the low-frequency ranges (e.g., hum of the refrigerator, a bass drum). The most common hearing loss in older adults is in the high frequencies. Much of human speech patterns fall in the higher frequency, especially consonant sounds S, F, K, T, Sh, and Th. Often individuals with mild to moderate high-frequency loss can hear that someone is speaking to them, but because of their hearing impairment, they are unable to discriminate the speech sounds. For example, "do you think she'll find it?" may sound like "did you see Saul's mind yet?" Understandably, this can lead to problems in communication and frustration in social interactions. This sound discrimination issue is one of the reasons that speaking louder is not a good compensatory strategy when working with an older adult with hearing impairment, because saying it louder does not necessarily increase the clearness of the sounds. Rather, ensuring that the individual can see the providers' face and mouth, slowing down speech, and enunciating clearly can help with this communication problem.

Visual impairment is also a common sensory deficit experienced by older adults. When older adults have both hearing loss and visual impairment (sometimes referred to as dual sensory impairment), this can complicate their experience of hearing loss. Individuals with hearing impairment often use visual cues to help their understanding of conversation, such as lipreading, facial affect, and other environmental information. Visual impairment reduces the individual's ability to rely on this type of information, which impacts their hearing functioning. A common joke that illuminates this experience is "I can't hear you. . . I don't have my glasses on."

Hearing Loss and Health Risks

Hearing loss is associated with specific diseases such as diabetes, arthritis, and cardiovascular disease (Stam et al. 2014; Helzner et al. 2011). There is evidence that individuals with hearing loss are hospitalized more and are at higher fall and accident risk (Genther et al. 2013; Lin and Ferrucci 2012). Compared to matched samples of older adults without hearing loss, individuals with hearing loss are at higher risk of functional impairment and decreased levels of physical activity (Chen et al. 2015; Gispen et al. 2014). Some observational studies have found that hearing loss alone was an independent risk factor for mortality (Fisher et al. 2014; Genther et al. 2015).

Hearing Loss and Cognitive Decline

Individuals with hearing loss are at higher risk of developing dementia and faster decline in the trajectory of the disease (Lin et al. 2013). This risk increases with the severity of the hearing loss – mild, moderate, and severe hearing loss increases risk two, three, and five times, respectively, compared to individuals without hearing loss (even after other health problems were controlled for). Three possible mechanisms of this increased risk are (1) reduced social and environmental engagement due to communication difficulties, (2) shared pathology of hearing loss and dementia (e.g., vascular changes), and (3) increased cognitive load (Lin and Albert 2014). Cognitive load describes the amount of mental effort being used in working memory. Given the difficultly discriminating speech sounds and trying to block out background noise, it can be much more effortful to engage in communication for individuals with hearing loss. It is possible that as the brain allocates resources to engage in this effort, it depletes resources from other brain functions. Currently, it is unknown what mechanism is responsible for this increased risk, but generally it is hypothesized to be a combination of these three mechanisms.

It is notable that untreated hearing loss can result in an individual appearing as though they have cognitive impairment when they do not. Also, if an individual has some cognitive deficits, hearing loss can make them seem more cognitively impaired than they are. Reduced communication abilities or attention abilities are sometimes the result of not being able to hear. For example, an inaccurate answer may be the result of mishearing a question, or a lack of attention may be because the individual did not hear or realize they were being spoken to. Sometimes, simple interventions, like using a personal amplifier (e.g., pocket talker) or making sure that hearing aids are functioning properly (e.g., batteries are charged, ear tubes are clean), can make a big impact on an individual's cognitive ability in the moment.

Hearing Loss and Psychosocial Risks

An important area of possible intervention in geropsychology is on the impact of hearing loss and psychosocial functioning. Hearing loss is associated with social isolation, loneliness, and depression (Brink and Stones 2007; Pronk et al. 2014). The impact of not being able to hear in loud groups, such as restaurants or theaters, can limit an individual's ability to enjoy these types of events. In one-on-one or small group conversation, it can be frustrating or embarrassing to repeatedly remind conversation partners to speak up or ask them to repeat themselves. This can lead to increased withdrawal. Even solitary activities, such as watching television or listening to the radio, can lose some of their enjoyment, especially if aids such as closed captioning or amplifiers are not available.

Hearing loss can also cause problems in significant relationships, lowering socialization and relationship satisfaction (Kamil and Lin 2015). A marked reduction in socialization by a hearing-impaired significant other can lead to reductions in social opportunities for both parties. For example, if a husband no longer likes to go to

dinner with friends because he cannot hear in that setting, his partner might not want to go without him and is also missing that opportunity to socialize. Within significant relationships, benign or neutral interactions can easily escalate to heated moments or conflict due to frustration by both the hearing-impaired individual and their partner. It is common for individuals with hearing loss to blame their significant other when they cannot hear what is said with comments like "she mumbles too much" or "he is always talking to me from across the house – how is anyone supposed to hear that?" Similarly, it can be frustrating for significant others to repeat themselves, especially when they need to repeat themselves several times. Also, as significant others repeat themselves, they are often raising their voice to a louder volume. This can strain the interaction, making the hearing-impaired partner feel yelled at and increasing feelings of frustration on the part of the speaker.

Individuals with mild hearing loss sometimes lack insight to the changes in their hearing abilities. As described above, it can be common for attributions about changes in others or the environment to be made, instead of acknowledging the changes in their hearing. For example, "my grandchildren speak too fast and mumble" or "the television companies do a poor job with balancing sound on their programs." While both of these statements might have some truth, often, it is more likely that the individual is experiencing changes in their hearing abilities. Hearing loss is often an insidious process, and changes over time may go unnoticed. This lack of insight or acceptance of hearing loss can be a challenge for family members and contribute to reduced quality social interactions.

Prosthetics and Rehabilitation

Hearing aids are the most common treatment for irreversible sensorineural hearing loss. There have been large advancements in hearing aid technology, but a hearing aid does not correct hearing in a way that glasses can correct vision (to 100% accuracy). Hearing aids increase amplification and are programmed to pick up different frequencies to fit the user's type of hearing loss. The human ear has the ability to focus in on individual sounds and tune out background noise; hearing aids are not able to perfectly mimic this ability. Though advances have been made in reducing the background noise amplification in hearing aids, it still can be difficult for users in louder settings. Other hearing aid advances include tele-coil technology, which directly links into sound systems in public places like auditoriums and theaters (if the setting has the corresponding sound system technology), phones, and televisions. Also, some hearing aids are able to use bluetooth technology to connect to phones and televisions. Unfortunately, it is estimated that a high percentage of individuals who could benefit from hearing aids do not use them. Chien and Lin (2012) found that among hearing-impaired individuals, only 4.3% of people aged 50–59, 7.3% aged 60–69, 17% aged 70–79, and 22.1% aged 80 and older wear hearing aids.

Another, more intensive intervention for sensorineural hearing loss is a cochlear implant. This intervention, which is recommended mostly for individuals with profound to severe hearing loss, involves a surgical procedure, and the implanted device replaces the functioning of the inner ear. A sound processor is worn externally and behind the ear, which captures the sound, turns it into digital code, and sends the information to the implant. The device then converts the code to electrical impulses and communicates via the hearing nerve with the brain. Similar to a hearing aid, while it greatly enhances the individual's ability to hear, it does not correct an individual's hearing ability to "normal" levels. Also, often in the surgical placement of the cochlear implant, the inner ear functioning is damaged to the point that what natural hearing abilities the individual had are not restorable if they change their mind or the cochlear implant does not work.

Audiological rehabilitation involves using training or treatment with individuals with hearing loss to improve their hearing abilities and quality of life. Usually provided by an audiologist,

interventions in audiological rehabilitation include education about the hearing loss to both the individual and the family members and education about using the hearing aid or cochlear implant, improving speech, using visual and contextual cues, managing communication, and similar other environmental techniques to improve quality of life.

Implications for Working with Older Adults with Hearing Loss

In working with older adults, asking about possible hearing loss and the impact on the individual's life is an important area to assess. As noted above, older adults are sometimes not aware of their hearing loss or sometimes shrug it off as just an inevitable part of aging. This can be an area where obtaining collateral information from family members can help give a clearer picture of the individual's hearing functioning and its impact on their daily living. Often just asking about their hearing and observing the patient's behavior in session will give you plenty of information about their functioning. There are also brief screenings, like the *Hearing Handicap Inventory for the Elderly – Screening Version*, which is a ten-item screening that assesses perceived problems related to hearing in the social and emotional domains (Ventry and Weinstein 1982). This can be a useful tool to assess for changes in the individual's quality of life related to hearing loss. If there is concern about hearing loss and the patient has not seen an audiologist recently, a referral would be warranted.

Given the prevalence of hearing loss in the older adult population, it is very important that providers ensure that their older adult patients or clients have the best opportunity to hear and understand during the clinical interaction. Providers should lower their vocal register (especially people who naturally speak in higher tones) and slow down the speed of their speech. It is important to face the patient and make sure that they can see the provider's face and mouth. The provider should enunciate well. Speaking somewhat louder can be helpful, but providers should be careful that the patient does not feel like they are being yelled at. Clinics and providers who regularly work with older adults should have personal amplifiers on hand (e.g., pocket talkers); these devices can greatly improve communication. It is also helpful to reduce extraneous noise, meeting in a quiet area. And, finally, use written material, such as handouts or written instructions to aid in communication.

Cross-References

- ▶ Communication with Older Adults
- ▶ Disability and Ageing

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Age-Related Positivity Effect and Its Implications for Social and Health Gerontology

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Synonyms

Positivity effect

Definition

Age-related preference in attention and memory for positive over negative information.

Introduction

Aging has long been associated with sadness, fear, and loss. From the downtrodden visage of Picasso's "The Old Guitarist" to the incompetent shenanigans of TV's Mr. Magoo, older adults have been depicted as depressed and cognitively impaired, and negative stereotypes of aging are ubiquitous. Recent empirical evidence, however, has revealed that older adults experience more positive and fewer negative emotions in their daily lives compared to younger adults (for a review, see Charles and Carstensen (2010)). Older adults also appear to favor positive over negative information in attention and memory compared to younger adults, a developmental phenomenon known as the age-related positivity effect. This entry provides an overview of the empirical origins and theoretical foundations of the positivity effect, the debates concerning its underlying mechanisms, the moderators of the effect, and open questions for future research in this area. Implications of the positivity effect for social behavior and well-being in later life are discussed.

Empirical Origins

Social scientists have long held that negative stimuli are more attention grabbing than positive stimuli and that negative information is processed more deeply than positive (Baumeister et al. 2001). Even though the bulk of research showing this preference was based on undergraduate samples of young adults, few questioned its universality. When researchers began to study cognitive processing in older adults, however, it became clear that "bad" was not "stronger than good." In fact, several early studies found that whereas younger adults showed a negativity bias, older adults preferentially processed *positive* over negative information in attention and memory (for a review, see Mather and Carstensen (2005)). The interaction between age and valence in the processing of emotional information constitutes the age-related positivity effect.

Early evidence for the positivity effect spanned paradigms from memory to attention and incorporated a wide variety of stimuli. The positivity effect initially emerged in studies of working memory, short-term memory, and autobiographical memory. Compared to younger adults, older adults appeared to privilege positive over negative stimuli such as emotionally valenced images and words. Studies of visual attention likewise showed that older adults spent more time viewing happy and less time viewing angry or sad faces compared to younger adults.

As empirical studies accumulated, investigations of the positivity effect were extended to higher-level cognitive processes such as decision making (for a review, see Peters et al. (2011)). When asked to make decisions about health-related choices (e.g., doctors and hospitals) or consumer choices (e.g., cars and apartments), older adults focused more on positive than negative attributes compared to younger adults, both when they initially viewed the attributes and when they were asked to subsequently recall the information.

Theoretical Foundations and Debates

Initial evidence for the positivity effect emerged from empirical tests of socioemotional selectivity theory (SST; Carstensen 2006), a life-span theory of motivation. SST posits that a select group of goals operates throughout adulthood. Some goals are related to preparing for the future, such as accumulating knowledge and meeting new people. Other goals pertain to optimizing the present, such as savoring close relationships and striving for emotional satisfaction. Though both goal categories are important across the life span, their relative prioritization is shaped on inter- and intraindividual levels by future time horizons, which are inversely associated with chronological age. When the future is perceived as long and nebulous, as is typical in youth, individuals prioritize future-oriented goals over emotional gratification. With advancing age, however, people perceive their futures as progressively more limited. As a consequence of these narrowing time horizons, motivational priorities shift in favor of present-oriented goals related to emotional meaning and well-being over goals associated with long-term rewards. Insofar as positive information is more emotionally satisfying and meaningful than negative information, SST maintains that older adults will display a relative preference for the positive. The positivity effect, therefore, represents controlled cognition operating in the service of chronically activated goals and is presumed to adaptively reflect goal-directed behavior (Mather and Carstensen 2005).

SST offers falsifiable hypotheses about the contours of the positivity effect, that is, the precise conditions under which older adults are expected to favor positive information and those where age differences are mitigated or even reversed. Theoretically, the effect will be evident when individuals have sufficient cognitive resources to deliberately direct their attention and memory, but not appear when cognitive resources are limited or constrained. Second, the effect will emerge when individuals are afforded the freedom to pursue chronically activated goals, but not when

external goals or instructions conflict with default priorities. Finally, the effect will appear when selective attention and memory contribute to well-being, but not when it is emotionally risky or maladaptive to selectively process positive information. As discussed in the following section, evidence largely supports these predictions.

Whereas SST posited that the positivity effect emerges from top-down and fluid processes guided by motivational priorities, alternative accounts emerged to suggest that the effect is a product of bottom-up and fixed processes related to biological or cognitive aging (for a discussion, see Reed and Carstensen (2012)). These deficit-based perspectives contend that older adults preferentially process positive information because processing negative information exceeds cognitive capacity and/or neural degradation. Reasoning from these positions, the positivity effect is expected to be most evident among individuals with the most cognitive impairment and is relatively insensitive to contextual factors such as situation-specific goals. Such hypotheses, however, have not been supported in empirical studies. On the contrary, as discussed below, the positivity effect varies systematically in response to situational and methodological factors, and it is typically not observed in cognitively impaired samples.

Not long after the effect was first identified, skepticism emerged among researchers who failed to observe the effect using paradigms that were putatively similar to studies that did observe the effect. Questions soon arose concerning the consistency and reliability of the positivity effect. In the early years, concrete answers to these questions proved elusive because the empirical literature was still nascent and lacking in volume. Within less than a decade, however, mounting empirical attention to the positivity effect yielded a literature with over 100 studies. As discussed in the following section, the sheer volume of evidence enabled a systematic meta-analysis that resolves much of these questions and the surrounding debate.

Moderators and Mechanisms

In the intervening years since the positivity effect was initially observed, dozens of studies have attempted to clarify the underlying mechanisms of the positivity effect as well as the contexts under which it is observed versus not. The accumulating literature ultimately afforded a systematic meta-analysis of the research literature to determine the reliability, robustness, and moderators of the positivity effect (Reed et al. 2014). Results of the meta-analysis indicated that the positivity effect is evident when cognitive resources are readily available, when experimental tasks or stimuli do not activate automatic processing, and when information processing is unconstrained by external factors such as task instructions. Collapsing across the entire research literature indicates that these conditions yield a reliable, medium-sized positivity effect in the form of a classic crossover interaction between age and valence: Younger adults favor negative information, while older adults favor positive information. The positivity effect also appears across a wide variety of paradigms. In visual attention, the effect is evident in looking time as indexed by eye-tracking and dot-probe methods. Studies observe the positivity effect in working memory, short-term memory (both true and false), long-term memory, and autobiographical memory. The positivity effect has been shown to influence aspects of decision making from pre-choice information processing and gain/loss sensitivity to risky decisions (for a review, see Peters et al. (2011)). The positivity effect manifests across a wide range of stimuli, from basic stimuli such as words, images, and faces to complex stimuli such as health messages and videos.

Consistent with predictions derived from SST, meta-analysis indicates that the positivity effect is significantly mitigated when experimental tasks impose external constraints on cognitive resources and/or goal pursuit. Examples of processing constraints include distracter tasks designed to consume executive control resources

and explicit instructions to attend to or ignore emotional stimuli. Many of these studies inadvertently constrain processing by, for instance, informing participants at the outset that their memory for experimental stimuli will be tested at the end of the session, thereby prompting increased attention across stimulus types.

In contexts such as these where individuals are instructed to pursue specific goals other than emotionally meaningful ones, older adults process positive and negative information comparably, while younger adults' processing preference for negative information is substantially weakened. The moderating role of experimental constraints is further highlighted by studies that purposefully manipulate these factors. For instance, age differences in attention and memory for choice attributes are eliminated when individuals are explicitly instructed to "focus on the specific facts and details" or make decisions for other people rather than for themselves (Löckenhoff and Carstensen 2008). Close analysis of individual studies also indicates that the positivity effect does not appear when experimental tasks target automatic processing and that individuals with habitually poor cognitive control (as indexed by cognitive tests) do not show the positivity effect. Emerging evidence also suggests that positivity may be reduced when the "stakes are high" and other goals supersede emotion-related priorities. For instance, it appears that older adults in relatively poor health pay more attention to negative information than their healthy peers when making health-related decisions such as selecting a physician (English and Carstensen 2015). Theoretically, this is because under such circumstances, the search for personally relevant information outweighs emotional goals.

Consistent with the motivational formulation offered by SST, the positivity effect does indeed appear sensitive to the experimental context under which it is measured. These findings also help to explain why the controversy over the existence of the positivity effect emerged: Concern about the reliability of the effect had been based on studies that placed constraints on processing (e.g., via experimental instructions to attend to all stimuli), and meta-analysis affirms that these studies typically observe a mitigated, if any, positivity effect. By contrast, when individuals are simply asked to review information without processing instructions (e.g., open-ended visual attention paradigms), the positivity effect is reliable and fairly robust. This pattern underscores the need for a clear theoretical framework. Seemingly minor methodological differences across studies, in theoretical context, are meaningful and result in critical changes to experimental paradigms. Taken together, evidence suggests that the effect reflects default cognitive processing that favors information relevant to emotion-regulatory goals. Older people value goals related to emotional meaning and well-being, and, all else equal, cognitive processing serves such goals.

Neural Signature

The positivity effect also manifests in distinct age-by-valence interactions in neural responses to emotionally valenced stimuli (for a review, see Samanez-Larkin and Carstensen (2011)). At the subcortical level, older adults show reduced activation in the amygdala relative to younger adults when viewing or evaluating negative faces (e.g., displaying sad, fearful, or angry expressions). Although several researchers have interpreted this finding to support age-related dysfunction in the amygdala, it is critical to note that age-related decreases in amygdala activation are eliminated or even reversed in response to positive faces (e.g., Mather et al. (2004)). The age-by-valence interaction suggests that negative (but not positive) stimuli may be less salient to older versus younger brains. At the same time, age differences observed in cortical activity suggest that older and younger adults differentially engage emotion-regulatory processes while processing negative stimuli. When viewing negative faces, older adults recruit medial prefrontal regions to a

greater extent than younger adults, indicating that they are actively and effortfully downregulating negative affect to a greater extent than their younger counterparts. Evidence also suggests that age differences in prefrontal activation while viewing negative stimuli may underpin downstream age differences in memory. Relative to younger adults, older adults appear to devote fewer subcortical resources to encoding negative stimuli and more cortical resources to downregulating their affective responses, which yields worse memory but better emotional outcomes. In addition to attention and memory, the age-by-valence interaction in brain activation extends to higher-level cognitive processes such as decision making. For example, in financial decision-making tasks, older adults show increased activation of caudate and insula when anticipating monetary losses but not gains. Thus, the positivity effect and its motivational precursors appear to be deeply seated within the brain.

Temporal Signature

The rapidly expanding literature on the positivity effect not only sheds light on the importance of context but also the temporal signature of the effect, with clear implications for underlying mechanisms. In general, evidence suggests that the positivity effect has a delayed onset consistent with controlled cognitive processing. Close examination of visual gaze patterns using eye-tracking indicates that older adults preferentially attend toward happy faces only half a second after they are presented and that gaze aversion from sad faces emerges only 3 s after onset. In fact, older adults' immediate visual attention (under 500 ms) shows a bias *away* from positive faces, suggesting that positivity may emerge as a response to automatic processing biases rather than constituting an automatic process itself. Neural evidence provides converging support for this view (for a review, see Samanez-Larkin and Carstensen (2011)). Specifically, older adults' medial prefrontal brain activity in response to happy and fearful faces shows an initial reduction in processing of positive stimuli paired with delayed downregulation of emotional responses to negative stimuli. This pattern of findings is inconsistent with explanations for the positivity effect based on age-related neural or cognitive degradation, which predicts an immediate and automatic positivity effect in processing. However, it is consistent with the motivational view of SST, which emphasizes the deliberate allocation of cognitive resources consistent with a delayed onset.

Cultural Specificity

The age-related positivity effect was initially conceptualized as a broad developmental pattern related to the increasing value placed on emotionally meaningful information in later life. Findings from cross-cultural studies suggest that, just as the definition of emotional meaning varies between Western and Eastern cultures, age differences in preferential emotion processing may likewise differ across cultures. For instance, East Asian cultures are less likely to distinguish positive and negative information relative to American culture. Consequently, some studies suggest that older Hong Kong Chinese do not show positivity in gaze patterns – if anything, they appear to demonstrate a stronger preference for negative faces relative to younger Chinese (Fung et al. 2008). In Western cultures that place great value on positive experience, evidence for the positivity effect is highly reliable. By contrast, the effect is mitigated and sometimes eliminated in cultures that place comparable value on negative and positive experience and stimuli. In a study conducted with a Korean sample, and based on memory for emotionally evocative images, a positivity effect was observed only when stimuli were categorized as positive or negative based on the Korean participants' own ratings. Korean participants considered some of the images rated by Westerners as neutral, such as a teacup, as positive. These findings indicate that further research is needed to fully elucidate the role of culture and emotional values in the positivity effect.

Implications for Social Gerontology

The positivity effect appears to support goal-directed behavior and parallels age-related preferences for everyday social behavior. In general, older adults appear particularly motivated to avoid negative social interactions, which presumably contributes to improved emotional experience in daily life (Charles 2010). Selective exposure is arguably the most effective way to regulate emotional states, and there is considerable evidence that older people are more selective than younger people in their choice of social partners and environments (for a review, see Charles and Carstensen (2010)). Specifically, older adults prefer the company of meaningful social partners such as close friends and family over novel partners such as recent acquaintances. Age differences in social partner preferences appear to reflect the same top-down motivational priorities that underlie the age-related positivity effect and are likewise susceptible to contextual factors. Consequently, older and younger adults express comparable partner preferences when future time horizons are experimentally constrained or expanded.

The positivity effect manifests not only in how older adults selectively seek versus avoid social interactions but also in how they process and appraise their social partners and experiences. Consistent with theoretical predictions, the positivity effect is evident in impression formation. For example, in a recent study, participants were asked to evaluate the positive and negative traits of strangers based solely on neutral facial photographs (Zebrowitz et al. 2013). Older adults rated the targets as healthier, more trustworthy, and less hostile than their younger counterparts. Complementary findings were observed in a neuroimaging study in which individuals formed impressions of strangers based on photos paired with valenced behavioral attributes (Cassidy et al. 2013). Older adults selectively recruited brain regions such as the medial prefrontal cortex and amygdala to a greater extent when evaluating positive versus negative attributes about strangers, whereas younger adults showed the reverse pattern. The positivity effect in impression formation also extends to contexts where social partners are both tangible and aversive. For instance, when older adults are asked to collaborate with a disagreeable stranger on a problem-solving task, they subsequently rate the task as more enjoyable and the stranger as more likeable relative to younger participants (Luong and Charles 2014). In combination, these findings suggest that older adults devote more resources to processing positive versus negative social information and may consequently form more favorable impressions than younger adults – even when their social partners and experiences are negative.

Implications for Well-Being

Emerging evidence suggests that the relationship between the age-related positivity effect and health is nuanced, complex, and elusive. As defined by SST, the positivity effect operates in the service of goals related to emotional meaning. That is, if a person is seeking meaningful experience, they tend to see stimuli that are related to meaning. A distinct but related issue concerns the *consequences* of attention to positive stimuli. That is, when people attend to positive material, does such attention improve mood? To date, this issue remains unresolved. On the one hand, older adults, who typically display positive preferences, report higher levels of emotional well-being than younger adults, who typically display preferences for negative information (Charles and Carstensen 2010). Findings based on laboratory studies that present positive and negative stimuli and subsequently measure mood are equivocal (Isaacowitz and Blanchard-Fields 2012). Whereas some studies do observe improvement in mood, others do not. It is possible that stimuli in laboratory studies, such as synthetic faces, are insufficiently positive or emotionally evocative to elicit changes in mood. It is also possible that the effect does not directly benefit mood.

It is clear that the positivity effect is most pronounced in older people who have relatively good cognitive functioning and is weak in those in

poorer cognitive health. Alzheimer's disease patients, for example, do not show systematic preferences for positive over negative information (for a review, see Reed and Carstensen (2012)). Again, the balance of evidence indicates that the positivity effect is a reflection of the goal-directed behavior.

Kalokerinos and colleagues (2014) recently proposed that the positivity effect may benefit older adults' health by strengthening immune system functioning. In one study, older adults' positivity in recall of emotional images predicted better immune function (as indexed by t-cell counts and activation) at a 1-year follow-up. Though these findings point to a possible tangible benefit of positivity for health, they should be interpreted with some caution. Specifically, it is likely that cognitive control resources, which were not assessed in this study, predict both the positivity effect and good health in later life. Further research is therefore needed to elucidate the unique contributions of the positivity effect to health, above and beyond cognitive status.

Although the consequences of the positivity effect for emotional, cognitive, and physical health have yet to be elaborated, findings do suggest that the positivity effect *can* effectively be leveraged to improve health-related behavior in later life. In particular, positively framed health messages may be especially effective in motivating older adults to engage in healthy behaviors. Older adults demonstrate better memory for positive health messages (e.g., emphasizing the benefits of regular cholesterol tests) versus negative messages (e.g., emphasizing the risks of failing to check cholesterol), and they may be more responsive to such messages as well (Shamaskin et al. 2010). In two recent quasi-experimental studies, older adults walked significantly more when exposed to messages that emphasized the *benefits* of walking compared to those who were exposed to messages warning of the *dangers* of inactivity (Notthoff and Carstensen 2014). By contrast, younger adults did not walk more or less as a function of messaging. These applications of the positivity effect to health behavior change, though scant, represent fertile ground for future research. Future research testing positive message frames in alternative domains will be valuable.

Open Questions and Future Directions

Although the literature on the age-related positivity effect has grown rapidly, its relatively nascent status leaves many questions unanswered. For instance, SST maintains that the positivity effect represents downstream consequences of age-related shifts in time horizons and the increasing valuation of emotional meaning, yet the discrete contributions of these factors remain unclear (Reed and Carstensen 2012). Questions about the role of time horizons in the positivity effect have not been fully addressed, although some evidence suggests that younger adults favor positive information when endings are made salient (Ersner-Hershfield et al. 2009).

In a similar vein, many if not most empirical tests of the positivity effect use stimuli that are neither personally meaningful nor affectively evocative. On the one hand, research-specific materials such as cartoon faces and IAPS images create a "level playing field" for testing attention and memory by ensuring that age groups are equally unfamiliar with the stimuli. On the other hand, they lack face validity. Research that better simulates the emotional worlds people navigate in their daily lives is needed, as well as paradigms that measure affective information processing outside of the laboratory.

Finally, little is known about the potential pitfalls of the positivity effect. Two domains are particularly relevant in this regard. First, older adults' preference for positive and inattention to negative information may leave them especially vulnerable in situations that demand attention to negative information, such as potential scams. Some advocates worry that a disproportionate on focus on gains that are "too good to be true" may place older people at risk. Such concerns are compounded by the fact that scam artists disproportionately target older people. A second maladaptive consequence of the positivity effect is that it may be detrimental to everyday decision making. Beyond financial scams, there is no

shortage of domains in which negative information (e.g., about potential risks or drawbacks) is equally important, if not more so, than positive information (e.g., about benefits and strengths). For example, sticking with underperforming investments, failing to switch prescription drug plans after rate hikes (e.g., Medicare Part D), and playing the lottery represent just a few examples of potential suboptimal decisions that stem from the positivity effect. Better understanding the contexts in which the positivity effect undermines decision quality could facilitate the development of interventions to improve decision outcomes in later life.

Conclusion

The first decade of research on the positivity effect yielded key insights about the basic mechanisms involved, reliability and moderators of the effect, as well as implications for the broader literature on age-related changes in emotion and cognition. Important questions remain unanswered regarding the extent to which the positivity effect may be maladaptive for older adults and, conversely, how the effect might be leveraged to promote adaptive behavior in later life. Resolving these knowledge gaps will require research that translates laboratory-based approaches into naturalistic studies and interventions. In doing so, researchers may use the positivity effect in ways that ultimately improve older adults' health, finances, and overall well-being.

Cross-References

- ▶ Aging and Psychological Well-Being
- ▶ Aging and Attention
- ▶ Decision Making
- ▶ Emotional Development in Old Age
- ▶ Emotion–Cognition Interactions
- ▶ Memory, Episodic
- ▶ Positive Emotion Processing, Theoretical Perspectives
- ▶ Social Cognition and Aging
- ▶ Socioemotional Selectivity Theory

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Age-Related Slowing in Response Times, Causes and Consequences

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Synonyms

Latency; Response

Definition

Response time refers to the time between an input and an output. In cognitive psychology, this is typically the time needed for some task, from the moment the stimulus is presented to the moment a response is emitted, measured most often by the time elapsed between the appearance of the relevant stimulus and an appropriate key press. Response times of an individual can be characterized in many ways – most often, the central tendency (mean or median) is what researchers focus on, but the dispersion (variance or standard deviation) and skew can be of interest as well. In an aging context, most of the work has focused on changes in mean response times, sometimes labeled "age-related slowing," and what these changes can teach us about aging in different subsystems of the cognitive substrate.

Age-Related Slowing in Basic Response-Time Tasks

It is no surprise that, generally speaking, older adults take longer than younger adults to process information. The increase in response time (RT) with age is monotonic and quite large. In a large meta-analysis on studies using continuous age samples, Verhaeghen and Salthouse (1997) reported an age-speed correlation of −0.52; Welford (1977) estimated that each additional year of adult age increases two-choice reaction time by 1.5 ms. The increase accelerates notably with advancing age (Verhaeghen and Salthouse 1997; Cerella and Hale 1994). Cerella and Hale (1994) estimated that the average 70-year-old functions at the speed of the average 8-year-old – a large effect.

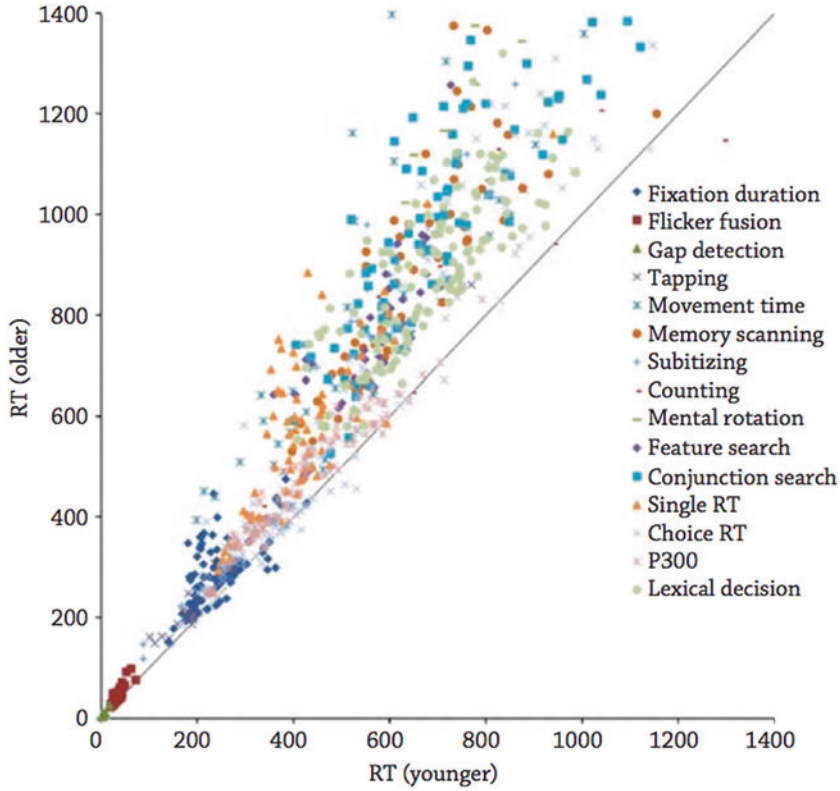
One question that was widely debated in the field in the 1980s and 1990s was the question whether or not age-related slowing was monistic or unitary, that is, whether or not "it all goes together when it goes" (Rabbitt 1993). The so-called general slowing hypothesis states that a single dimension suffices to explain age-related slowing. The main technique to investigate the dimensionality of age-related slowing is the Brinley plot (Brinley 1965): a scatter plot with mean performance of younger adults on the X-axis and mean performance of older adults on the Y-axis. Many varieties of Brinley plots exist: One can plot mean latencies or mean accuracies of a number of studies, or mean latencies of a number of tasks or conditions with the same group of participants. Early research using Brinley plots as a meta-analytic technique (i.e., gathering results

from multiple studies in a single plot) typically demonstrated not only that older adults are slower or less accurate than young adults but that data from multiple studies and conditions could be well described by a single straight line (with a small negative intercept), and hence a single linear equation. For instance, the first published Brinley analysis was a meta-analysis on 99 data points from 18 studies; the resulting equation was RT(old) = 1.36 RT(young) – 70 ms; $R^2 = 0.95$ (Cerella et al. 1980). This result implies that within broad classes of tasks, performance of a group of older subjects can be extremely well predicted simply from knowing the performance of a group of young subjects and the linear equation from the Brinley plot; information about the actual tasks is not needed. This in turn strongly suggests that processing differences between young and older adults are quantitative rather than qualitative in nature, and that the nature of processing (i.e., the type of processes involved and their sequencing) is well preserved throughout adulthood. According to these studies, what happens over the course of aging, in other words, is mainly a general decline in processing efficiency. The extreme regularity of the Ceralla et al. and subsequent data sets thus gave rise to the notion that all computational processes in older adults are slowed to the same degree, as indexed by the slope of the Brinley function (a slope of 1.36 indicates 36% slowing for older adults of the indicated age).

A stronger answer to the question of general slowing, however, demands an approach where age-related effects are first estimated within specific elementary cognitive tasks; in a second step, the slowing factors of these different tasks are compared and tested for statistical differences. One such attempt was made by Verhaeghen (2014) in a large-scale meta-analysis; the Brinley plot is provided in Fig. 1. Table 1 provides data for both younger and older adults for each of 15 elementary tasks/processes, derived from a total of 1,014 data points from 307 studies; the tasks or processes included were fixation duration, flicker fusion threshold, auditory gap detection threshold, tapping speed, movement time towards a target, memory scanning, subitizing (i.e., enumerating 1, 2, or 3 elements), counting (i.e., enumerating 4 or more elements), mental rotation, feature visual search, conjunction visual search, simple reaction time, choice reaction time, P300 (an ERP component in EEG that reflects the engagement of attention), and lexical decision times. The table includes the estimated average response times for younger and older adults for each of these tasks, the number of studies used for each estimate, and two measures of age-related slowing: the old-over-young ratio of response times and the slope of the Brinley function.

Inspection of both the Brinley plot and the data in the table suggest that there is more than a single dimension at play. It should be noted that, despite the clear fan in the Brinley plot, a single dimension does fit the data impressively, with 96% of the variance in older adults' RT accounted for in a multilevel regression model. A 15-dimensional model, with a separate regression line for each task, adds only 0.5% to the explained variance; this amount, however, was highly significant. The data from this large meta-analytic set thus show that although the general slowing model is a powerful approximation of the data, it is also blatantly imperfect. Many lower-dimensionality cut-ups of the data are possible (see Verhaeghen 2014), but a few regularities can be derived from this and other data sets:

1. Spatial tasks yield larger age-related effects than linguistic tasks and, more generally, tasks involving manipulations of lexical items (such as memory search).
2. Within spatial tasks, lower-level or "early" tasks, likely involving occipital brain structures (such as flicker fusion threshold and feature visual search), generally yield smaller age-related effects than more integrative, "later" spatial tasks, likely driven more by parietal brain structures (such as subitizing, conjunction visual search, and mental rotation).
3. When no decision component is involved, sensorimotor tasks yield small or no age-related effects; when a decision component is involved, a more moderate age-related slowing



Age-Related Slowing in Response Times, Causes and Consequences, Fig. 1 Brinley plot of all data included in Table 1, grouped by task (1,014 data points); data restricted to the 0–1,400 ms range. The *dotted line* represents the diagonal (Figure used with permission from Verhaeghen (2014))

Age-Related Slowing in Response Times, Causes and Consequences, Table 1 Mean response times for 15 tasks for younger and older adults, as derived from a large-scale meta-analysis (Verhaeghen 2014), as well as young/older ratios and the Brinley slopes derived from these data

	Mean RT (younger)	Mean RT (older)	k	Young/older ratio	Brinley slope
Fixation duration	242 ms	280 ms	27	1.16	0.96
Flicker fusion cycle time	29 ms	36 ms	22	1.24	1.25
Gap detection threshold	4.4 ms	8.1 ms	10	1.84	1.33
Tapping speed	105 ms	121 ms	20	1.15	1.16
Movement time	124 ms	179 ms	9	1.44	1.63
Memory scanning	60 ms	72 ms	9	1.20	1.33
Subitizing	40 ms	61 ms	8	1.53	1.11
Counting	330 ms	335 ms	8	1.02	1.03
Mental rotation	4.8 ms	8.6 ms	8	1.79	1.86
Feature visual search	4 ms	6 ms	39	1.50	1.76
Conjunction visual search	28 ms	55 ms	30	1.96	1.80
Single reaction time	246 ms	310 ms	26	1.26	1.40
Two-choice reaction time	283 ms	351 ms	20	1.24	1.60
P300	400 ms	452 ms	38	1.13	0.95
Lexical decision	679 ms	863 ms	33	1.27	1.36

Note. k = number of studies

factor is observed (flicker fusion threshold and tapping rate vs. movement time, single RT, and choice RT).

Age-Related Slowing in Tasks of Executive Control

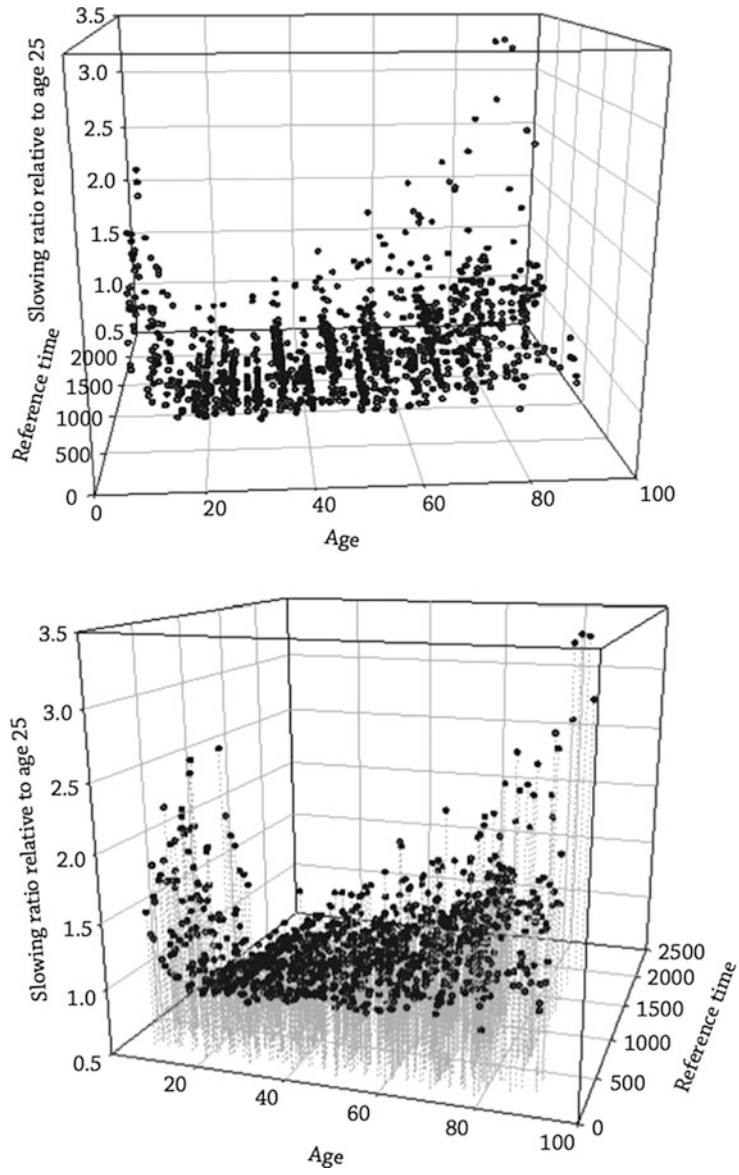
Debate is still ongoing about whether tasks with an added executive control requirement yield larger age-related differences than basic cognitive tasks such as the ones described in the previous section (e.g., Braver and West 2008). Executive control can be loosely defined as the set of general-purpose mechanisms that modulate the operation of various cognitive subprocesses and regulate the dynamics of cognition (Miyake et al. 2000). Factor-analytic work (e.g., Miyake et al. 2000; Oberauer et al. 2000) suggests that the concept of executive control can be split into at least four interrelated but distinct aspects: (a) resistance to interference (also known as inhibition as, for instance, measured by Stroop tasks), (b) coordinative ability (as, for instance, measured in dual-task situations), (c) task shifting (measured in task-switching paradigms), and (d) memory updating (as measured, for instance, in N-Back tasks).

Too few studies exist to warrant a meta-analysis on updating, but the former types all have been analyzed using Brinley plots (Verhaeghen 2014). Two conclusions emerged. First, at the level of absolute age differences – the level older adults deal with in their daily lives – there are indeed near-universal deficits: Absolute age differences are typically larger for task versions requiring executive control (e.g., reading the font color of incompatible color words in the Stroop task) than for versions with minimal control demands (e.g., determining the color of color patches). This stands in stark contrast to the second level, the level of the underlying dimensionality as revealed by Brinley plots: Most executive-control tasks do not show deficits over and beyond those already present in their low-control or no-control baseline version. Perhaps most surprisingly given the attention this explanation has received in the literature, most tasks involving resistance to interference show no age-sensitivity in the control process, neither do tasks measuring task shifting. In contrast, the ability to coordinative different tasks (as expressed in dual-task costs and in the costs of having to prepare for multitasking) does show specific age deficits. At a broad level of generalization, one could conclude that tasks of selective attention are mostly spared and that reliable age differences emerge in tasks that involve divided attention and/or the maintenance of two distinct mental task sets.

Life-Span Trajectory of Age-Related Changes in Response Times

Figure 2 shows meta-analytic data (Verhaeghen 2014) pertaining to the life-span trajectory of response times; 1,292 data points from 50 studies that compared younger adults with either children or middle-aged or older adults. The tasks are diverse – simple RT, two-choice RT, go/no-go RT, a cancelation task, a clock test, abstract matching, digit symbol substitution, different category membership classification tasks, lexical decision, memory search, visual search, mental rotation, stroop, task switching, and trail making. The data are represented in 3D space. The X-axis represents age. The Y-axis represents response time at the given age divided by the response time of the group of younger adults for that particular task in that particular study (data for younger adults are data at age 25, real or interpolated from the data); this metric expresses age-related differences in response time as a ratio of speed at age 25. (Thus, a score of 1.25 means that this particular group of subjects, in this particular task in this particular study, are 1.25 times, or 25%, slower than 25-year-olds in this particular task in this particular study.) The Z-axis represent the response time of 25-year-olds for the particular task within the particular study; this time can be taken as an index of task difficulty or task complexity (i.e., harder or more complex tasks typically take longer to perform).

Three findings stand out. First, the decline in speed over the adult life-span is positively accelerated: The trajectories curve upwards, so that



Age-Related Slowing in Response Times, Causes and Consequences, Fig. 2 3D representation of life-span response time data. The X-axis is age; the Y-axis represents slowing ratios relative to speed at age 25 within each task within each study; the Z-axis is the reference time, that is, response time for the task at age 25. The two panels show the same data from a different vantage point (Figure used with permission from Verhaeghen (2014))

decline becomes progressively larger with advancing age. Second, the minimum of the function – the apex of processing speed – is situated in early adulthood, at around age 23. Third, age-related slowing, expressed as an old/young ratio, increases with task difficulty, as can be seen in the increasing 3D curvature as age increases.

The trajectory plotted in Fig. 2 is cross-sectional, that is, it depicts age-related differences between groups of individuals as measured at the same point in historical time. This confounds aging with generational and historical differences. To have a more precise estimate of changes related to aging proper, we would also need to look at longitudinal studies, where a group of participants is followed over a period of time, often decades. In longitudinal studies, changes in scores are due to the aging process itself, as well as to historical change; generation is kept constant. In eight studies that contained both cross-sectional and longitudinal data, the average

ratio of cross-sectional over longitudinal slopes is 1.09, suggesting that cross-sectional age differences generally overestimate longitudinal age differences by about 10% (Verhaeghen 2014). This, in turn, suggests that some of the age-related differences in cross-sectional studies are due to generational differences: People born later in historical time tend to have faster response times.

Causes of Age-Related Slowing

Proposed causes of age-related slowing range from the purely psychological to the biological.

Psychological explanations include increased caution (i.e., older adults would place higher priority on accuracy than on speed; e.g., Ratcliff 2008) and disuse (i.e., compared to younger adults, older adults lack recent and/or relevant practice; e.g., Baron and Cerella 1993). The former explanation carries some weight: In a meta-analysis on 42 studies where data could be modeled using the diffusion model, older adults were indeed found to be more cautious, even though they were still slower in their processing even when caution was taken into account (Verhaeghen 2014). The disuse explanation seems less plausible. That is, this explanation would by necessity imply that older adults should show larger practice effects than younger adults when performing speeded tasks repeatedly over an extended period of time. This is, however, not the case: In a meta-analysis of 31 repeated-practice studies, younger and older adults showed identical learning rates as measured by the exponent in the power law of practice (Verhaeghen 2014).

On the biological side, age-related slowing has been associated with a loss of brain connectivity (e.g., Penke et al. 2010); with changes in neurotransmitter systems, notably dopamine (e.g., Bäckman et al. 2000); with changes in brain glucose metabolic rate or intracellular pH levels (e.g., Hoyer 2002); and with the degree of neural myelinization (e.g., Anderson and Reid 2005). The life-span trajectory, with its minimum around age 23, likely represents the convergence of two influences: growth in brain connectivity in the early part of the life-span (functional brain connectivity increases up until age 30; Dosenbach et al. 2010) and loss of connectivity in the second part of the life-span (both, directly through decreases in cerebral white matter volume, starting at age 40 (Walhovd et al. 2011), and indirectly through changes in the dopamine system). Both mechanisms operate in concert to determine the system's processing speed, with a buildup of (functional and anatomical) connectivity dominating childhood and adolescence, until the steady decline in the efficiency of the dopamine system and, later, white matter volume causes the system to slow down even as (functional and anatomical) connectivity is still increasing.

Some researchers (e.g., Anstey 2008) have gone even deeper and argue that the best predictors of response times (especially of the simpler variety) are low-level measures of basic physiological health, such as forced expiratory volume, grip strength, and vision; under this model, age-related slowing can be conceived as a general indicator of the overall intactness of the biological substrate.

Consequences of Age-Related Slowing

Age-related differences in processing speed are likely to have consequences for more complex aspects of cognition. In younger adults, speed of processing is at least moderately correlated with fluid intelligence. In one meta-analysis on the subject (which included both age-homogenous and age-heterogeneous samples), Sheppard and Vernon (2008) estimate the average correlation between inspection time (the minimum presentation time needed before a given stimulus becomes identifiable, a very basic measure of processing speed) and fluid intelligence at 0.36 and the average correlation between single reaction time and fluid intelligence at 0.26.

Speed of processing indeed turns out to be a powerful mediator of age-related changes in cognition: Individual differences in speed are associated with 62–93% (on average: 78%) of the

age-related variance in more complex aspects of cognition (viz., episodic memory, spatial ability, and reasoning; (Verhaeghen 2014)). The available longitudinal evidence (reviewed in Verhaeghen 2014) confirms the interdependence of different aspects of the cognition over the adult life-span: Individual differences in response time at the onset of longitudinal studies are correlated with changes in higher-order cognition, and vice versa (cross-correlations explain on average 55% of the relevant variance); and within-individual changes in speed over the course of a study are correlated with within-individual changes in higher-order cognition over the same time course (explaining on average 16% of the within-subject age-related variance). Moreover, in lead-lag analyses, speed appears to drive changes in higher-order cognition, but higher-order cognition has no leading role for changes in speed.

These findings all converge on the conclusion that age-related changes in speed (and/or other basic aspects of processing associated with it) drive age-related changes in more complex aspects of cognition. This does not, however, necessarily imply that speed is causal; it may simply be a biomarker or proxy par excellence. That is, speed might be the most sensitive (in the case of individual differences) or earliest (in the case of age-related differences) indicator that a more general, low-level underlying suboptimality is creeping into in the substrate. Speed then acts as the canary, so to speak, in the coal mine of the aging mind. High cognitive speed is then an indicator of a well-functioning substrate at the peak of its integrity; decreases in speed are indicative of insults to the system.

One type of data that suggest that this may be the case comes from the study of intraindividual differences in response times, that is, a person's inconsistency in speed of processing, often considered to be an indicator of noise in the information-processing system (for an overview, see MacDonald and Stawski 2015). Inconsistency, even after controlling for mean performance, follows the same U-shaped trajectory over the life-span as mean RT and shows an accelerated pattern within the older-adult portion of the life-span. Inconsistency is also longitudinally predictive of cognitive outcomes. For instance, in one large-scale study (the UK Heath and Lifestyle Survey (HALS); Shipley et al. 2006), higher variability in response times significantly predicted all-cause mortality over the course of 19 years; inconsistency has also been shown to uniquely predict terminal decline (i.e., cognitive decline close to the end of life; MacDonald et al. 2008).

Can Age-Related Slowing Be Remediated or Reversed?

There are at least two ways to improve response time, even in old age. First, performance can be improved with repeated exposure to the task. There are, however, two clear limitations to be noted here. The first is that, as stated above, learning rates of older adults are identical to those of younger adults. This suggests that the effect of practice is not one of remediation or reversal of age-related slowing, but simply one of increased efficiency of the processes involved in the particular task and/or the assemblage of these processes in the service of the task. The second limitation is that there is no indication whatsoever that the effects of repeated practice generalize beyond the task at hand: Only four studies have examined transfer effects (i.e., effects of training on response time that generalize to other cognitive tasks), but the end result is a zero effect (Verhaeghen 2014). Second, performance can be improved with aerobic fitness training (Hillman et al. 2008). The effects of fitness training appear to be rather large and are already visible after relatively short training regimens (3 months or even shorter); they also spread throughout the cognitive system, and thus hold better promise for more general cognitive rehabilitation. Note that such effects appear to be restricted to aerobic fitness training – strength or flexibility training does not yield the same benefits.

Cross-References

- Age and Time in Geropsychology
- Aging and Attention
- Executive Functions
- History of Cognitive Slowing Theory and Research
- Individual Differences in Adult Cognition and Cognitive Development
- Plasticity of Aging
- Process and Systems Views of Aging and Memory

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Aging and Attention

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Synonyms

Attention; Cognitive control; Executive control; Multitasking; Spatial attention; Task switching

Definition

In everyday life, people often refer to attention as if it were a single, unitary thing, such as a vat of energy that can be spread across stimuli or tasks. Research suggests otherwise (Nobre and Kastner 2014). There appear to be many different limited mental resources associated with different brain networks and pertaining to different levels of processing (e.g., spatial vs. central) that can be utilized in multiple ways (e.g., activation, inhibition, control). For example, one can apply extra mental effort to an important task, as in the oft-heard command "pay attention," as opposed to performing it automatically. Attention can also refer to selective processing of one thing over another (selective attention), which could be a spatial location, object, feature, thought, or entire task. Attention can also be spread among tasks (divided attention), often degrading performance on one or all of them. Relatedly, one can shift attention from one task to another. What all of these varieties have in common is control over how limited mental resources are utilized in the service of thought and action.

Introduction

Attention is critical for everyday performance. Yet it is usually taken for granted until it fails, as in everyday action slips (e.g., forgetting to turn off the stove) and accidents (e.g., driving accidents while talking on a cell phone) and in disorders such as ADHD and visual neglect. Furthermore, attention is a necessary precursor for many other cognitive functions to work properly. For instance, the most important aspect of *working memory* – best predicting performance in reading, reasoning, as well as academic and occupational pursuits – is not storage capacity per se but rather how well one controls the contents of that store (i.e., attention). Likewise, attention is also critical for encoding information, so poor attention could ultimately lead to poor long-term memory as well.

The central questions motivating research on aging and attention are as follows. Do attentional abilities decline with normal aging (absent any pathologies)? Is the decline uniform across varieties of attention, or is there a mixture of preservation and decline? Can a unified theory explain all, or most, of these attentional problems that occur with old age?

The first possibility to consider is that there are no specific age-related declines in attentional functioning, per se, just a general age-related slowing of all cognitive processes, or at least all non-peripheral processes (Cerella 1985; Salthouse 1996). Regardless of the precise cause of this generalized cognitive slowing – slower synaptic transmission, increased information loss, longer cycle time per calculation, greater neural noise, etc. – the end result is that every task that measures attention by how fast people can respond should show at least some age-related slowing. The exact amount of slowing depends on the age ranges of the older adult sample and other factors (e.g., whether the task is lexical or nonlexical), but the typical response time (RT) increase is about 50%. Performance in an attention-demanding condition should be even worse than this before researchers argue for a specific attentional deficit. To rule out general-slowing explanations, researchers often transform the data (proportional, log, or z-score) or replot the data as Brinley plots or state traces (Faust et al. 1999; Verhaeghen 2000). Below, references to an "age effect" imply that the researchers found age effects that persisted even after correcting for generalized cognitive slowing. None of the

research areas discussed below are entirely without controversy, in part due to disagreement about how to appropriately account for generalized slowing.

Empirical Review

This review summarizes research on the impact of normal cognitive aging on three broad categories of attentional function that have been widely studied: selective attention, divided attention, and switching attention. Each has been investigated using a variety of dependent measures (RT, accuracy, neuroimaging) and tasks. However, a prototypical task will include at least one condition that taxes the targeted aspect of attention, to be compared against a control condition that does not.

Selective Attention. Selective attention is the ability to focus on one thing while ignoring other things, excluding to-be-ignored information from deeper processing and control over action. Selectivity can be applied to many different things, such as locations, features, objects, sensory modalities, moments in time, or entire tasks. The selection is often a voluntary choice, although it can also be involuntary, as when we orient to a blaring police siren that we were not expecting.

Perhaps the most basic form of selectivity is allocating attention to regions of space. A real-world example is watching a stoplight for a color change. A common approach to studying space-based selective attention is the Posner cuing paradigm, in which participants use an advance location cue, either peripheral or central, to find the target. When a cue reliably predicts the target's location, the question is how well people can utilize that cue. When a cue is unreliable/irrelevant yet particularly salient (e.g., flashing or moving), the question is whether people can successfully ignore it. Many studies have shown preserved abilities with age in both cases – using location cues and resisting capture (Hartley 1993; Lien et al. 2011; Kramer et al. 1999). Interestingly, whereas behavioral data usually show preserved spatial selective attention, neuroimaging data suggest that older adults rely more on top-down processes, perhaps to (successfully) compensate for underlying deficits in other processes (Madden et al. 2007).

Another widely studied example of space-based selection is the Eriksen flanker task, in which participants respond to a central target character while ignoring flanking distractor characters. Critically, these flankers can have the same or different identity as the target. As an example, a participant might see S H S and be asked to report whether the central character is an S or an H. Although it is relatively easy to find the target, whose location is fixed, people nevertheless usually respond more slowly when the flanker identity is incompatible rather than compatible with the target. Here, again, selectivity appears to be generally well-preserved with age (Salthouse 2010). An electrophysiological study corroborated that conclusion from behavioral data, showing similar early visual components of the event-related potential (P1 and N1) across age groups (Wild-Wall et al. 2008). If anything, older adults showed enhanced target processing relative to younger adults, perhaps by applying greater top-down control over spatial attention.

The negative priming task also involves interference between targets and distractors, except that the key question is not how the distractor influences the *current trial* but rather how it influences the *next trial*. If the distractor is inhibited to facilitate processing of the current target, then this inhibition might slow responses if that inhibited distractor becomes the next target. Researchers have examined both inhibition of distractor identity and distractor location. For younger adults, both dimensions have revealed negative priming effects. Several studies have reported that older adults showed smaller negative priming effects than younger adults, taken as a sign of reduced inhibition in older adults. However, a recent meta-analysis (Verhaeghen 2015) reported that, overall, negative priming effects are quite similar for young (21 ms) and old (18 ms). Negative priming studies typically show little overall age-related slowing in the baseline condition, so, from a generalized slowing perspective, one would also not necessarily expect older adults' negative priming effects to be much larger.

The Stroop task resembles the Eriksen flanker task, except that the competing information is (in most variants) located within the same object. In the classic version, a person must indicate the ink color of a word (typically by saying it out loud) that happens to spell out a potentially conflicting color word. Here, selection must be accomplished by choosing one object feature (ink color) over another (color word name). Ink color-naming is slower when word meanings and ink color mismatch (incongruent) than when they match (congruent) or when the word is neutral (e.g., a row of Xs). In younger adults, this Stroop effect is famously robust, suggesting that word reading is an automatic process that cannot easily be stopped, even when doing so would benefit performance. A majority of studies have reported increases in the Stroop effect with age (Hartley 1993). Although one meta-analysis with Brinley plots argued for a general-slowing interpretation (Verhaeghen 2015), Stroop effects were, on average, almost twice as large in older adults (480 ms) than younger adults (254 ms). Another study failed to find age effects in a few alternative Stroop-like tasks, such as with color words not in the response set (e.g., the word "NAVY" printed in green) or color-associated words ("SKY" or "BLOOD"), but did report age effects with the classic Stroop color word task that produces the strongest interference (Li and Bosman 1996). One popular interpretation of exaggerated Stroop effects is that older adults have reduced executive attentional control (i.e., impaired inhibition). The age effect might also reflect, in part, that older adults read more automatically due to a lifetime of reading (a point discussed in more detail below).

In the flanker and Stroop paradigms, there are typically just a few stimuli (e.g., one or three) and the target location is known and fixed. In visual search tasks, however, people search for a prespecified target in an unknown location among a variable number (possibly quite large) of distractors. In younger adults, if the target has a simple visual feature not shared by any distractors, then visual search is usually very efficient. Meanwhile search for conjunctions of features (e.g., red and horizontal) and search for the absence of a feature tend to be very inefficient. This means that RT increases relatively steeply as the number of items in the visual display increases (i.e., the search slope is steep). Many studies of simple feature search have reported only modest effects of age on visual search performance, roughly in line with what one would expect from a general slowing of all cognitive processes. Researchers have, however, reported age effects with especially difficult visual searches with high target-distractor similarity, conjunction searches, and also on target-absent trials.

Overall, the general trend in studies of selective attention is that age effects are small or nonexistent for many relatively easy tasks (e.g., selection by location), but can become relatively large when the task becomes sufficiently difficult (e.g., classic Stroop and particularly challenging visual searches).

Divided Attention. The selective attention tasks discussed above might present multiple objects per trial, but there is really only one task: find the target and report some attribute. In daily life, however, we often attempt to do more than one thing at a time, such as texting while walking. For younger adults, regulating multiple processes simultaneously often results in substantial dual-task costs, possibly because one must spread limited mental resources across multiple tasks. In fact, one popular account (the *central bottleneck model*) asserts that we cannot perform any central operations – those that fall in-between perception and action, such as response selection – on more than one task at a time (Maquestiaux et al. 2013). Even highly practiced tasks such as driving and talking can interfere to a degree, resulting in accidents.

Although dual-tasking is already difficult enough for younger adults, it apparently is even more difficult for older adults. Dual-task costs have often been cited as being particularly sensitive to age effects (Verhaeghen 2015; Craik 1977), and many authors have argued for a specific deficit in multitasking. One review reported an average dual-task cost of 215 ms for older adults but only 106 ms for younger adults (Verhaeghen 2015). These age effects have been attributed to mere slowing of component central processes,

reduced processing resources, or more cautious task-coordination strategies by the elderly.

The aforementioned dual-task studies typically present participants with two novel tasks and provide a minimal amount of practice during a single session lasting about an hour. In contrast, many real-world tasks of interest involve extensive practice, possibly over many years. This observation raises the question of whether younger and older adults can combat dual-task interference by automatizing some or all of the component processes. Automaticity of a mental process can entail many different things, such as being fast, obligatory, or uncontrollable. In a dual-task context, though, the main question is whether a mental process can operate capacity-free (i.e., not requiring any limited mental resources). There are two distinct issues: can older adults acquire new automaticity, and can they maintain previously acquired new automaticity?

With regard to acquisition of new automaticity, the picture is somewhat bleak. Although older adults can improve performance on novel tasks with practice (Fisk and Rogers 2000), they often do so more slowly than younger adults. More importantly, they are in many cases less likely to eventually achieve capacity-free automaticity. Studies of visual search with consistent stimulus–response mappings, for example, have shown that practice reduces search slopes (the RT increase per item to be searched) to nearly zero for younger adults, consistent with parallel display processing, but not for older adults (Rogers et al. 1994).

In dual-task practice studies with *novel* tasks, younger adults can – under favorable conditions (simple tasks, distinct input modalities, distinct output modalities, etc.) – eventually learn to perform the two tasks in parallel, bypassing the central bottleneck. It has been reported, however, that older adults typically continue to perform central processes serially despite considerable practice levels. One study reported that older adults failed to achieve dual-task automaticity despite receiving extra practice on even easier tasks, to the point that they responded just as fast as younger adults on each task in isolation (Maquestiaux et al. 2013). This dual-task finding is very difficult to explain in terms of mere generalized slowing, so it appears to indicate a genuine age-related deficit in the acquisition of new task automaticity.

Nevertheless, it is not simply the case that old adults avoid all automaticity across the board. It has been argued, in fact, that they actually rely even more heavily on previously automatized routines, while avoiding novel tasks. Studies of expertise have consistently shown that older adults maintain automaticity acquired earlier in life. Expert typists, for example, appear to maintain their skill well into old age. They can sometimes even maintain their high typing rate, compensating for general cognitive slowing with greater chunking (Salthouse 1984). Language skills and vocabulary are also generally well-preserved into old age. Some studies have even found that older adults can access the mental lexical *more* automatically than young adults (Lien et al. 2006). A possible exception to the general rule is that certain motor skills that are automatic in young and middle age (such as walking or writing) are sometimes found to require more attention in old age to compensate for motoric deficits.

In summary, older adults have extra difficulty performing multiple novel tasks at the same time, and this difficulty cannot generally be overcome simply by providing more practice. Although older adults typically maintain automaticity acquired earlier in life, they have difficulty acquiring new automaticity of novel tasks. This might explain the anecdotal observation that younger adults frequently attempt multiple tasks at the same time (texting while driving, walking, or almost anything else), but older adults do not.

A lingering question is whether older adults are merely slow to acquire new automaticity (and eventually would if researchers were to invest in much more lengthy training regimens). Relatedly, do the findings reflect a deficit in forming new associations (reduced plasticity), a decrease in processing resources, or increased cautiousness? Interestingly, one study successfully induced more automatic memory retrieval in older adults by providing monetary rewards for fast responding (Hertzog and Touron 2011), though it is as yet unclear how widely this finding will apply.

Switching Attention. People have a remarkable ability to control their minds and reconfigure themselves to carry out any arbitrary new task rather than reflexively repeating the last task or performing the task most strongly associated with the current environment. This control, however, comes with a cost. It takes extra time and effort to instantiate the new task set, and once instantiated, performance of a new task tends to be slower than performance of an old task. In the terminology used in task-switching experiments, task-switch trials are slower than task-repetition trials. Critically, this is typically true even given ample time to prepare for a new task. This *residual switch cost* might be due to carryover of the previous task set or to an inability to completely reconfigure a new task set via mental preparation alone, without actually performing the task.

Given that dual-task costs are exaggerated with age, one might naturally expect that task-switching costs would as well. Indeed, note that dual-task studies almost always involve task switching as well. However, the picture is not quite this simple. When calculating switch costs between task-repetition and task-switch trials within a block – sometimes called *local switch costs* – many studies have found little or no effect of age beyond generalized slowing (Verhaeghen 2015; Lien et al. 2008), especially with pairs of relatively simple tasks that do not overburden working memory. Substantial age effects often do emerge, however, when comparing task-repetition trials within "mixed" blocks containing both tasks to task-repetition trials in "pure" blocks of only one task, called *global switch costs* (Verhaeghen 2015; Kray and Lindenberger 2000). The cause of this pattern is not yet clear. One speculation, however, is that although task repetitions within mixed blocks could theoretically be performed with minimal executive control, older adults apply extra top-down control anyway. This conservatism by older adults would have two consequences: (a) slowing performance in mixed blocks (hence exacerbating global switch costs) and (b) undermining the usual benefit of task repetition which (perhaps counterintuitively) reduces measured local switch "costs" (Lien et al. 2008).

Summary. The findings reviewed above reveal age-related deterioration in some attentional functions that cannot easily be explained by mere generalized cognitive slowing. Yet age effects in attention tasks are far from universal. The strongest evidence of age effects have been obtained when holding multiple tasks active (divided attention and global task switching), suppressing competing semantic representations (Stroop), and when attempting to acquire new automaticity. Meanwhile, the functions that are relatively well-preserved with age tend to be those involving shifts of spatial attention (e.g., using spatial cues, resisting capture, filtering out flankers), local task switching, and the retention of automaticity acquired earlier in life.

A common trend, however, is that even where age effects are generally spared, deficits begin to emerge when the component tasks become more complex (9). A potentially related recurring finding is that even when older adults show equivalent behavioral performance, neuroimaging data often show greater activation in older adults, especially in prefrontal cortex. This finding inspired the CRUNCH (compensation-related utilization of neural circuits) hypothesis, which states that older adults compensate for emerging cognitive deficits by utilizing more top-down resources (Reuter-Lorenz and Cappell 2008). This compensation might be successful for relatively easy tasks, allowing older adults' performance to mimic that of younger adults, yet be insufficient when overwhelmed by sufficiently difficult tasks. Overutilization of top-down control might also explain why older adults sometimes have great difficulty acquiring new automaticity, which requires performance of a task with fewer resources rather than more.

Theories of Age-Related Attentional Deficits

It is conceivable that the age-related changes in attention noted above reflect a large set of unique underlying deficits. Alternatively, there might be just a very small set of global attentional deficits, or perhaps just one, that causes all the attentional

problems observed in old age. Several such accounts have been proposed.

One influential account is the inhibitory deficit view, which attributes a wide variety of age-related cognitive declines to a decline in inhibition (Hasher and Zacks 1988). This view could explain the oft-reported age effects in the Stroop task. It could also conceivably explain difficulties juggling multiple tasks (e.g., multitasking and task switching) in terms of a reduced inability to suppress the irrelevant task. Although this inhibitory deficit view has been highly influential, and it is plausible that older adults do sometimes show reduced inhibition, several lines of evidence now argue against a strong version of the account. Several paradigms that would seem to be particularly sensitive to inhibition – such as inhibition of return and negative priming – actually tend to show little or no age effect (Verhaeghen 2015). Meanwhile, other paradigms (e.g., acquisition of new automaticity) do show age effects despite not obviously relating to inhibition.

The frontal lobes decline in volume and integrity more rapidly with advancing age than the other lobes. This has led many to argue that frontal lobe attentional functions such as inhibition and switching should decline more rapidly with age than parietal lobe attentional functions such as shifting spatial attention (Hartley 1993). This prediction loosely fits the findings noted above that spatial attention tends to show the least age effects, whereas certain aspects of executive control (global task switching, dual-task costs, working memory span) tend to show relatively large effects. It is also supported by the observation that cognitive deficits in old age are quite similar to (though milder than) those caused by frontal lobe damage. A potentially inconsistent finding, however, is the lack of an age effect on local task switching, although this exception could perhaps be explained by compensation.

Other single-cause theories of cognitive aging have focused on the dopamine system or more specifically on dopamine projections to prefrontal cortex (Braver and Barch 2002). Note that the above single-cause theories overlap to some degree and are not mutually exclusive. For example, inhibition is a frontal lobe function, and the frontal lobes are a main target of dopaminergic pathways. Further research combining behavioral and neuroscientific approaches is needed to achieve greater resolution regarding the primary causes of declines in attention with age.

Cross-References

- ▶ Age-Related Slowing in Response Times, Causes and Consequences
- ▶ Aging and Inhibition
- ▶ Automaticity and Skill in Late Adulthood
- ▶ Cognitive and Brain Plasticity in Old Age
- ▶ Cognitive Compensation
- ▶ Cognitive Control and Self-Regulation
- ▶ Common Cause Theory in Aging
- ▶ Executive Functions
- ▶ Expertise and Ageing
- ▶ Working Memory in Older Age

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Aging and Driving

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Synonyms

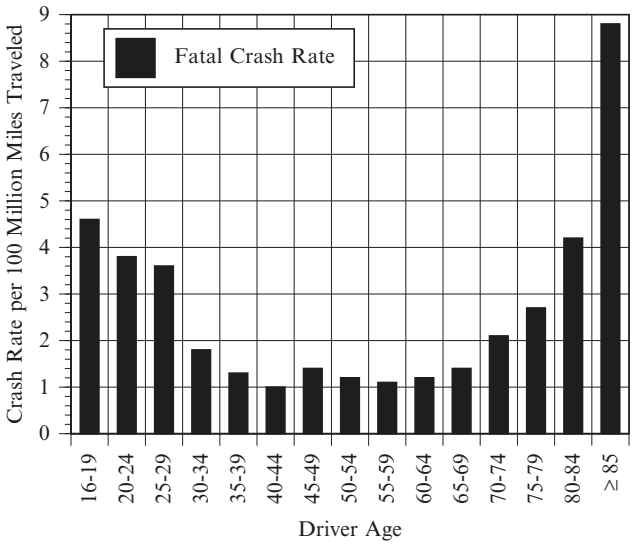
Motor vehicular transport in later life

Definition

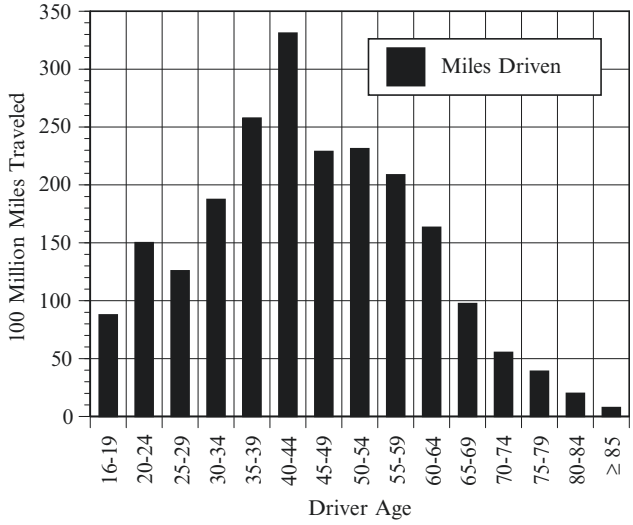
Motorists 65 and older show an increased risk of fatal crashes when turning across traffic. Age-related declines in dual-task processing play an important part in this effect. Several solutions are suggested to mitigate the increased crash risk.

Operating an automobile is the single riskiest activity that most readers of this entry engage in on a regular basis. For example, motor vehicle crashes are the leading cause of accidental injury deaths in the United States and are the leading cause of all deaths for people between the ages 1–33 and 56–71 (NSC 2010). Driving is a complex skill that takes years to master. Support for this assertion is provided in Fig. 1, in which are plotted fatal crash rates for different age drivers normalized by million miles driven (FARS 2015; IIHS 2015). In the figure, fatal crash rates steadily decline from novice/teen drivers until crash rates asymptote around 30 years of age. Around age 65, fatal crash rates begin to steadily increase mirroring the fatal crash rates of the teen drivers.

The U-shaped function depicted in Fig. 1 is multiply determined. On the one hand, younger drivers have less experience, take greater risks, and have a higher likelihood of being intoxicated



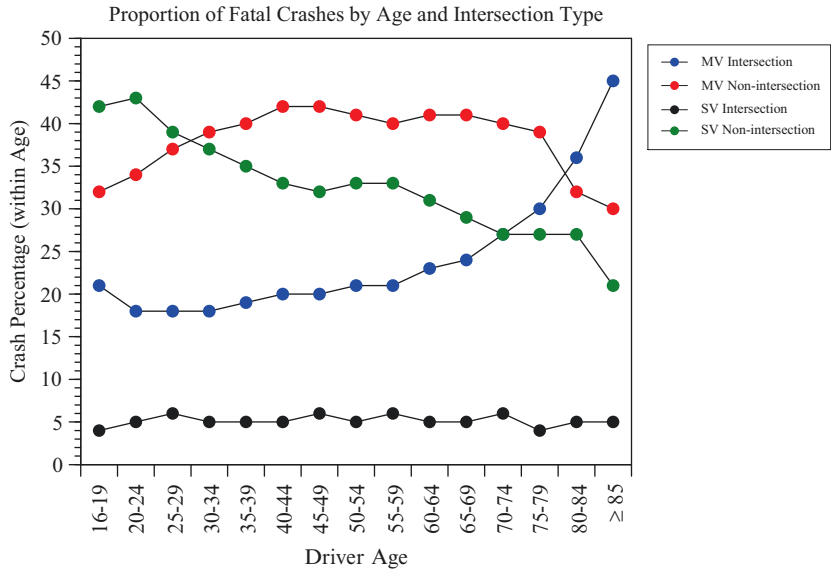
Aging and Driving, Fig. 1 Fatal crash rates as a function of the age of the driver. The miles traveled for each age cohort were used to normalize the data



Aging and Driving, Fig. 2 Miles traveled as a function of the age of the driver

from drugs and alcohol as compared to drivers in the 35–60-year age range. On the other hand, drivers over 65 years of age tend to have more experience, take fewer risks, are less likely to drive at night, are more likely to use seat belts, and they have the lowest proportion of intoxication of all adults. Older drivers are also more likely to succumb to the health complications associated with a crash than are younger drivers (NHTSA 2009); however, the U-shaped function is still present, albeit muted, when considering both fatal and nonfatal police-reported crashes (as discussed below, older drivers are involved in more side-impact crashes (i.e., where their vehicle is hit broadside at an intersection). These at-fault crashes are often more severe (Farmer et al. 1997), making it difficult to determine if exposure to serious crashes is really equivalent across the age range.

Interestingly, Fig. 2 shows that driving exposure, plotted in million miles driven, has an inverse relationship with fatal crash rates – most noticeably, as fatal crash rates increase for older drivers, exposure decreases precipitously



Aging and Driving, Fig. 3 The proportion of fatal crashes by the age of the driver and intersection type. *MV* multiple vehicle, *SV* single vehicle. Note that fatal multiple intersection accidents increase systematically with the driver's age; single-vehicle intersection crashes remain constant, and both non-intersection fatal crashes decrease across the age range

(FARS 2015; IIHS 2015). This is likely a consequence of lifestyle changes (e.g., employment status) and self-regulation on the part of the older driver (e.g., avoiding driving at night or in inclement weather). Indeed, Ross et al. (2009) used a longitudinal analysis and found that the most at-risk drivers limited their driving exposure, although this self-regulatory behavior did not adequately compensate for the elevated crash risk. Moreover, as the population of older drivers increases, a greater number of older motorists are projected to be on the road. By the year 2030, one out of five drivers on the roadway will be over the age of 65 in the United States (DOT HS 809 980). The situation is similar in other countries around the world. Driving therefore provides an excellent opportunity to examine aging in this important real-world context, particularly in light of the disproportionate increase in at-fault crashes for older adults.

Figure 3 presents another intriguing piece to the aging and driving puzzle (FARS 2015; IIHS 2015). When examining different sections of the roadway where fatal crashes occur, only one type systematically increases with age: Intersection crashes involving multiple vehicles. Multiple vehicle intersection crashes begin to increase from baseline levels as drivers enter their sixth decade. The other categories are either flat or decline across the lifespan. Intersections with traffic place high demands on the driver because they require dividing attention between traffic lights, pedestrians, and other vehicles on the roadway. Non-intersections and intersections with a single vehicle apparently do not place the same demands on attention. The patterns in Figs. 1, 2, and 3 are important because they help to illuminate the sort of cognitive issues that underlie fatal crash rates in older drivers.

Older adults are at a particularly elevated risk of crashing when making left turns at intersections. For example, using Fatality Analysis Reporting System (FARS) data and adjusting for exposure, Sifrit et al. (2011) found that the risk of at-fault crashes increased strikingly when older drivers were turning left at intersections both with stop signs or stop lights. These authors reported a similar pattern using a nationally representative sample of police-reported motor vehicle crashes of all types, from minor to fatal.

Other researchers have found that older drivers' at-fault crashes increased when making gap-acceptance maneuvers while crossing traffic (Staplin and Lyles 1991). Side impacts associated with failing to yield the right of way are also more prevalent in older drivers (Evans 2004). Importantly, side impacts account for approximately 34% of crashes on the roadway and 30% of fatalities (Farmer et al. 1997). These side impacts tend to be more severe than front and rear impacts because the side crush space is limited.

Fisher (2015) recently examined the eye movements of drivers at intersections and found that they often make a primary glance to the left and right as they approached the intersection and then make a secondary glance to the left and right just before entering the intersection. Importantly, Fisher (2015) found that older adults were three times less likely to take secondary glances to the left and right as they entered an intersection. This decreased rate of making secondary glances is critical for avoiding intersection crashes. However, with one hour of simulator training, the rate of secondary glances at intersections doubled for older adults thereby reducing crash rates by 50%.

The objective of this entry is to provide an account for the age-related differences in at-fault crashes. As illustrated in Fig. 3, one category stands out above all others as a culprit for the increased crash risk of older drivers: Intersection crashes involving multiple vehicles, particularly those where the driver is turning across traffic. In considering what distinguishes this category of crashes from the others, it is worth considering the factors that are in common (and hence are not a proximal cause in the increased crash risk) (It is often difficult to distinguish causal factors from factors that are simply associated with the elevated crash risk. While not causal factors (e.g., failure to use a seat belt did not cause the crash, reduced health reserves of the driver, etc.), in many instances they heighten the consequences of a crash and, thereby, are associated with fatal crashes.). The ability to control the vehicle, per se, would seem to be ruled out as a causal factor, as are many of the typical risk factors (e.g., speeding, alcohol intoxication, seat belt compliance), since these should be common in each of the crash categories (and these risk factors also tend to decrease with age).

Slower perception-reaction time is without doubt a contributing factor to the increased crash risk. In fact, slower reactions have been shown to increase both the likelihood and severity of crashes (Brown et al. 2001). However, processing speed of an individual should covary with the four crash categories suggesting that it is not sufficient to explain the increased at-fault crashes. The complexity of an intersection with multiple vehicles places an additional load on the cognitive system over and above the baseline differences in processing speed.

Aging, Vision, and the Useful Field of View

A variety of physical and psychological factors are likely to contribute to multiple vehicle intersection crashes. One important factor is the overall health of the visual system. Common problems associated with senescence include presbyopia, cataracts, glaucoma, and macular degeneration (CDC 2015). Increased glare sensitivity and reduced light sensitivity are also more prevalent in older populations (Wood 2002). As the visual health declines, the quality of the information transmitted to the visual cortex is degraded. Older drivers are also often restricted with their ability to turn their head and neck, which may limit scanning in the periphery for potential hazards. However, after controlling for these physiological factors, drivers across the age range still differ in the amount of information that they can extract at a glance (Remy et al. 2013).

The useful field of view (UFOV) refers to the area in the visual field in which a driver can extract useful information without head or eye movements (Ball and Owsley 1993). UFOV is most commonly assessed using a computerized program that has four subtests (Ball et al. 1993; Edwards et al. 2006). The first subtest involves the identification of a centrally presented target (a silhouette of a car or truck). The second subtest measures divided attention by requiring identification of both a centrally presented target and a

peripherally presented target at a fixed eccentricity in one of eight radial locations. The third subtest combines these two subtasks but adds 47 visual distractors (triangles) along the eight radial locations. The fourth subtest adds to the demands of the third subtest, by presenting two objects at the center location and requiring a same-difference judgment in addition to the localization of the peripheral target. In the UFOV task, the display duration for each subtest is systematically adjusted so that it is performed accurately on 75% of the trials (i.e., the duration of each subtest ranges from 16 to 500 ms). The UFOV score is determined by the sum of the durations of the four individual subtests.

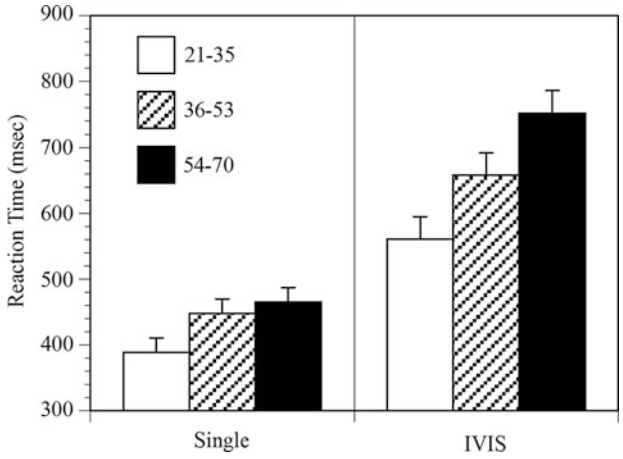
The UFOV tests the speed of both visual and higher-order attentional processing (e.g., focused attention, divided attention, visual search, ignoring distractions, etc.). In an examination of over 2700 adult drivers, the UFOV scores were found to be positively correlated with age ($r = 0.437$). UFOV scores was approximately 800 ms for drivers less than 70 years of age and averaged 1200 ms for drivers 85 or older – a 50% increase in UFOV processing time (Edwards et al. 2006). In fact, each of the subtests of the UFOV correlated with age, with correlations of .209, .353, .399, and .385, for subtests 1–4, respectively. Importantly, UFOV scores are also negative associated driving outcomes (for a meta-analysis Clay et al. 2005).

The UFOV measures help to shed light on the increase in multiple vehicle crashes for older adults. In particular, the time required for older adults to divided attention between spatial locations (subtest 2) and ignore distractors (subtests 3 and 4) systematically increases with increasing age. The UFOV task shares many of the processing requirements that confront older drivers as they approach an intersection with multiple vehicles. In such circumstances, drivers must divide attention between the other vehicles, pedestrians, traffic lights, and other sources of visual distractions (e.g., signs, stopped/parked cars, people waiting at the crosswalk, etc.). Intersections with multiple vehicles represent the perfect storm in terms of the demands placed on visual attention and processing speed for drivers of all ages, but particularly so for older drivers.

Driving and Multitasking

Watson et al. (2011) combined the driving and neuropsychological literatures by suggesting that the U-shaped function depicting crash rates and age was closely aligned with the rise and decline in prefrontal cortical (PFC) regions of the brain (e.g., an inverted U-shaped function across the lifespan that reaches apex around 30 years of age). The PFC regions are involved in a wide variety of higher-level cognitive functions that support executive attention. In this context, executive attention would be involved in processing task-relevant information associated with the safe operation of a vehicle (e.g., lane position, speed management, relation to other vehicles, status of traffic lights, acceptable gap for making a left-hand turn, etc.) as well as juggling other task-irrelevant interactions (e.g., talking or texting on a cell phone). In addition, the increased perceptual load at intersections places an additional burden on the executive attention system. For example, the effect of secondary-task load increases as the extraneous perceptual load in the driving environment increases (e.g., Strayer et al. 2003). Consistent with this interpretation, multiple studies have found age-related declines in dual-task processing (e.g., Craik 1977; Hartley 1992; Hartley and Little 1999; Kramer and Larish 1996; McDowd and Shaw 2000).

When the complexity of driving increases, as is the case with multiple vehicle intersection crashes, older adults exhibit greater difficulties dividing attention between the different components of the driving task. This is illustrated in Fig. 4 which compares the performance of younger-, middle-, and older-age adult drivers when they drove a new car on residential streets (i.e., the single-task baseline condition) with a condition where they perform the same driving task and also concurrently used voice commands to perform simple operations that were unrelated to the task of driving (Strayer et al. in press). These in-vehicle information systems (IVIS)



Aging and Driving, Fig. 4 The DRT data plotted for the younger adult-aged (*solid white pattern*), middle-aged (*striped pattern*), and older-aged (*solid black pattern*) adults. The *left panel* reflects single-task performance when participants are driving without any secondary task. The *right panel* reflects performance in the in-vehicle information system (IVIS) secondary-task portions of the experiment. Error bars reflect 95% confidence intervals around the point estimates

were cognitive in nature and did not require the driver to take their eyes off the road or their hands off the wheel (e.g., using voice commands to place an outgoing phone call or changing the radio station).

The data presented in Fig. 4 were obtained using a new international standard for assessing the cognitive demands of driving an automobile (The DRT task: ISO DIS 17488, 2015). The DRT task presents a visual probe every 3–5 s, and drivers are required to press a button attached to their finger when they detect the light (i.e., this is a simple RT task). The logic behind the DRT task is that RT is inversely related to the mental workload experienced by the driver. Prior research with younger drivers has found that when additional cognitive load is added to the driving task either in the form of increased demand in the driving task itself (e.g., with different traffic densities or different roadway configurations) or by adding a concurrent secondary task that is unrelated to driving (e.g., talking or engaging in other voice-based interactions in the vehicle), that RT increases relative to baseline levels (e.g., Strayer et al. 2013; Cooper et al. 2014).

The left-hand panel of Fig. 4 presents single-task performance in the DRT task. RT increased with age and this is likely due to differences in processing speed associated with senescence (Salthouse 1996; but see Ratcliff and Strayer 2014). Note that the single-task condition provides the standardized baseline upon which to evaluate the effects of IVIS secondary-task load. Interestingly, the right-hand panel of Fig. 4 shows that the costs of IVIS secondary-task interactions increased with the age of the driver (as evidenced by an age X condition interaction). When older adults used these voice-based commands, the cost of interacting with the IVIS was 55% more than the cost incurred by younger adults performing the same activities.

The data presented in Fig. 4 represents a superadditive interaction. That is, the RT increase for older adults is more than the simple addition of a constant dual-task cost in RT (i.e., dual-task- > single-task + constant). The RT cost is also greater than a proportional increase in RT from younger adults to older adults (i.e., the dual-task/single-task ratio for younger adults times the single-task data for older adults is less than that is observed for older adults in dual-task conditions). In fact, the actual dual-task cost for older adults was 40% greater than that predicted by a proportional increase. The costs of interacting with the IVIS system were substantially greater than that predicted by general slowing model.

These findings are in line with the *age-complexity hypothesis* (Cerella 1985; Cerella et al. 1980) that posits that age-related differences are amplified as the complexity of the task increases. The pattern of dual-task interference shown in Fig. 4 should serve as a caution for drivers of all ages who attempt to use these in-vehicle systems as they place surprisingly high demands on the driver. The data also suggest that older adults, who are the most likely to purchase a new vehicle with voice-based technology (Sivak 2013), will experience a much greater cost when required to divide their attention within their vehicle.

Aging and Mobility

Mobility is important for maintaining independence and is a critical factor in older adults' ability to "age in place," maintaining social connections, accessing healthcare, and performing daily tasks (e.g., shopping, meals, work, etc.) (Colello 2007). Operating a motor vehicle is often a key component of mobility, particularly in rural communities where other modes of transportation are unavailable (Bailey 2004). In fact, twenty percent of adults 65 or older do not drive at all, and half of these nondrivers do not leave home on a regular basis (Farber et al. 2011). Bailey (2004) found that the reduced mobility of senior nondrivers resulted in a 15% decline in trips to healthcare providers, 59% fewer trips for shopping and dining, and 65% fewer trips for social and religious functions.

The cessation of driving tends to isolate older adults and has clear negative consequences for independent living. At the same time, the increased crash rates, particularly multiple vehicle crashes at intersections, is a significant concern for traffic safety. According to the Highway Loss Data Institute (2015), approximately 40% of the states in the United States have restrictions on relicensing of older drivers. Nineteen states currently require more frequent visual screening of older drivers and several do not offer a renew-by-mail option for older drivers. Surprisingly, neither tests for visual acuity nor tests of contrast sensitivity are predictive of population-based crash risk (McGwin and Owsley 2015), suggesting that the current practice for licensure of older adults is currently not supported by the empirical literature. Based on the literature reviewed above, a more promising test for licensure may be the UFOV.

A recent study by Lambert et al. (2016) added an interesting twist to the aging/driving story. In the study, one group of drivers was given information consistent with the stereotype that older drivers are impaired in driving performance (e.g., the impairments reviewed in Figs. 1, 2, and 3). The other group was given other driving-related information without the stereotype threat. Older participants under stereotype threat exhibited greater impairment to driving (e.g., slower brake RT and a greater frequency of rear-end collisions) than did the age-matched controls that did not receive the stereotype threat. These findings suggest caution in how the media and public policy communicate information about older adult driving, as this information can impair the driving of older motorists (i.e., reading the preceding passages may make older adults perform worse on the driving task).

Conclusions

At-fault crashes increase with senescence at intersections, particularly when the driver is making a left turn. This pattern is consistent with the hypothesis that age-related declines in dual-task processing play an important part in these fatal crash statistics. There are several things that can be done to mitigate the crash risk. First, the crash risk is lower when there are left-turn arrows to control the flow of traffic (e.g., Sifrit et al. 2011). Adding left-turn signals at intersections would help both younger and older motorists to navigate these hazardous sections of the roadway. Roundabouts have also been shown to reduce the severity of intersection crashes. For example, crashes decline by 40% and serious injuries decline by 80% when roundabouts have been installed (IIHS 2015). Fisher (2015) also found that training older drivers to take second glances as they enter an intersection reduced crash rates by 50%. This simple driver feedback offers a cost-effective

way to reduce fatal crashes for all ages. Moreover, these changes were still present in a 2-year follow-up of drivers who received training, indicating that the benefits are long-lived. In a similar vein, Horswill et al. (2010) found that training using a short video on hazard perception facilitated older drivers' subsequent identification of traffic hazards. Finally, a strategy that could be adopted by older drivers is the "three rights make a left" rule. Motorists can often use this rule (or the comparable rule in countries which drive on the left) to avoid making turns across traffic and to accomplish the same change in navigational direction. While taking longer to complete, the procedure avoids the type of complex turns that are a significant source of at-fault crashes.

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Aging and Inhibition

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Synonyms

Age-related suppression deficit; Inhibitory deficit hypothesis; Inhibitory theory

Definition

Age-related decrease in the ability to ignore irrelevant information.

Introduction

Inhibitory theory, first advanced in Hasher and Zacks (1988) and subsequently elaborated on in Hasher et al. (1999; see also Lustig et al. 2007), proposed that the ability to regulate attention is central to memory and other cognitive functions. The theory made four foundational assumptions: (1) that familiar stimuli automatically trigger activation of their representations in memory; (2) that

downregulation – or inhibition – of excessive activation is the critical function that works together with (3) goals to constrain thought processes to only (or mostly) relevant information; and (4) there are substantial age and individual differences in the ability to suppress nonrelevant stimuli along with minimal differences in automatic activation. The empirical work on this topic now covers a wide range of domains within cognitive and social psychology, along with differences tied to mood (e.g., Biss et al. 2012) and to circadian rhythms (e.g., Anderson et al. 2014). Here we review how a reduction in the ability to ignore irrelevant information has wide-ranging effects on cognition in late adulthood.

Neural Correlates of Inhibitory Deficit

Neuroimaging findings have corroborated the idea that older adults process more irrelevant information than their younger counterparts. Using recordings of event-related potentials, researchers have found that older adults show a larger neural response to unattended auditory stimuli played while they are reading a book compared to young adults, even after many repetitions of the sounds (Fabiani et al. 2006). Young adults quickly suppress their neural response to the repeated tones, showing efficient "sensory gating" of auditory distraction during reading. These neuroimaging results suggest that the age-related deficit in filtering out irrelevant information occurs at a low level of sensory processing.

Similar low-level processing of irrelevant visual information has been observed in older adults using functional magnetic resonance imaging (fMRI). In a study measuring cortical blood flow during a selective attention task, older and younger adults were instructed to attend to face stimuli and ignore place stimuli (Gazzaley et al. 2005). Older adults showed more activation in a place-selective brain region to the irrelevant stimuli than did young adults, suggesting that the perceptual qualities of distracters are processed to a greater degree in older adults. In that study, only the degree to which irrelevant stimuli were suppressed was correlated with a memory measure, as inhibitory theory would have predicted. Recent evidence suggests that successful inhibition of irrelevant stimuli is associated with activation in a specific set of frontal and parietal brain regions that comprise the frontoparietal control network (Campbell et al. 2012). Older adults show less activity in cognitive control regions and less coherence within the frontoparietal control network compared to young adults when ignoring distraction (Campbell et al. 2012).

Noisy environments can significantly impair recognition memory in older adults. In one fMRI study, forgetting of face stimuli was predicted by decreased activity in brain areas responsible for successful encoding (e.g., hippocampus) as well as elevated activity in the auditory cortex (Stevens et al. 2008). Since the memory task in this study was purely visual, the auditory cortical activity presumably reflected distraction from scanner noise. The auditory distraction only disrupted the memory performance of older but not younger adults, consistent with the inhibitory theory assumption that young adults are efficient at filtering out irrelevant information.

These lines of work suggest that the increase in processing of irrelevant information is at least partially driven by a failure of top-down control networks to exert control over the focus of attention, which in turn allows irrelevant items to be processed. Once irrelevant items are processed, they can interfere and compete with relevant items, resulting in a general performance reduction in older adults and others with inhibitory deficits (e.g., Nigg 2000).

Inhibitory Control and Response Times

Perhaps the most replicated finding in all of cognitive gerontology is the slowing of response times with age. Many studies have shown that older adults are slower to make speeded responses than are young adults and there is evidence that age-related slowing is exacerbated by the presence of distraction. Lustig et al. (2006) measured response time to make a simple similarity judgment between two sets of letters

(e.g., *RXL____RXL*) in young and older adults, and they manipulated visual distraction in this task by either presenting only one trial at a time (low distraction condition) or presenting many stimuli at once (high distraction condition). Older adults were faster to respond in the low distraction condition compared to the high distraction condition, but the manipulation had a smaller effect on young adults. Thus speed differences between young and older adults may be exaggerated in tasks with a high degree of visual clutter. Furthermore, only speed on the high distraction condition predicted fluid intelligence for older adults, consistent with the suggestion that the regulation of attention in the face of distraction is a major determinant of overall cognitive functioning.

A similar effect of distraction has been widely reported in the literature on reading speed. The presence of distracting text interspersed throughout a written passage in a distinctive font has a dramatic slowing effect on older adults' oral reading times, but does not affect young adults to the same degree (Connelly et al. 1991). The slowing effect of distracting text is observed to be greater in older adults even when visual acuity is matched between age groups (Mund et al. 2010).

Inhibition and Explicit Memory

Another hallmark of cognitive aging is a decrease in explicit memory performance (e.g., Craik and Jennings 1992). Attention to distraction can have a profound effect on memory. There are at least two inhibitory-based functions that have been identified. The first is the role inhibition plays at retrieval when a new task follows an earlier one. According to the theory, the ability to suppress the recent past as tasks and goals change is compromised by poor inhibitory regulation. In a previous section, we reviewed the evidence that older adults' reading times are slowed by the presence of distracting text in a different font, but there is also evidence that distracter text can intrude into older adults' memory for a written passage. Following the reading of a passage interspersed with distracting text, young and older participants were prompted to recall the passage they read; older adults, who were more slowed by distracting text during reading, also made more intrusions from distractor words compared to young adults (Mund et al. 2012), showing that older adults' memories can be colored by irrelevant past experiences.

Interference resulting from the encoding of extraneous, never-relevant information not only influences recall but can also disrupt later learning. Biss, Campbell and Hasher (2013a) asked participants to perform a picture judgment task in which distracting words were superimposed over the pictures; later, in an ostensibly different task, participants were asked to learn pairs of pictures and words, some of which were comprised of new words and old pictures from the judgment task (high-interference condition) and some of which were completely new (low-interference condition). Older adults showed worse cued recall in the high-interference condition compared to the low-interference condition. Young adults showed no effect of the previously seen distraction. This result, consistent with the predictions of inhibitory theory, suggests that older adults retain knowledge of previously encoded distraction and this knowledge can create interference that impacts future learning episodes. Retention of the recent past (or failure to suppress it) is also a source of age differences in measures of working memory capacity (May et al. 1999).

Conversely, the retention and transfer of irrelevant information from one task to the next can confer a unique benefit to older adults' learning if the irrelevant items later become relevant (e.g., Amer and Hasher 2014). Weeks and colleagues (2016) showed that older adults' cued recall of face-name pairs can be improved to the level of young adults' if the names are previously presented as distraction alongside the faces earlier in the experimental session. This transfer of distraction to a new task appears to be implicit since it occurs without participants reporting awareness of any connection between tasks. Together, these studies suggest that separate tasks may begin to bleed into one another in old age, making experiences less distinct and more interrelated as a result of broader encoding.

The second inhibitory-based role at retrieval occurs when a retrieval cue activates two

competing memory traces; inhibition of the irrelevant or incorrect trace is required in order for the correct trace to be selected. Inhibition during competition resolution was directly tested by Healey and colleagues (2013), who found that older adults do not inhibit irrelevant items at retrieval like young adults do (Healey et al. 2013). In this paradigm, participants first incidentally encoded a list of words that contained pairs of orthographically similar words (e.g., *ALLERGY* and *ANALOGY*); later, they solved a series of word fragments, some of which could be completed with only one word from the encoded pair (e.g., A_L_ _GY, solved by *ALLERGY*). In order for the word fragment to be correctly solved, competition between the two activated words would have to be resolved by suppressing the incorrect word (e.g., *ANALOGY*). To test this prediction, Healey and colleagues (2013) measured naming time of competitor words and found that older adults showed priming for competitor (i.e., incorrect) words, while young adults did not. The lack of priming for previously seen competitor words in young adults suggests that they used inhibition to resolve interference at retrieval. In contrast, older adults do not suppress competitors at retrieval and instead show facilitated access to these irrelevant items. In other circumstances, by contrast, older adults can totally fail to produce a response, despite a recent exposure to relevant items (Ikier and Hasher 2006). In this study, older adults who had seen two words (*BELLS* and *BILLS* that could complete a fragment (B_L_S) often gave neither answer. Older adults who had seen only one of the two words showed equivalent retrieval to that of young adults. Failure to suppress competing items at retrieval can compound the effects of attending to distraction, resulting in a situation in which interference cannot be overcome and retrieval fails altogether (Postman and Underwood 1973).

Inhibition of Thoughts and Biases

In some cases, memory retrieval is actually undesirable, as is the case with unpleasant or irrelevant memories. Inhibition is also important in suppressing these unwanted thoughts, and there is evidence that older adults do not suppress thoughts as effectively as younger adults do. In the so-called "think/no-think" paradigm, participants first learned word pairs (e.g., *BANNER – FOOTBALL*) and then, in a second phase, are cued with one word from the pair (e.g., *BANNER*) to either think about or avoid thinking about the second word (Anderson et al. 2011). The no-think instruction is similar to the real-world phenomenon of suppressing retrieval of unpleasant or off-topic thoughts. Anderson and colleagues (2011) measured suppression of the no-think words by cuing the items with their category (e.g., Sport – F_____) and comparing retrieval rates between no-think items and baseline (i.e., uncued) items. They found that younger but not older adults had suppressed the no-think items, resulting in more forgetting of the unwanted memories (Anderson et al. 2011).

Similarly, there is also evidence that older adults fail to inhibit prejudices, even when they intend to do so. Older adults were more likely than young adults to show implicit prejudice in their judgments of an other-race person, even when they were explicitly instructed not to use a person's background in their judgments (von Hippel et al. 2000). Although older adults in this study also scored higher than young adults on scales of overt prejudice, the age difference in implicit use of stereotypes was mediated by inhibitory abilities, as measured by the reading with distraction task and not by their overt prejudice scores (von Hippel et al. 2000).

This failure to control social biases may be related to older adults' inability to suppress previous interpretations of text. In a study by Hamm and Hasher (1992), young and older adults read passages that were initially biased toward one interpretation (e.g., a hunter on a safari) and either took an unexpected turn (e.g., the hunter takes a shot with a camera and the reader learns it is a photographic safari) or remained consistent with the initial interpretation. During the reading of the passage, participants were asked to indicate whether certain words were consistent or inconsistent with their current interpretation of the story. Older adults' responses indicated that they continued to hold onto their initial interpretation of the story even after the turning point in the story

demanded a reinterpretation. On the other hand, young adults showed evidence of suppressing the initial interpretation when it became clear that it was incorrect. Older adults' inability to suppress thoughts, once activated, may bias their future thoughts and decision-making.

Further, older adults' cognition may be heavily influenced by previous goals, since there is evidence that they do not deactivate no longer relevant goals as young adults do. Scullin et al. (2011) taught a group of young and older adults to respond with a button press whenever they saw a given target word during an imageability judgment task. Later, after the prospective memory task had ended, participants were given a lexical decision task that contained former target words from the prospective memory task, and response latencies were compared between target and new items. In keeping with the idea that older adults do not inhibit previous goals, older but not younger adults showed slower response times to targets from the prospective memory task, despite both age groups indicating that they knew the prospective memory task was complete. Further, the age difference in slowing to former target words was mediated by age differences in measures of inhibitory control (Scullin et al. 2011). The tendency to "hold on to" prior thoughts, goals, and biases may impact the way older adults interact with the world and may underlie many of the observed age-related changes in cognition and social behavior.

Conclusions

The presence of distraction is disruptive to most people's ability to perform cognitively demanding tasks, but here we have reviewed some evidence that distraction is disproportionately disruptive to older adults. In accordance with the predictions of inhibitory theory (Hasher and Zacks 1988), reduction of inhibitory ability has been implicated as a major contributing factor to cognitive aging and underlies age differences in a wide range of tasks, including speeded response tasks, reading, learning, memory, and social judgments. Lack of inhibition is proposed to be a general deficit, the major consequence of which is an increase in interference between relevant and irrelevant items. Interference can impact cognition at all levels since it occurs as a result of competing perceptual stimuli, competing memory traces, and competing thoughts or goals. Interference can be either prevented or resolved by top-down control over the contents of attention, and this process seems to necessitate cohesive brain activity in the regions comprising the frontoparietal control network (Campbell et al. 2012). Decreased connectivity of the frontoparietal control network has been observed in other populations with decreased inhibitory abilities, including those with depression (Kaiser et al. 2015) and people at their off-peak time of day (Anderson et al. 2014). The results reviewed here in light of inhibitory theory suggest that some cognitive and social deficits previously associated with aging are instead associated with a decrease in inhibitory ability and not age per se. If this is the case, it may be possible to prevent or reduce impairment in old age by targeting and training inhibitory abilities. An alternative approach has been successful in improving older adults' memory by capitalizing on the tendency to ignore distraction. The benefit of helpful distraction has been demonstrated (a) when information from a previous task becomes relevant to a new task, with some evidence that age differences in memory are eliminated under these circumstances (Weeks et al. 2016), and (b) when distraction occurs during a retention interval and serves as a rehearsal opportunity for those who attend to it, reducing forgetting in older adults (Biss et al. 2013b).

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Aging and Mental Health in a Longitudinal Study of Elderly Costa Ricans

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Synonyms

Geriatric depression; Mental well-being and aging; Neuropsychiatric disorders and aging;

Old-age dementia; Psychiatric disorders and aging; Psychotropic and antidepressant medications at old age

Definition

Geriatric depression and cognition impairment, including memory loss, are common neuropsychiatric disorders at old age. Diagnosing these conditions in the context of a general population-based survey conducted by nonmental health specialists is challenging. The effect of aging on an individual's mental health is not always mirrored in the prevalence of mental disorders of the population by age. Changes over time and across cohorts, as well as survival selection, affect the comparison of individuals at different ages. Longitudinal studies that follow the same individuals over time allow a better assessment of the effect of age on mental health. The Costa Rican Longevity and Healthy Aging Study (CRELES) includes a panel of elderly people that provides a rare opportunity of documenting mental health and aging in a middle-income country.

Introduction

Worldwide populations are aging. With the exception of a few countries, most have had remarkable increases in life expectancy coupled with declining birthrates in the latter half of the twentieth century, which has led to aging populations even in low- and middle-income countries. The increase in older populations worldwide has led to increased interest in how countries can enable and ensure healthy aging.

A vital aspect of healthy aging is one's mental health, and older adults have a substantial burden of disease from mental health conditions. Worldwide, 7.5% of all disability-adjusted life years (DALYs) for those aged 60+ are due to neuropsychiatric disorders. Alzheimer's disease and dementia are the most disabling conditions in this age group, accounting for 4.2% of all DALYs worldwide and 2.9% of all DALYs in low- and middle-income countries in this age group. In addition, the number of dementia cases is growing rapidly worldwide, but particularly in low- and middle-income countries (Yasamy et al. 2013). Depression is the second most disabling condition, accounting for 1.5% of DALYs worldwide and 1.4% of DALYs in developing countries in this age group (authors' calculations based on World Health Organization (2004)).

Older adults face specific challenges and opportunities that may affect their mental well-being. The process of aging simultaneously includes several opposing forces with regard to mental health. Older adults are more likely to face increased isolation, declining physical health, changes in cognitive ability, and decreased income, which may lead to more mental health conditions. At the same time, having more time for engaging leisure activities and family interaction may help protect against the onset or remission of mental health conditions. In addition, studies suggest that aging increases one's positive affect because of increased emotional regulation (Mather and Carstensen 2005). These increases in positive affect may lead to a more positive outlook, keep people engaged in their daily activities, and therefore buffer against the onset of mental health conditions.

Understanding what factors are directly related to common mental health disorders in older populations is therefore difficult because researchers must disentangle competing forces. In order to better understand how a change in one factor affects changes in another, longitudinal data enable stronger and richer studies. Longitudinal study designs follow the same individual over time, which allows researchers to compare the same individuals before and after life changes, and thus account for invariant unmeasured or unobservable factors such as disposition or genetics. This possibility is particularly important for the study of mental health conditions, because imperfectly measured individual traits may predict both cognitive and physical disability, as well as mental health-related symptoms, and thus confound inferences in cross-sectional studies.

In an effort to better understand the aging process, several countries have invested in detailed, nationally representative longitudinal health and

retirement surveys of their older populations. These include the United States' Health and Retirement Survey; English Longitudinal Study of Ageing; Survey of Health, Ageing and Retirement in Europe; Japanese Study of Aging and Retirement; The Irish Longitudinal Study on Ageing; China Health and Retirement Longitudinal Study; Mexican Health and Aging Study; and Korean Longitudinal Study of Aging. The Costa Rican Longevity and Healthy Aging Study (CRELES) is part of this growing set of health and retirement surveys being conducted and is a nationally representative longitudinal survey of health and life-course experiences of older Costa Ricans. Costa Rica is of particular interest to study given its high longevity: life expectancy is greater than that of the United States, despite being a middle-income country with about one-fifth the per capita income and one-tenth the per capita health spending.

In this entry, the longitudinal CRELES data are used to describe the prevalence of common geriatric mental health disorders as people age, particularly dementia and depression. To date there have been few studies that examine changes in mental health status for the elderly in middle-income countries such as Costa Rica with large aging populations, particularly the eldest of the old.

The CRELES Data

The Costa Rican Longevity and Healthy Aging Study (CRELES, or *Costa Rica Estudio de Longevidad y Envejecimiento Saludable*) is a longitudinal study of health and life-course experiences based on a national sample of residents of Costa Rica aged 60 and older in 2005, with oversampling of the oldest old. The sample was selected randomly from the 2000 census database using a multistage sampling design. This entry uses the information from three waves of interviews conducted primarily in 2005, 2007, and 2009. Documentation and public-use CRELES data are available from the National Archive of Computerized Data on Aging at the University of Michigan (Rosero-Bixby et al. 2010).

This entry exploits the longitudinal information on mental health collected within CRELES, to sort out the effect of aging from the effects of cohort, period, and survival selection that usually cloud traditional cross-sectional data by age. The focus of the analysis is on the effects of aging on mental health, and the entry presents estimates of the prevalence of mental health conditions by age and sex among elderly Costa Ricans from cross-sectional CRELES data, as well as of the transition (incidence and remission) rates from the longitudinal CRELES data on changes of state between waves. Then, these rates are used to simulate the pure effect of aging in hypothetical cohorts using multiple-decrement life table methods. The comparison of the age profiles of observed and simulated mental health prevalence provides not only a better picture of the effect of aging on mental health but also hints some of the changes under way in Costa Rica.

CRELES Indicators of Mental Health

Ever Diagnosed with Psychiatric Problems

Responded "yes" to the wave 1 question "Has a physician ever told you that you have a nervous or psychiatric problem such as depression?" In wave 3 the question was: "In the last 4 years, since the first time we visited you, has a physician told you that you have nervous or psychiatric problems such as depression?" Therefore, the yes responses in wave 3 are added to those of wave1; no information was available from wave 2. This variable does not allow transitions back to "never diagnosed" nor does it allow us to disentangle barriers in accessing care that would yield a diagnosis from the lack of symptoms meeting diagnostic criteria.

Impaired Cognition

The CRELES used a short version of the Mini-Mental State Examination (MMSE) questionnaire (Folstein and Folstein 1975) that had been adapted and validated for Latin America (Quiroga et al. 2004). This version has a maximum score of 15 points instead of the original 30-point MMSE test. The six cognitive domains included in this

test were time orientation (4 points), primary verbal memory (three words, 3 points), attention (to repeat a five-digit number backward, 1 point), secondary verbal memory (three words, 3 points), following instructions (1 point), and reconstruction (to copy two intersected figures, 1 point). The Cronbach alpha for this series of 15 items was 0.72, indicating acceptable internal validity. The test was administered at the beginning of the interview to decide whether to use a proxy to help in responding the interview. Individuals with a score of <10 were considered to have impaired cognition (needing a proxy respondent) as were individuals who were considered by trained interviewers to be too impaired to complete the test.

Depression Screening Symptoms

The CRELES used the 15-item short-form Geriatric Depression Scale (GDS15) (Sheikh and Yesavage 1986). This instrument more accurately assesses depression in older populations because it was developed specifically for use with older adults, has a simplified yes/no response format, and contains very few items related to somatic symptoms. This scale is an instrument designed for screening purposes, and thus it may lead to an overestimate of clinical depression. A systematic review of 42 studies validating this instrument reports an average positive predictive value of only 0.32, whereas the negative predictive value is 0.95 and sensitivity and specificity are in the order of 0.8 (Wancata et al. 2006). Most studies in that review used a cutoff value of 7+ to classify an individual as depressed, which is the same cutoff value employed here in the CRELES data. The Cronbach alpha for the 15 items in CRELES data was 0.85, indicating high internal validity of the scale. Per study protocol, the CRELES did not administer the GDS15 questionnaire to approximately 25% of participants with cognitive impairment (i.e., needing a proxy respondent).

Taking Antidepressant Medicines

As part of the CRELES interview, participants were asked to show the interviewer all of the medicines they were currently taking. From the database of all recorded medicines, antidepressant medications were identified by brand or generic name to create indicators of whether respondents were taking antidepressants at the time of each survey wave. This indicator has the advantage of identifying those taking antidepressant medications regardless of the reason for medications; antidepressants are known to have high rates of off-label use (Radley et al. 2006). Respondents who were prescribed antidepressants but did not fill them and respondents who initiated and then discontinued antidepressant therapy between waves could not be identified.

Results

Of the 2,827 participants interviewed in the CRELES first wave, 2,369 (84%) were interviewed in the second wave and 1,855 (79%) in the third wave. Loss of follow-up was 6% in wave 2 and 9% in wave 3. The remaining 10% and 12% of participants died between waves, respectively.

Table 1 shows the prevalence of the four indicators of mental health by wave and sex. A simple way of using data from longitudinal studies is by taking each wave as a cross section as shown in Table 1 and looking for time trends. For example, the data for women show a reduction in the prevalence of depression symptoms from 19% in 2005 to 17% in 2007 and 15% in 2009 and an increase in the proportion using antidepressant medicines from 9% in the first wave to 11% in second and third waves. Because this panel does not have refreshment cohorts and the effect of age was not controlled for in the analysis, these inter-wave changes could be a result of the aging of the panel, as well as from period changes. Additionally, these changes might be a result of survival selection. Disentangling these three forces – age, period, and survival selection – is a classic problem in demographic studies, as is sorting out aging from cohort effects when one compares individuals at different ages.

Table 1 also shows the results of the three waves pooled together, which yields more reliable estimates as shown by the smaller standard errors. Pooling together several waves of interviews is a

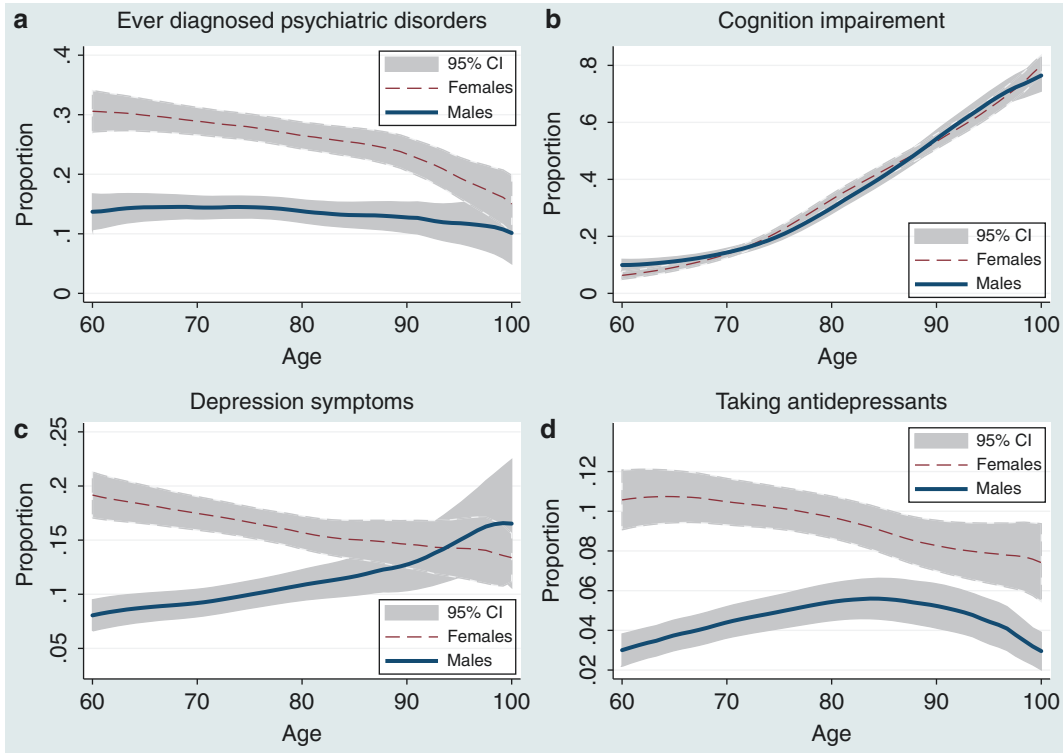
Aging and Mental Health in a Longitudinal Study of Elderly Costa Ricans, Table 1 Prevalence of four mental health conditions investigated in the CRELES by wave and sex

Sex and mental		Wave 1	Wave 2	Wave 3	All waves
Health indicators		2005	2007	2009	2005–2009
Sample size		2,827	2,369	1,855	7,051
Both sexes					
Ever diagnosed psychiatric disorders	Prevalence	19.6%	.	24.1%	21.4%
	(S.E.)	(0.9)	.	(1.2)	(0.9)
Cognitive impairment	Prevalence	14.2%	20.6%	17.3%	17.2%
	(S.E.)	(0.6)	(0.9)	(0.9)	(0.6)
Depression symptoms	Prevalence	14.1%	12.3%	11.9%	12.9%
	(S.E.)	(0.9)	(0.9)	(1.0)	(0.7)
Taking antidepressants	Prevalence	6.6%	7.9%	7.8%	7.4%
	(S.E.)	(0.5)	(0.6)	(0.7)	(0.5)
Males					
Ever diagnosed psychiatric disorders	Prevalence	13.0%	.	15.0%	13.8%
	(S.E.)	(1.2)	.	(1.5)	(1.2)
Cognitive impairment	Prevalence	13.3%	20.6%	17.7%	16.9%
	(S.E.)	(0.9)	(1.3)	(1.4)	(1.0)
Depression symptoms	Prevalence	9.1%	7.1%	8.6%	8.3%
	(S.E.)	(1.1)	(1.0)	(1.2)	(0.8)
Taking antidepressants	Prevalence	3.8%	4.6%	4.0%	4.1%
	(S.E.)	(0.6)	(0.8)	(0.7)	(0.5)
Females					
Ever diagnosed psychiatric disorders	Prevalence	25.6%	.	32.1%	28.2%
	(S.E.)	(1.4)	.	(1.7)	(1.4)
Cognitive impairment	Prevalence	15.0%	20.6%	17.0%	17.4%
	(S.E.)	(0.9)	(1.1)	(1.2)	(0.8)
Depression symptoms	Prevalence	18.8%	16.9%	14.9%	17.1%
	(S.E.)	(1.4)	(1.4)	(1.4)	(1.1)
Taking antidepressants	Prevalence	9.2%	10.9%	11.3%	10.3%
	(S.E.)	(0.9)	(1.0)	(1.2)	(0.8)

S.E. binomial standard error of the proportion per 100

simple way of taking advantage of longitudinal data, although the researcher must be careful in using only corrected estimates of the standard errors (as was done in Table 1) that take into account the clustering of data due to repeated measurements for the same individual. These estimates show that depression prevalence among women in this sample is 17%, a figure that is more than twice that of men (8%). The proportion of women ever diagnosed with psychiatric conditions (28%) and the proportion taking antidepressant medicines (10%) also more than double the proportions estimated for men. In contrast, the prevalence of cognitive impairment (17%) is about the same for males and females.

Studying cross-sectional variation by age is a common procedure in assessing the effect of aging on mental health or other diseases. Figure 1 shows the cross-sectional age variation in the four indicators of mental health using the pooled CRELES data for the three waves. The prevalence curves in the figure were smoothed out using local regression procedures; the 95% confidence interval for each curve is shown as a shaded area. The figure confirms that the prevalence of depression, other psychiatric disorders, and antidepressant use is higher for women, although this gender gap shrinks or disappears at advanced ages. In contrast, the indicator of cognition impairment does not differ significantly by sex at any age.



Aging and Mental Health in a Longitudinal Study of Elderly Costa Ricans, Fig. 1 Prevalence of four mental health conditions by age (locally weighted smoothing functions)

Only the prevalence of cognitive impairment shows a strong increase with age, and there seems to be no difference across sexes. Prevalence of this impairment is about 10% at age 60 years, increasing to about 40% by age 85 years. The other three indicators suggest that among women, depression declines with age. The result for males is mixed: depression symptoms increase with age, the proportion ever diagnosed is essentially flat, and the proportion taking antidepressant medicines increases until about age 85 and diminishes afterward.

The age profile of cross-sectional curves, such as those in Fig. 1, is certainly driven by age effects, but cohort and period effects may also exert influence. For example, the higher prevalence of depression among younger women might occur because the disease is less common as a woman get older, but also because, in a generational change, younger cohorts of women are more affected by this disease or because, in a period change, the disease has become more widely recognized. A fourth source of variation by age is survival selection. For example, age declines in the curve of prevalence of depression could occur if women suffering depression die at substantially higher rates. Longitudinal data allow assessing pure aging effects. It is rare to have long-running longitudinal studies that observe a cohort of, say, 60-year-old individuals at baseline until their death after four or five decades. In the case of CRELES, the longitudinal observation was only during 4 years. During that period, longitudinal transition rates were determined with the data, and then hypothetical cohorts were constructed with those rates using multiple-decrement life table techniques (Wachter 2014). Table 2 shows the transition rates – incidence and remission – estimated from the data and then used to simulate the hypothetical cohorts. Both are annual rates, which are estimated using Poisson regression models with exposure equal to the time

Aging and Mental Health in a Longitudinal Study of Elderly Costa Ricans, Table 2 Annual transition (incidence and remission) rates for the four mental health conditions by sex

Mental health indicator	Males		Females	
Ever diagnosed psychiatric disorders				
Incidence rate	0.012		0.023	
(S.E.)	(0.002)		(0.002)	
Cognitive impairment				
Incidence rate	0.019	• 1.081^x	0.019	• 1.081^x
(S.E.)	(0.002)	(0.005)	(0.002)	(0.005)
Remission rate	0.373	• 0.946^x	0.373	• 0.946^x
(S.E.)	(0.043)	(0.006)	(0.043)	(0.006)
Depression symptoms				
Incidence rate	0.021	• 1.028^x	0.067	• 0.979^x
(S.E.)	(0.004)	(0.014)	(0.010)	(0.011)
Remission rate	0.279		0.279	
(S.E.)	(0.014)		(0.014)	
Taking antidepressants				
Incidence rate	0.011	• 1.032^x	0.039	• 0.991^x
(S.E.)	(0.003)	(0.011)	(0.006)	(0.009)
Remission rate	0.335		0.278	
(S.E.)	(0.027)		(0.020)	

x = age – 60
Standard errors in parentheses

(in years) between waves. Because of the log-linear specification of Poisson regression models, the effect of age is multiplicative, and age is an exponent. In models where age showed non-statistically significant effects, age is excluded as a control variable, i.e., the rates are then modeled as constant for all ages. In models where the effect of gender was not significant, the same age coefficients were assumed in each sex.

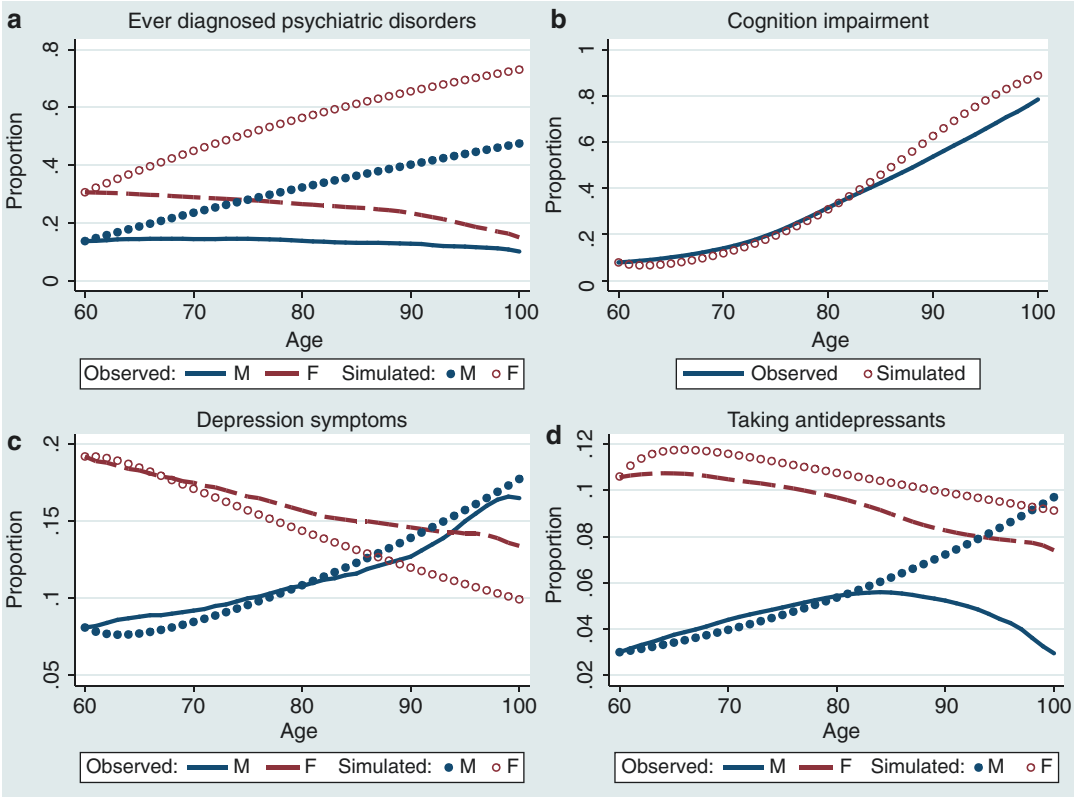
The condition "ever diagnosed" has no remission by definition. Its incidence rate does not vary significantly with age. The incidence rate of 0.023 for women means that, in a year, 23 women are newly diagnosed out of 1,000 not yet diagnosed. The rate for women is about double that for men.

The transition rates for depression symptoms and for taking antidepressant medicines behave similarly. The incidence rate at age 60 years is about three times higher for women than for men (0.067 compared to 0.021 for depression symptoms). Then, while among men the incidence rate increases by 3% per year, among women it decreases by 2% per year for depression symptoms and 1% for taking antidepressant medicines. By age 85 or 90 years, the incidence rates of men and women are about the same. The remission rates for the two conditions are very high at all ages: close to 30% of ill individuals leave the disease state every year.

Figure 2 shows the simulated prevalence in the four conditions under study. The simulations created hypothetical cohorts using as inputs the incidence and remission rates shown in Table 2 and initial prevalence at age 60 similar to that observed in Fig. 1. The simulated curves show the expected age profile of prevalence if aging is the only change that takes place, i.e., if cohort and period effects are absent.

The observed and simulated curves of prevalence of cognition impairment are similar, which suggests that this population has not been subject to meaningful changes in this condition over time nor across generations. The same can be said about the prevalence of depression symptoms, whose observed and simulated curves differ little, especially for men. For women, the simulated curve suggests that the age slope of decline in observed prevalence should be steeper. A potentially important confounder of this curve is the fact that about 50% of the sample aged 80 years or more were not administered the depression screener because they required a proxy for responding (a more complex analysis could also include the simulation of a third state in the model: requiring a proxy.)

The simulated curves for the proportion taking antidepressant medicines are not that different from the observed prevalence curves either, except in two aspects: (1) The simulation for women results in a systematically higher than observed curve, which would be consistent with a recent increase in prescription of antidepressant medicines to women. (2) The simulation for men



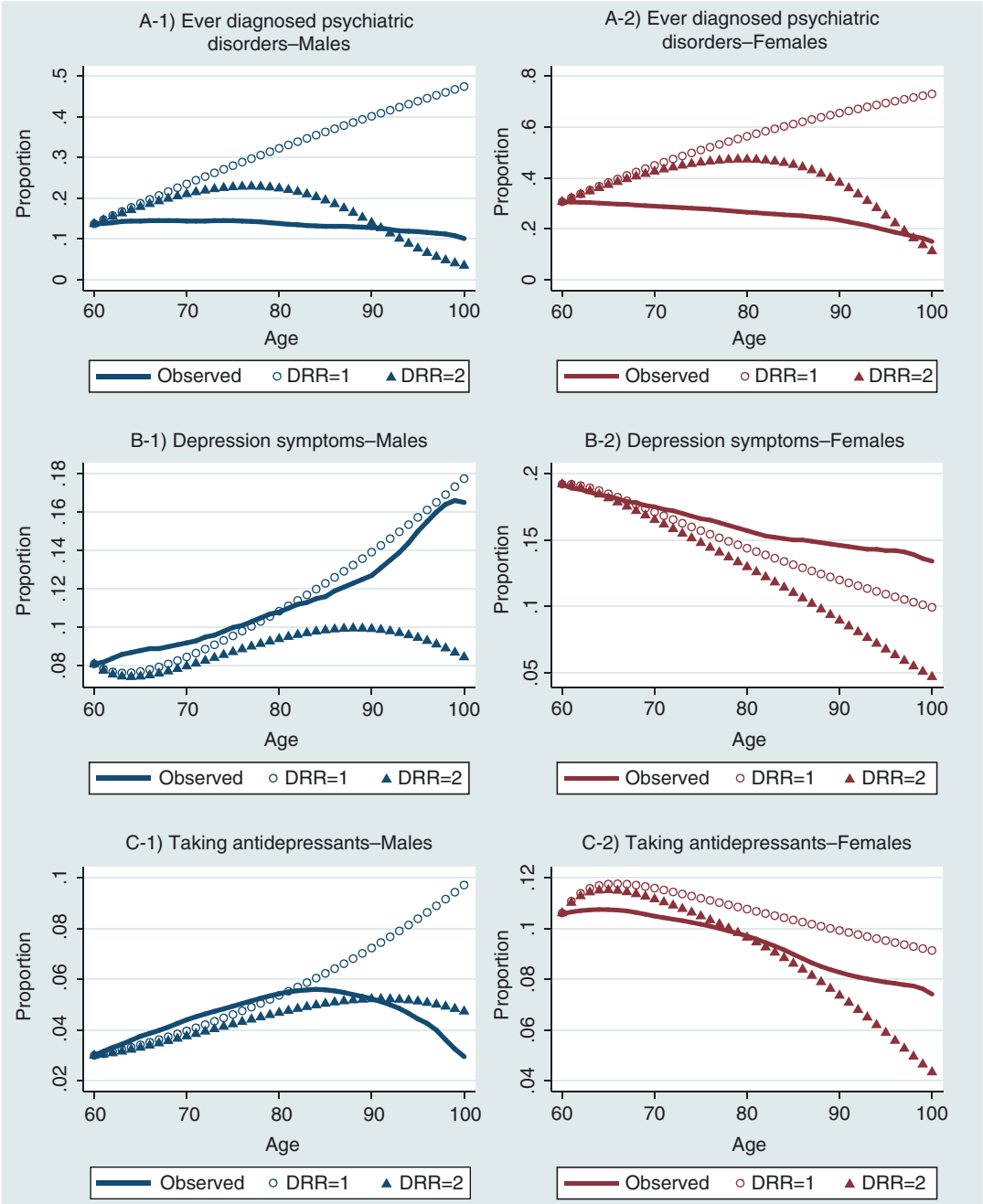
Aging and Mental Health in a Longitudinal Study of Elderly Costa Ricans, Fig. 2 Hypothetical cohort simulations and observed prevalence of four mental health conditions by age

older than 80 years results in a growing curve compared to the flat or even declining observed curve. This discrepancy may result from survival selection as noted below.

By contrast, the indicator "Ever diagnosed with psychiatric disorders" differs markedly between the observed and simulated aging curves in Fig. 2, panel A. Being cumulative, the cohort proportion of ever diagnosed psychiatric conditions should increase monotonically with age, as it does in the simulated curves. In this case, the decline in the observed curve with age is highly misleading if interpreted as a pure aging effect; instead, this likely reflects cohort or period increases in these diagnoses or else elevated mortality among people suffering from psychiatric impairments.

The simulations shown so far assumed that mortality is similar among prevalent and non-prevalent individuals. To illustrate the effect of removing this assumption, Fig. 3 shows simulations assuming that mortality among individuals with mental illnesses doubles the mortality of the general population, which is an extreme assumption of over-mortality of people with mental health problems. Mortality for the general population is assumed to follow a Gompertz distribution with the parameters estimated for Costa Rica elsewhere (Rosero-Bixby et al. 2014).

The new simulations for ever diagnosed depression confirm that the flat or declining prevalence curves by age observed in this sample might originate in survival selection, given that the simulation curves that included differential mortality stopped growing by age 77 among men and age 80 among women and decreased afterward. This is speculative, however, pending further longitudinal analysis to more precisely estimate the mortality differences by psychiatric indicator.



Aging and Mental Health in a Longitudinal Study of Elderly Costa Ricans, Fig. 3 Hypothetical cohort simulations with differential mortality and observed prevalence of three mental health conditions by age and sex

Figure 3, panel C, also shows that the new simulations with differential mortality produce simulated prevalence values that are quite close to the observed values, especially for older men. Again, this indicates that differential mortality is plausibly important in driving the observed age curves of the proportion taking antidepressant medicines, especially for older men.

Simulations with differential mortality of the proportions with depression symptoms (plot B in Figure 3) result in curves lower than those simulated with no differential mortality and, therefore, further away of the observed curves, especially at older ages. This suggests that differential mortality by depression status may be less extreme than it is for the other indicators.

For cognitive impairment, simulations with differential mortality (not shown in Fig. 3) result in even closer observed and simulated curves than those already similar in Fig. 2, especially after about age 80.

Discussion

The data from the CRELES study is a valuable first step in assessing the prevalence of mental health problems among elderly Costa Ricans. About 28% of Costa Rican women aged 60 or more reported being ever diagnosed with psychiatric disorders, about 17% were screened as suffering cognitive impairment or geriatric depression, and 10% were found taking antidepressant medicines. These female proportions are twice the rates of males except for cognitive impairment, a condition that does not differ by gender.

The longitudinal information in CRELES allow researchers to disentangle the age, cohort, and mortality patterns in mental health rather than simply observing cross-sectional patterns by age. There is a clear increase with aging in cognitive impairment for both sexes, as well as for depression symptoms for males. In contrast, depression symptoms decrease with age among women, and this trend is not an artifact of period-cohort effects nor survival selection. The aging effects on depression symptoms – increasing for males and decreasing for females – are consistent with similar profiles in the curves of the proportion taking antidepressants, and these are confirmed by the simulations enabled by the longitudinal data.

The cross-sectional pattern for the proportion ever diagnosed with psychiatric disorders is more complex and on its own would provide a misleading description of aging effects. The flat and decreasing cross-sectional patterns by age are likely a result of survival selection or of recent increases in diagnosis among younger cohorts; the simulated age profiles enabled by the longitudinal data instead reveal strongly increasing rates with aging.

An important limitation of two of the indicators used (ever diagnosed psychiatric disorders and taking antidepressant medicines) is that they are sensitive to access to care – those meeting depression criteria but who have poor access to physician care would not report diagnosis nor would they be taking medicines. In addition, since the wording of the survey question specifically asks for diagnoses from physicians, respondents may not report diagnoses received by other mental health specialists, such as psychologists, nurse practitioners, or social workers, thus potentially understanding lifetime diagnosed prevalence.

It is also helpful to compare the different indicators of depression or psychiatric history, as the indicators are better understood in their contrasts. Self-reported psychiatric history could cover psychiatric conditions beyond depression, such as anxiety or psychotic disorders, as well as conditions that are no longer symptomatic, such as childhood or early adult disorders. This measure could undercount depression, however, if there is perceived stigma in reporting conditions or if respondents experienced barriers to care. The depression screener will detect current symptoms, but not prior history. Respondents who are untreated or inadequately treated, for example, might meet current symptom criteria but not have a prior history of diagnosis. The depression screener also has the limitation that it cannot be easily administered to individuals with cognitive limitations requiring a proxy to respond, who are an important group at older ages, close to 50% at 85 or more years. Finally, receipt of antidepressant

medication indicates current use of medication for either depression or other conditions. Persons who are adequately treated by antidepressants would no longer exhibit psychiatric symptoms and may or may not report a prior psychiatric history. The discordance among these measures in the CRELES is further described elsewhere (Domino et al. 2014).

Conclusion

Many factors suggest that mental health conditions merit increasing attention in aging populations, and this is likely to be particularly true in lower- and middle-income countries that have traditionally devoted fewer resources to mental health. Epidemiological surveillance surveys have drawn attention to an increasing mental health disease burden, but documenting this burden via periodic cross-sectional surveys is only a first step in understanding and planning for likely future patterns. Using the CRELES longitudinal survey, this analysis has illustrated the crucial importance of true panel data in order to disentangle aging effects from period and cohort influences. In addition, the analysis highlights the importance of longitudinal mortality follow-ups in order to better estimate the role of differential mortality selection in shaping these age patterns. Beyond the scope of this contribution, there is of course a long tradition of further uses of longitudinal data in strengthening causal inference, which would be relevant, for example, in evaluating the effects of mental health policies and interventions implemented in low-resource settings. Although only the longitudinal CRELES data was introduced in this entry, there are increasing efforts to collect comparable data in other lower- and middle-income settings so as to enable further cross-national comparisons over time as well.

Cross-References

- ▶ Aging and Psychological Well-Being
- ▶ China Health and Retirement Longitudinal Study (CHARLS)
- ▶ Cognition
- ▶ English Longitudinal Study of Aging (ELSA)
- ▶ Health and Retirement Study, A Longitudinal Data Resource for Psychologists
- ▶ Irish Longitudinal Study on Ageing (TILDA)
- ▶ Korean Longitudinal Study of Ageing (KLoSA): Overview of Research Design and Contents
- ▶ Mental Health and Aging

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Aging and Psychological Well-Being

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Synonyms

Positive psychological functioning; Psychological health; Subjective well-being

Definition

Psychological well-being is defined as a psychological state with positive functioning and absence of mental illnesses.

Introduction

Old age is often associated with declines and losses in physical, cognitive, and social domains, with many older people perceived as unhappy, lonely, or depressed as a result. However, recent empirical findings do not support these stereotypical beliefs. In contrast to the popular belief that most of older adults are depressed, the statistics of the 2012 National Survey on Mental Health reveal that the 12-month prevalence of major depression declines from young adulthood to old age. In particular, the percentages of adults aged 18–25, 26–49, and 50 or older who had at least one major depression episode in the previous year were 8.9%, 7.6%, and 5.5%, respectively, implying that the rate of depression is lower in late adulthood. Moreover, the findings from the German Socio-Economic Panel Study and the British Household Panel Study also show that average levels of life satisfaction remain quite stable across adulthood and only decline in very late life (Baird et al. 2010). These findings suggest that the majority of older people maintain a high level of psychological well-being that is equivalent to that experienced by their younger counterparts.

When studying psychological well-being over the life course, Carol Ryff's six dimensions of psychological well-being, life satisfaction, and positive and negative affect are often assessed in younger, middle-aged, and older adults (Ryff 1989). In this entry, the age-related changes in these three aspects will first be reviewed, followed by discussion on theoretical explanations and future directions.

Age-Related Changes in Ryff's Psychological Well-Being

Ryff's (1989) six distinct dimensions of psychological well-being comprise self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth. These dimensions are regarded as the eudaimonic well-being, which is characterized by purposeful life engagement and realization of one's potential. Self-acceptance refers to a person's attitudes toward acceptance of himself/herself; positive relations with others captures the quality of relationships with significant social partners; autonomy is defined as one's own freedom and independence to think and act in particular ways; environmental mastery assesses the sense of mastery and competence in managing life events; purpose in life concerns the sense of meaning, purpose, and directedness in life; and personal growth refers to the tendency to develop personal talents and actualize potentials.

Cross-sectional studies showed that compared with younger and middle-aged adults, older adults exhibited higher levels of environmental mastery and autonomy but lower levels of purpose in life and personal growth (Ryff 1989; Ryff and Keyes 1995). No significant age variation was found in

self-acceptance and positive relations with others. Using two waves of data from two population-based longitudinal studies, Midlife in the United States (MIDUS) and the Wisconsin Longitudinal Study (WLS), Springer and colleagues (2011) demonstrated a similar pattern of age-related increases in environmental mastery and age-related decreases in personal growth and purpose in life over approximately 10 years. However, for the other three dimensions of psychological well-being, the age trends are somewhat different from those reported in the cross-sectional studies. In particular, autonomy declined with age in the WLS younger, middle-aged, and older groups, whereas it increased with age in the three MIDUS age groups. For the three age groups in the WLS and MIDUS, an age-related increase in positive relations with others was observed. Self-acceptance decreased in the three WLS cohorts, whereas it slightly increased for the middle-aged MIDUS cohorts but not the younger and older cohorts (Springer et al. 2011).

Age-related changes in psychological well-being vary by cultural context. Karasawa and colleagues (2011) compared the six dimensions of psychological well-being between Japanese and American adults. The results of their studies revealed that the culture by age interaction was shown in personal growth and positive relations with others. In particular, personal growth increased with age among Japanese adults, whereas a reverse pattern was shown in the US sample. Concerning interpersonal well-being, younger and middle-aged Japanese adults (aged 35–54) rated their relations with others better than their older counterparts (aged 55–74), whereas older US adults reported more positive relations with others than their younger counterparts.

In summary, when people grow older and progress through the developmental tasks, the direction of changes in psychological well-being is dependent on the dimensions concerned, with increases in some dimensions and declines in the others. These patterns of age-related changes are indeed in alignment with the emphasis in the theory of selective optimization with compensation that adult development is multidirectional (Baltes and Baltes 1990).

Age-Related Changes in Life Satisfaction

Life satisfaction is another core aspect of psychological well-being. It is defined as a person's cognitive assessment of satisfaction with his/her life. Life satisfaction is often assessed by a single item to measure a person's current happiness with his/her overall life or the Satisfaction with Life Scale which comprises five items (Ryff 1989; McAdams et al. 2012).

Past studies on life satisfaction across adulthood have yielded inconclusive results. For example, a positive linear relationship between age and life satisfaction was shown in a representative sample of Americans aged 25–74 years (Prenda and Lachman 2001). A curvilinear relationship between age and life satisfaction was demonstrated in a large sample of American men aged 40–85 years who participated in the Veterans Affairs Normative Aging Study over a period of 22 years (Mroczek and Spiro 2005). Specifically, growth-curve models revealed that life satisfaction increased from age 40 to 65 years and then declined. Significant individual differences in rate of change and amount of curvature were also shown, implying that people vary in their life satisfaction trajectories and not every individual changes at the same rate and in the same way.

Mroczek and Spiro's (2005) study, however, included those aged 40 years as the youngest participants, making it difficult to get a clear picture about changes in life satisfaction across the lifespan. To address this concern, Baird and colleagues (2010) analyzed the longitudinal data from the German Socio-Economic Panel Study and the British Household Panel Study which comprise nationally representative samples of a wide age range (16–91 years). Their study demonstrated that average levels of life satisfaction remained relatively stable over adulthood and started declining after age 70 when health, income, and social support were declining. Even though the two samples share some similarities, the British Household Panel Study revealed a moderate increase from the 40s to the early 70s.

In addition to overall life satisfaction, McAdams and colleagues (2012) used data of

the British Household Panel Study to systematically analyze age-related trajectories of domain satisfaction. Eight life domains were investigated, including health, income, house, spouse/partner, job, social life, amount of leisure, and use of leisure. Among these domains, health satisfaction declined steadily over the lifespan. Job satisfaction and income satisfaction remained flat in young adulthood but increased gradually after mid-40s. Satisfaction with spouse/partner first increased from adolescence to the twenties, remained stable until mid-40s, and then slightly improved until late 70s. For the remaining four domains – namely, satisfaction with social life, amount of leisure, use of leisure, and housing – all showed a decline from teens to late thirties or early forties and then increased until late 70s. When aggregating satisfaction ratings in all these eight domains, the overall trajectory is largely similar to that in overall life satisfaction. That is, life satisfaction and aggregated domain satisfaction drop from adolescence to early 40s, then increase until mid-70s, and gradually drop among the oldest group of participants. Similarly, using four waves of data from 80 countries in the World Value Survey, a U-shaped effect of age on life satisfaction was demonstrated, with the lowest level of life satisfaction being observed in between the mid- and late 40s (Blanchflower and Oswald 2008). Such a U-shaped pattern is found in most Western countries (e.g., Canada, France, Germany, Great Britain, the USA), East European countries (e.g., Croatia, the Czech Republic, Hungary, Poland, Lithuania), and developing countries (e.g., Brazil, China, Iraq, Mexico, Vietnam).

Even though the U-shaped pattern of life satisfaction is observed in Western, East European, and developing countries (Blanchflower and Oswald 2008), other studies suggest that the relationship between age and life satisfaction may vary by culture. For instance, in a study conducted among Chinese adults residing in five capital cities in Mainland China, a steady increase in life satisfaction was observed over the life course (Xing and Huang 2014). On average, Chinese adults aged 65 years and above are more likely to experience a higher level of life satisfaction than younger and middle-aged adults.

In summary, the level of overall life satisfaction remains high into the 60s and early 70s and then drops when satisfaction with health, social life, and leisure activities decreases in late life.

Age-Related Changes in Positive and Negative Affect

Positive and negative affect are important components of psychological well-being. They are defined as hedonic well-being. Positive affect refers to subjective experiences of pleasant emotions (e.g., happy, excited, enthusiastic), whereas negative affect refers to subjective experiences of unpleasant emotions (e.g., sad, angry, worry). They are often measured by emotion checklists to record one's affective experiences at the moment of assessment or over a certain period of time.

Recent research has suggested that affective well-being improves from early adulthood to old age until late 70s and 80s. Both cross-sectional and longitudinal studies found that older adults in general experience stable levels of positive affect, lower levels of negative affect, and lower rates of anxiety and depression (Charles and Carstensen 2010). When examining positive affect, a longitudinal study over two decades found that positive affect remained quite stable from early to middle adulthood and then decreased slightly from mid-60s to late 80s (Charles et al. 2001). Moreover, a longitudinal experience sampling study found that positive emotional experiences improve with age and level off after age 70 (Carstensen et al. 2011). A recent investigation of high- and low-arousal emotions also reveals that age-related decreases in positive emotions in late life are strongly related to high-intensity positive emotions such as excitement and enthusiasm, whereas low-intensity positive emotions such as calm and peaceful do not show an age-related decrease (Scheibe et al. 2013). The age-related decreases in negative emotions from early to middle adulthood are consistently shown in prior research, including the examination of both high-intensity (e.g., anger, rage, despair) and low-intensity negative affect (e.g., worry).

For depressive symptoms, the results of the Baltimore Longitudinal Study of Aging (Davey et al. 2004) showed an age-related increase. However, when certain factors such as health and functional abilities are taken into consideration, these age-related increases in depressive symptoms vanish, and old age is again associated with lower levels of negative affect (Kunzman et al. 2000).

Karasawa and colleagues' (2011) cross-cultural comparison on hedonic well-being revealed that both older Japanese and American adults experienced higher levels of positive affect and lower levels of negative affect than their younger counterparts. In a longitudinal study, Hong Kong Chinese adults whose age ranged from 18 to 86 years were interviewed over the phone to report their emotional reactions to the SARS outbreak (Yeung and Fung 2007). Older respondents experienced less anger than did younger and middle-aged adults during and after the SARS outbreak. To conclude, past findings from both Western and Eastern countries all suggest that older adults often display better emotional well-being than younger adults.

Theoretical Explanations

The aforementioned review of past research suggests that individuals enjoy high levels of psychological well-being in old age even though there are unavoidable declines in physical and cognitive areas. Two theories of lifespan development can help explain these age-related changes. First, socioemotional selectivity theory stresses that motivation changes when individuals age and perceive future time as increasingly limited (Carstensen 2006). Relative to younger people, older people's realization of limited time is accompanied with present-focused awareness, so they are prioritized with goals that can maximize their emotional satisfaction in the present. Accordingly, older adults are more likely to pay attention to emotional information or to use emotion regulatory strategies such as reappraisal to reduce the discrepancy between their current and ideal states. As a result, psychological well-being of older people can be maintained or even improved.

Second, the theory of selective optimization with compensation proposes that when physical and cognitive capacities decline with age, the individuals allocate their resources more carefully (Baltes and Baltes 1990). They select goals that are important and realistic, devote effort and resources to optimize their performance in the prioritized domains, and make use of external aids and social support to maintain a satisfactory outcome. Applying this theoretical framework to psychological well-being, older people select the life domains that are important and achievable to enhance their affective experiences. For instance, they focus on goals of maintaining relationships with emotionally close social partners instead of peripheral partners. Their prior knowledge on handling emotional situations enables them to use the most effective emotion regulatory strategies to deal with the contextual demands. They also seek emotional support and instrumental assistance to compensate their losses in other domains. The use of selection, optimization, and compensation thus helps to maintain psychological well-being in old age.

Future Directions

Contrary to the stereotypical beliefs that old age is linked to sadness and distress, research evidences reveal that people maintain or even improve their psychological well-being with age. However, most past studies on aging and psychological well-being are conducted during typical periods of daily life, and not in the context of major life events. Maintaining a positive psychological functioning is more challenging during moments of hardship or adversity. It remains an open question whether older adults are more able to maintain a high level of psychological well-being in the midst of stressful life events than younger adults. Future studies should compare younger and older adults' longitudinal changes in affective responses to major life events. In addition, prior research mainly assessed the participants' current psychological functioning and seldom looked into their anticipated outcomes in the future. Lang and colleagues (2013) made use of the data from the

German Socio-Economic Panel Study to investigate the effects of current life satisfaction, anticipated future life satisfaction in 5 years, and accuracy of the anticipated life satisfaction on health outcomes. Compared with younger adults, older adults were more pessimistic about their future and underestimated their actual life satisfaction 5 years later. However, such underestimation was indeed associated with positive health outcomes such as lower rates of mortality and disability. It suggests that anticipating a dark future may be adaptive for older people as it can facilitate more preventive measures to minimize potential losses and cultivate a greater sense of control. Future studies should apply this reasoning to other domains of psychological well-being, such as anticipated positive affective experiences in 5 years, to develop a more comprehensive picture of aging and psychological well-being. In addition, cultural variations are observed in certain dimensions of psychological well-being. Future studies would benefit from making use of the longitudinal data from the representative national samples (e.g., MIDUS and Midlife in Japan) to conduct a systematic cultural comparison to unveil the similarities and differences in psychological well-being trajectory between Westerners and Easterners.

Cross-References

- ▶ Age-Related Positivity Effect and Its Implications for Social and Health Gerontology
- ▶ Aging and Quality of Life
- ▶ Mental Health and Aging
- ▶ Positive Emotion Processing, Theoretical Perspectives
- ▶ Psychological Theories of Successful Aging
- ▶ Selection, Optimization, and Compensation at Work in Relation to Age
- ▶ Socioemotional Selectivity Theory

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Aging and Quality of Life

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Synonyms

Happiness; Life satisfaction; Quality of life; Well-being

Definitions

Quality of life – a multidimensional concept that can refer to physical, psychological, and/or social well-being measured at the societal and/or individual level, objectively and/or subjectively.

A Broad Concept

Quality of life is both a multidisciplinary and a multidimensional concept. It can refer to physical well-being, incorporating medical disease, health conditions, and perceived health, to psychological well-being, as indexed by self-esteem and happiness, or to social well-being, capturing how well one functions in their social roles, and connections with family and friends. It can also be conceptualized as a sweeping concept that combines some or all of these particular domains; sometimes referred to as over-all well-being. It can refer to either or both the macro (societal, objective) and micro (individual, subjective) levels.

To illustrate, Anderson (2004) defines five domains of well-being: physical well-being (health, fitness, mobility, etc.); material well-being (possessions, transport, security, privacy, etc.); social well-being (family, relatives, interpersonal relationships, etc.); emotional well-being (trust, self-esteem, satisfaction, etc.); and development and activity (political freedom, employment, education, economic freedom, etc.). Bowling (2004) distinguishes between eight models of quality of life: objective standard of living; health and longevity; satisfaction of human needs; life satisfaction and psychological well-being; social capital; ecological and neighborhood resources; health and functioning; cognitive competence and autonomy and self-efficacy; and values and interpretations and perceptions. Arun and Çevik (2011) draw on Allardt and colleagues' (1993) model, an index comprising three domains – having (material and interpersonal needs), loving (social needs), and being (needs for personal growth) – where each domain has both objective and subjective indicators.

Within each domain, there is similarly no agreement on the conceptualization of the construct. For example, examining only the subjective domain, multiple terms and meanings are used that include morale, self-esteem, fulfillment, happiness, subjective well-being, and overall well-being. Subjective well-being can be studied as either or both cognitive evaluations of one's life and affectivity (ongoing emotional reactions to one's life) (Chappell 2007). It is often defined in terms of valuations of one's life, events in one's life, their bodies and their minds, and the circumstance of their lives (Diener 2006). The World Health Organization (WHO) (1995) has defined quality of life in terms of perceptions of one's

position in life within the context of their culture and in relation to goals, expectations, standards, and concerns. Camfield and Skevington (2008) argue that the centrality of value judgments in definitions of both subjective well-being and quality of life leaves little difference between them. They further argue that, while subjective well-being and subjective quality of life are virtually synonymous, the related concept of life satisfaction is insufficient to explain either.

Some define happiness as affect, feeling, experience, and life satisfaction as an overall evaluation of your life (Deaton 2008); yet others treat them synonymously. Hellliwell and colleagues (2013) note that individuals responding to surveys do not have difficulty distinguishing between happiness as an emotion and happiness as an evaluation of life. Knight and Rosa (2011), nevertheless define happiness as relatively short-term, situation dependent expressions of mood whereas self rating of life satisfaction refers to longer-term more stable evaluations. Veenhoven (1999) though defines happiness as the degree to which an individual judges the overall quality of his or her life favorably and states it can be called life satisfaction.

When reflecting on the number of medical conditions one can study, let alone psychological and emotional states or social circumstances one might live in, it is easy to become overwhelmed. Researchers typically do not address all of these areas but focus on particular aspects. As a consequence, inconsistencies or apparent contradictions between different aspects of quality of life can proliferate. An example comes from the ethnicity area where objective inequities often characterize subcultural groups. When quality of life is measured in terms of economic hardship – often within the context of broader economic, political, and social structures – ethnic subgroups often emerge with a low quality of life. However, when measured in terms of subjective well-being, these same groups often emerge as high, if not higher, than host country populations. This is often explained in terms of their greater access to social support from their social relationships, especially family, which appears to enhance their subjective quality of life (though this does not diminish the objective hardships they experience). The extent to which the in-group supportiveness results from necessity due to a lack of resources to purchase help or lack of culturally appropriate services, and the extent to which it is cultural and preferred, requires more research.

Notions of successful aging are closely aligned with the concept of quality of life. The 1980s saw new nomenclature appear within gerontology with the introduction of terms such as productive aging; referring to an individual who maintains their productivity with age, through work, volunteerism, family caregiving, or other socially valued contributions. The term successful aging became popular at this time, incorporating biomedical, psychosocial and lay definitions. Since that time it has been associated with positive adaptation to growing old, having little disease or disability, preservation of physical and cognitive functioning, high engagement with life, optimal life expectancy, and greater happiness. Recently, the WHO (2002) referred to active aging as "the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age." Other terms, often used interchangeably, have captured the same concept: robust aging, successful aging, vitality, maintenance of functioning, and aging well. All of these terms are intended to portray good aging, i.e., aging with a better quality of life.

It should also be noted that those studying a particular domain of quality of life may do so considering it an indicator of quality of life, but others may do so without considering it an aspect of quality of life but focusing only on that phenomenon. In the health area, researchers study cancer or depression or dementia to learn more about the disease or the health of the individual without necessarily having an interest in quality of life. For others, it can represent a partial or total focus for their quality of life research. In another example, standard of living or socioeconomic status are often studied in its own right or as measures of the political and economic structures of a society. It is also found in quality of life studies as objective measures of the quality of an individual's life, where the more material goods one has,

the higher the income, the greater the wealth, the better the quality of life.

It might also be noted that the emphasis of the research varies depending on the region of the world. In the USA, an overwhelming emphasis on life satisfaction has been evident while in Europe the focus has been more on declines in health and functioning, assuming the worse one's health, the worse one's quality of life.

A Focus on Health

Health receives much attention in gerontology because of the decline in physical health as people age. It is no surprise then that many with an interest in health and aging have an interest in quality of life. As life expectancy has increased in developed countries and increasingly in developing nations, chronic conditions tend to dominate. People are living longer but with several chronic conditions, often requiring complex care. Common chronic conditions in old age include: cardiovascular diseases, hypertension, stroke, diabetes, cancer, chronic obstructive pulmonary disease, muscular-skeletal conditions including arthritis and osteoporosis, mental health conditions such as dementia, and blindness and visual impairment. Both the number of chronic conditions and functional disability increase with age and continue to do so throughout old age (Chappell and Penning 2012).

However, the findings in relation to health-related life quality, within the same country and between countries, are mixed. The extent to which selection effects account for differences between studies is not known. It is clear that most studies exclude those living in long-term care institutions who no doubt have a greater number in addition to more severe chronic conditions. Typically, our physical health declines gradually. Not all older adults are incapacitated and, among those who are, there are degrees of disability. Many have a chronic condition (some loss of eyesight is an example; diabetes might be another) but that condition does not interfere with their functioning. When the health problem interferes with functioning, typically it has more consequences for the individual's quality of life. Mobility disability is especially important because being able to ambulate is critical to so many activities permitting independence, so often related to quality of life.

Disability is not a characteristic of the individual per se but rather it is a relational concept taking the intersection between the individual and the environment into account. For instance, if an individual has difficulty walking up and down stairs but lives in an area that is flat, with no stairs, they are not disabled and their difficulty is unlikely to effect their quality of life. In gerontology, the disablement process refers to a dynamic interaction that takes into account attitudes, emotions, stigma, accessibility, thus embracing a relational concept. However, it is not often measured as such. Some measures capture bodily function (also referred to as impairment), some activity limitation, some participation restriction. Some ask for self-identification as disabled, some ask about diagnosable conditions, basic activities of daily living, instrumental activities of daily living, and/or participation. The lowest rates are typically obtained when asking a person whether they have a disability, suggesting impairments per se do not necessarily result in perceptions of a lower quality of life.

When someone experiences multiple declines in physical, mental, and psychological functioning, there is relative consensus that he or she has transitioned from independence to dependence, and has thereby become frail. There is general agreement that their quality of life is poor, but no consensus on how to define frailty. Moreover, being dependent does not necessarily mean the person is frail (Rockwood and Mitnitski 2007). Adding to the complexity, some argue that successful aging does not mean avoiding declines in health but includes adjusting to poor health and other challenges in old age. That is, someone who is sick, has poor health, or is frail can age well and have a good quality of life. Supporting this view is the research documenting that life satisfaction, happiness, and well-being tend to be high even among older adults with declining physical health and increasing disability. The vast majority of older adults report being happy or very happy for example in the USA, Canada, China, Italy,

Germany, the Netherlands, Luxemburg, Austria, the UK, and Sweden (Chappell and Cooke 2010).

Health quality of life, similar to overall quality of life, is measured both objectively and subjectively. Declines in objective measures of health, however, do not necessarily translate into perceptions of lower quality of life, pointing to the importance of taking subjectivity into account.

Psychosocial/Subjective Well-being

In this area the focus tends to be on specific domains of quality of life related to family, social relationships, finances, leisure, spirituality, health, and/or a combination of these domains that are summed or weighted to provide an overall global evaluation of one's life. The subjectivity is especially important because the term "quality" suggests a standard of valuation that many argue is necessarily subjective, defined by the individual involved. This implies that older adults themselves must be the definers of their own quality of life (Walker and Mollenkopf, 2007). This argument is supported by the Easterlin paradox which essentially recognizes that within a society, rich people tend to be much happier than poor people; rich societies are no or not much happier than poor countries; and average national happiness does not increase over long spans of time, in spite of large increases in per capita income (Helliwell et al. 2013; Deaton 2008). Additionally, those who have a high standard of living and wealth can nevertheless be unhappy. Conversely, there are those living in objectively disadvantaged circumstances who are happy. Even though much of the research on the correlates or predictors of quality of life, reports that social class or socioeconomic status is a significant correlate, it explains little of the variance. This accounts for the apparent (but not real) contradiction with the fact that many subcultural groups who live in economic disadvantage also maintain good subjective quality of life. It also adds support to the argument that quality of life has, at minimum, a subjective component. Other typical correlates include health and relationships with family and friends, including social support. Furthermore, higher subjective well-being leads to healthier, more productive, and social connected lives (Helliwell et al. 2013). That is, there are benefits not only for the individual but also for families, the economy, and community.

An added dimension is that correlates of happiness change somewhat as we age. Diener (2006), studying adults throughout the life span, reports that while health satisfaction declines over the life course, job and income satisfaction are flat for much of life, but increase dramatically in later life starting in the 60s and 70s and peaks later. Relationship satisfaction increases sharply from the teen years to the 20s and is flat until the mid-40s then increases steadily until the late 70s. Satisfaction with social life, amount of leisure time, and use of leisure time decreases sharply from the late teens to the early 40s, and then increases rapidly from the mid-40s to late 70s. In most domains and the overall category, life satisfaction ratings do not decline until very late (80+). Indeed, when all domains are aggregated, there is a high correlation with the global life satisfaction scale.

Furthermore, the salience of specific domains of quality of life changes once we are older (speaking here of what we generally consider old age – 60+ or 65+). Not surprisingly, health and relationships, especially with family, gain importance. The decline in satisfaction with health is not surprising given the objective decline in physical health with age. While satisfaction with health is related to objective measures of health, overall satisfaction with life is not strongly related to objective measures of health such as life expectancy (Deaton 2008).

Global indices indicate that life satisfaction among older adults is high. The vast majority report being very satisfied or satisfied with their lives and to experience high levels of overall happiness. Blanchflower and Oswald (2008) analyzed data from 72 countries, and find a curvilinear (U-shaped) association between age and psychological well-being across the life course. Specifically, when factors such as gender, education, income, and marital status are held constant, individual life satisfaction and happiness are at a minimum in middle age. In contrast, Deaton

(2008) reports that, internationally, age has an inconsistent relation with happiness and that the U-shape is found only in wealthier English-speaking countries. Part of the difficulty in drawing conclusions in this area is the diversity of measures used, making comparisons problematic.

Longitudinal research shows differing results depending on the country studied, and often different studies conducted in the same country report different findings. Some countries reveal curvilinear relationships whereby happiness is the lowest in middle age. Depending on the study, some aspects of subjective well-being (such as positive affect) decline in old age while others (such as negative affect) remain stable. Still others find that life satisfaction remains constant across the lifespan, even among the oldest old (Yang 2008; Kunzmann et al. 2000). In many studies, age differences disappear when controlling for other factors such as functional limitations, income, and social relationships such as marital status.

Conclusions

Quality of life in old age is a concept with much intuitive appeal; people evaluate the quality of their lives. Reaching consensus on its meaning, however, has been challenging and thus far unachievable. It is used in a variety of ways by researchers in many different disciplines. It is viewed as objective and/or subjective, as multidimensional, or as an overarching concept referring to the totality of one's life. Objective domains are not consistently related to subjective domains, indicating the importance of saliency of the domain to the person involved. In older age, it is no surprise that the health domain becomes more salient given the declines in physical health that occur in later life. The fact that some individuals enjoy a high quality of life despite serious health conditions raises some interesting directions for future research that will enhance our understanding of the possible relationships between objective and subjective aspects of quality of life.

Indeed, one of the main paradoxes in this large but inconsistent research literature is the fact that objective measures of social class and socioeconomic status often emerge as statistically significant correlates of subjective measures of quality of life, and at the same time, economically disadvantaged groups can nevertheless experience a subjective quality of life that is at least equal to, if not higher than, those with greater economic or social class wealth. A challenge for this area is to adequately explain these apparent contradictory findings. An answer likely lies in an examination of the intersection of multiple facets of life (such as social class plus social support and expectations).

Cross-References

- ▶ Aging, Inequalities, and Health
- ▶ Aging and Psychological Well-being
- ▶ Mental Health and Aging
- ▶ Psychological Theories of Successful Aging
- ▶ Psychological Theories on Health and Aging

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Aging and Semantic Memory

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Synonyms

Conceptual knowledge; General knowledge base; Semantic network

Semantic memory is postulated to be our mental repository of facts, their relationships, and their meanings – knowledge about the world independent of personal identity or past (Tulving 1972). In Tulving's conceptual framework, semantic memory stands in contrast to episodic memory, which represents information about personally experienced events and when they occurred. As an example, the knowledge we have about pancakes (a common breakfast item; coming in buttermilk, blueberry, or Swedish varieties; served warm, perhaps with syrup; etc.) would reside in semantic memory. Whether we had pancakes for breakfast yesterday morning, and if so, how many and of what style, or simply whether we had seen *pancake* on a word list would all be time-tagged episodic memories. Generally speaking, information in semantic and episodic memory is said to constitute declarative memory, material we are able to express verbally, and stands in contrast to procedural memory, knowledge expressed via our actions rather than verbally.

There is substantial evidence that the information network comprising semantic memory holds up fairly well over the course of normal adult aging, particularly when compared to episodic memory. This article reviews the relationship of normal adult aging to various characteristics of semantic memory such as the integrity of information in semantic memory, the speed with which it can be retrieved, and the theoretical mechanism (priming via spreading activation) that permits awareness of one item in semantic memory to bring other, meaningfully related items to mind. It concludes with a discussion of semantic memory's role in neurological and cognitive adaptations associated with normal adult aging.

The Contents and Structure of Semantic Memory

Copious evidence shows preservation of (if not an increase in) the information stored in semantic memory such as vocabulary and general knowledge as measured via IQ or similar tests through much of adulthood. Begun in 1988, the Betula Project has involved thousands of adult

participants assessed at five-year intervals. One of its primary goals is to study changes in adult memory functions through old age. Cross-sectional word comprehension and general knowledge data reported from this study (Nilsson 2003) have shown that although the best performance for adults was in their late 50s, there was no significant difference in performance on semantic memory tasks between the group in their late 30s and the group in their late 70s. This corroborated many earlier findings that substantial deficits in vocabulary do not become common until one's 80s.

Rönnlund, Nyberg, Bäckman, and Nilsson (Rönnlund et al. 2005) performed a cross-sequential analysis of data from the Betula Project involving a sample of participants from across ten age cohorts ranging from age 30 to 85. For the portion of the study concerned with semantic memory, participants from these ten groups were administered general knowledge, vocabulary, and word fluency tests on two occasions separated by 5 years. Semantic memory performance based on the cross-sectional data indicated stable performance until age 55 and then a decline in performance close to two standard deviations by age 85. In contrast, the longitudinal change scores actually showed improvement in semantic factors through age 60 and then a much milder decline to age 85. Concerned about the possible influence of cohort effects on the cross-sectional data and practice effects on the longitudinal data, the researchers ran follow-up analyses to account for these factors. The adjusted adult age patterns for both the cross-sectional and longitudinal semantic memory data were remarkably similar to the pattern for unadjusted longitudinal data: improvement through age 60 followed by mild decline into the 80s.

Using participants from the Betula Project and another sample, respectively, both Nyberg et al. (2003) and Enmarker et al. (2006) supported the basic pattern of semantic performance over adult age described above through their comprehensive examinations of the structure of declarative memory, the invariance of this structure with advancing adult age, and the nature of declining performance with advancing adult age. Their findings supported an age-invariant semantic component to declarative memory with subdivisions of knowledge (the contents of semantic memory) and fluency – the efficiency with which the knowledge can be accessed. (Additionally, an episodic memory component emerged with subdivisions of recognition and recall.) Their results from vocabulary and knowledge-based tests, in particular, showed the same peak performance described above in young-old adults with no significant differences between middle-aged and old-old adult age groups. In the fluency measures, somewhat greater decline was found among the old-old.

Data from another large project in adult aging, the Seattle Longitudinal Study (SLS) (Schaie 2013), provide evidence similar to the pattern in semantic memory found in the Betula Project. This study was begun in 1956 and to date has involved more than 6000 participants aged 22 to over 100. Compared to many other measures of cognitive ability, SLS data show verbal meaning (vocabulary) scores decline the latest – not until the late 70s – but are then among the steepest. As the seven-year data cycles have progressed over the decades, peak scores in the latent verbal ability construct have moved from the 50s to the 60s. Even into the late 80s, declines in general verbal ability are modest. Indeed, because of the rise in abilities through middle age, the SLS data show essentially no difference in overall verbal abilities between adults in their 20s and 80s.

Yet another large project in adult aging, the Victoria Longitudinal Study, has yielded findings similar to the basic patterns reported above concerning semantic memory (Small et al. 2011). Based on two semantic measures (world knowledge questions and vocabulary), data gathered over a period as long as twelve years from nearly a thousand participants aged 55–95 indicated mild declines in world knowledge of about a quarter of a standard deviation per decade prior to age 75 and half a standard deviation per decade after that. No significant changes in vocabulary were found up to age 75; thereafter the declines were just shy of a third of a standard deviation per decade. Interestingly, for neither metric did declines accelerate in the 80s.

Older adults' semantic performance shows impressive resilience even when additional stressors are introduced. Situations in which diminished performance would be expected due to factors other than aging often do not produce interactive aging effects in semantic memory tasks. For example, if older adults' semantic structure were compromised relative to young adults', one might expect noisy testing conditions to impact older adults' performance more severely than young adults'. However, neither Enmarker (2004) nor Enmarker et al. (2006) found an interaction of noisy test conditions with adult age on word comprehension and word fluency measures. Marital status is also well known to affect physical health and cognitive abilities. Compared to married adults, declines are found in divorced, widowed, or never-married adults on such diverse measures as periodontal disease, depression, general cognitive abilities, risk for Alzheimer's disease, and life span. Yet, Mousavi-Nasab et al. (2012) found no interaction of adult age and marital status on vocabulary or fluency tests. The integrity of information in semantic memory appears to hold across adult age even in the face of factors known otherwise to diminish cognitive performance.

Accessing Semantic Memory

The above discussion shows that the richness of semantic information is well maintained and even rises with age. To this may be added many other findings that young and older adults produce comparable semantic associations, demonstrate similar effects of word frequency, and show the same influence of the strength of two items' semantic relatedness. All of the laboratory evidence supporting the preservation of semantic processes notwithstanding, age-related memory problems are reported more frequently among older than young adults, and these differences are confirmed in the laboratory in areas such as naming common objects, producing words from definitions, and the number of tip-of-the-tongue episodes (Burke et al. 2000). One clue to explaining this paradox is the robustness of reported decline across many types of information. It is plausible, therefore, that any adult age-related performance declines in semantic tasks may be attributable to retrieval processes rather than changes in the structure or content of the semantic memory system, per se. Consistent with this interpretation are production deficits such as generally increased speech disfluencies with adult age and even an age-related increase in spelling errors when conveying well-formed ideas in writing (MacKay et al. 1999).

The assessment of semantic fluency provides a good example of how older adults' decline in production processes might mask intact semantic processes. Early studies of word fluency showed deficits in the rapid access of lexical material with adult aging. As well, the Seattle Longitudinal Study (Schaie 2013) indicated significant decrement in word fluency by age 60 (unlike its finding of preserved vocabulary performance past the 70s), and fluency data from the old-old participants in the Betula Project showed somewhat greater declines relative to other semantic measures. Other work suggests that diminished verbal fluency past middle age may be less the result of declines in accessing semantic content than of declines in executive or language production processes. In a longitudinal study involving data collection at two points separated by a three-year interval, Hultsch et al. (1992) found declines in older adults' world knowledge and verbal fluency but not in their vocabulary. These results have been interpreted as support for the culpability of declining retrieval processes in that both the world knowledge and verbal fluency tasks make high retrieval demands but vocabulary does not.

Mayr and Kliegl (2000) used a word fluency task to demonstrate more directly a dissociation between semantic processes that remain intact and executive retrieval processes that decline with adult age. They had participants in one condition generate exemplars from a single category; participants in another condition generated exemplars from two alternating categories. They proposed that while executive and semantic search processes would be present in both conditions, additional executive functions would be present in the two-category switching task. Their results showed

age effects in the nonsemantic, executive task elements. However, the rate of semantic access did not differ with adult age. Furthermore, the manipulation of category difficulty affected young and older age groups equivalently, evidence that adult age did not affect semantic retrieval. Along with their analyses of the structure of semantic information, Nyberg et al. (2003) and Enmarker et al. (2006) found young-old adults' fluency in producing information from semantic memory was slightly better than middle-aged adults'. Consistent with a broader pattern across adulthood, however, the old-old adult age group showed significant decline.

Further support for the distinction between the activation of semantic information and the ability to report it comes from a study by Shafto et al. (2007) of tip-of-the-tongue (TOT) experiences. Their work also provides a glimpse at how a neurological approach to changes in adult cognition adds a dimension not captured by purely behavioral measures. TOTs produce a frustrating failure to report key information (i.e., the name of a target word) along with strong semantic activation of information related to the target. As mentioned above, there is a parallel increase in semantic knowledge and frequency of TOT episodes as adults age into their 70s. This suggests a deficit in reporting otherwise intact semantic information. Shafto et al. uncovered evidence of the neural underpinnings of these parallel trends. Their findings replicated a positive relationship between adult age and TOT frequency, but they also found a positive relationship between the number of TOTs and the amount of gray matter atrophy in the left insula as measured by MRI. The left insula is known to support phonological production. What is more, this relationship held with the effects of age removed, supporting the involvement of declining phonological production, not semantic impairment, with TOT frequency.

Neurological studies of semantic processes also show that equivalent or superior findings on cognitive measures in older versus young adults may also suggest different forms of supporting neural processes in the two groups. Peelle et al. (2013) had young- and older-adult participants undergoing an fMRI scan judge whether two named items shared a particular attribute (e.g., are a carrot and cucumber the same color?). While there was an age-group difference on this task, a subset of the older adults performed comparably to the young adults. Generally speaking, semantic processing was associated with a pattern of activation in the ventral-lateral temporal-occipital cortex for all the participants. However, the older adults who performed comparably to the young showed a different intensity of brain activation. Relative to the young adults, the better-performing older adults showed more activity bilaterally in the premotor cortex and in the left lateral occipital cortex. The authors concluded that performance maintenance on this semantic task in some older adults was due to a reallocation of the brain areas supporting the ability. Gray matter atrophy affected these areas in the older adults for whom task performance declined. The issue of modified patterns of brain activation with age is addressed more generally below.

Semantic Priming

In addition to explicit behavioral and neurological measures of semantic processes, semantic memory may also be examined using implicit measures. Explicit measures of the content or structure of semantic memory or the speed of accessing it based on deliberate, conscious search (e.g., in a fluency task or a free-recall paradigm) may show age-related decline to the extent that they rely on executive or speech production processes. But implicit measures of semantic processes avoid these concerns and provide corroborating evidence of preserved function with adult aging. This is commonly demonstrated in measures of semantic priming and with the semantic priming effect in particular. The semantic priming effect is the empirical finding that recognition or pronunciation of a target word will take less time or be more accurate when the word is preceded by a meaningfully related word than when preceded by an unrelated word or by no word at all. For example, responding that the string of letters *nail* is indeed a word will be faster

if it is presented following the word *hammer* than following the unrelated word *toast* (or following no word at all). The semantic priming effect here would be the difference in reaction times between the primed and unprimed conditions. This effect is held to be evidence for spreading activation, a theoretical (but neurologically informed) construct by which recognition of a stimulus facilitates responding to semantically related concepts. Theories representing semantic memory as a network of nodes and connections (Collins and Loftus 1975) attribute the reduced response time or increased response accuracy in priming conditions to a process of automatic spreading activation from the node of a recognized word to the linked nodes of meaningfully related words. Responding to a related target is facilitated by the accumulated activation from the node of the priming word.

In a meta-analysis of semantic priming effects, Laver and Burke (1993) found older adults' larger, but nonsignificant priming effects from individual studies provided combined evidence that older adults benefit more from a semantically related prime than do young adults. Not surprisingly, older adults' greater priming effects are typically associated with longer response latencies than for young adults. To address the concern that their longer response latencies permitted older adults a greater accumulation of spreading activation and thus greater priming, Laver (2009) employed a response deadline procedure to equalize response times for young- and older-adult participants. With processing times controlled across age groups, older adults still showed semantic priming effects at least as large as young adults'. This suggests the mechanism by which information in the semantic memory system is accessed is at least as efficient in older than young adults.

Semantic Memory and Theories of Cognitive Aging

Among the oldest theories of cognitive aging is general slowing, which holds that speed of execution diminishes with advancing adult age across all types of cognition (Salthouse 1996). Yet, many of the findings described above appear to contradict the notion of universal slowing. In response to findings incongruent with general slowing, a modification of the theory emerged, domain-specific slowing, in which tasks within a particular area of cognition exhibit decline due to slowed processes. Pressing questions for domain-specific slowing include differences in the onset of slowing in various areas of cognition and the rate with which slowing proceeds once begun. Nevertheless, the evidence discussed above is consistent with domain-specific slowing in that executive and response production processes show decline, whereas access to and activation among semantic concepts appear to remain intact well into adult age.

Another theory of cognitive aging that has been applied to semantic processes is the inhibition deficit theory (Zacks and Hasher 1997). The fundamental premise in this theory is older adults' diminished ability to inhibit task-irrelevant information. While evidence is found in many corners of the cognitive aging literature for greater activation of distracting information in older adults and their reduced ability to inhibit these distractions, this approach does not seem able to explain older adults' preserved or improved verbal and semantic abilities relative to young adults. As summarized above, older adults have no trouble with the comprehension or concept generation processes associated with semantic tasks, but their response production is often impaired. Inhibition deficit theory does not account for this asymmetry. Even when considering the one aspect of verbal production that inhibition deficit theory does predict, verbosity or off-topic speech, the detailed evidence is not congruent with inhibitory deficits. The amount of older adults' verbal output varies with the kind of topic they are addressing, but when they are verbose, older adults' speech is denser with topic-relevant information.

As an elaboration on earlier network theories (Collins and Loftus 1975), node structure theory is able to account for older adults' retained comprehension processes and rich semantic networks as well as their difficulties in response production (Burke et al. 2000). This theory organizes nodes

and their connections into hierarchical levels, with phonological and orthographic nodes at the bottom, lexical nodes above that, and propositional nodes forming the uppermost level. The flow of activation in perceptual/recognition processes is bottom up. The multiple feature nodes of a seen or spoken stimulus send activation upward along connections that converge on a lexical node. This spreading activation summates at the lexical node and may surpass a threshold level resulting in the recognition of a word. An activated lexical node, in turn, sends activation across connections to related propositional nodes in the level above. Related nodes not receiving activation sufficient to result in conscious recognition nevertheless receive a boost toward that threshold. In such a primed state, these nodes require less additional activation to reach threshold relative to their base state.

Activation within the semantic system of lexical and propositional nodes is supported by the redundancy of connections among its nodes. Along with reduced frequency or recency of use, node structure theory posits that advancing age may of itself diminish the ability of individual connections to transmit as much spreading activation as quickly as in young adults. In compensation, however, adult age results in more nodes and connections in the semantic system reflecting a greater knowledge base than in younger adults. The greater number of connections can offset their diminished individual functioning, which accounts for the finding that older adults' semantic priming effects are at least as large as young adults'.

However, the one-to-many, diverging architecture of top-down pathways (e.g., from concepts to phonology) in node structure theory does not always provide sufficient activation for responses, and this transmission deficit (along with older adults' slower connection speed) can explain diminished age-related response production even though concept recognition and generation are spared. When summation of priming is supported, as in bottom-up processes or in the spread of priming among the copious connections within a rich semantic network, the diminished capacity for transmission of priming within individual connections is easily overcome, and no age-related declines are manifest. Because node structure theory acknowledges the likelihood of slower cognitive processes (i.e., spreading activation) within the semantic system, in its own way it corroborates general slowing theory. But the semantic richness of old age and the converging bottom-up node structure compensate for this slowing. This results in a preservation of function not seen in other areas of cognitive aging.

Craik (2000) has written of the possibility that the general performance difference between episodic and semantic memory in older adults may stem from the specificity constraining the expression of information from the two domains. Semantic memory affords a richness or redundancy of information not present in episodic memory. As a consequence, much semantic information is open to various ways of expression, whereas episodic memories concerning time or place must be more specifically expressed. Craik sees this as a potential explanation of declines in semantic memory performance involving information that leans toward the specific and for which there are few if any possibilities for rephrasing, e.g., word finding or recall of names.

Semantic Memory and Adaptation

An important theme that emerges from the work on cognitive aging in general and semantic memory in particular is that of adaptation. The process of cognitive adaptation in adult aging is found in areas of study as distinct as age-related changes in basic neurological functions and the ability of elders to function in the everyday world. In the first area, we can juxtapose older adults' well-preserved semantic functions with the substantial adaptation (relative to young adults) in the brain tissue that supports those functions. In the second area, there is the possibility of adapting preserved semantic memory to the practical support of other cognitive functions that decline sooner or more rapidly in adulthood.

The first form of adaptation involves changing cognitive structures and changing patterns of neurological activation with advancing adult age.

Not only may older and younger adults' equivalent performance on certain cognitive tasks rely on different patterns of brain activation (as discussed briefly above), but older adults may demonstrate generally more distribution of brain activation as well. The proposition that what are distinct neurological or cognitive functions in early adulthood merge as adulthood progresses is known as dedifferentiation. Support for dedifferentiation comes from two broad, converging sources: analysis of behavioral measures (both cross-sectional and longitudinal) and results from neuroimaging techniques. In tying these diverse data together, Cabeza's (2002) theory of hemispheric asymmetry reduction in older adults (HAROLD) also incorporates evidence of diminished age-related asymmetry in word recognition and semantic retrieval tasks. What is more, early findings of increasing age-related correlations among cognitive measures as well as their increasing correlations with measures of sensory function suggest that dedifferentiation could occur not only within a cognitive domain (such as semantic memory) but also across cognitive domains (such as semantic memory and sensory processing). Hülür et al. (2015) corroborated this notion with data from the Seattle Longitudinal Study, indicating the consolidation over adulthood of subtest scores on number ability, verbal meaning, and word fluency within the factor of crystallized, semantic abilities. Their analysis also indicated the coupling of this factor with others such as fluid abilities and visualization.

Copious neurological data complement the cognitive data that point to dedifferentiation in showing shrinkage of brain tissue and reallocation of brain activity. Park and Reuter-Lorenz (2009) not only provided a review of such findings from imaging studies, they also offered the scaffolding theory of aging and cognition (STAC) to account for them. STAC posits that cognitive scaffolding – the use of additional neural resources to bolster declining structures – occurs throughout life in response to cognitive challenges. It does, however, become more prevalent over time as adult aging results in more frequent challenges. Of course, theories of age-related changes in cognitive function and neural activation address far more than semantic memory. But for all the relative resilience of semantic processes through adulthood, it is noteworthy that they too are subject to the broad influence of dedifferentiation.

The second form of adaptation concerns semantic memory's relative durability and how it may serve to support practical aspects of aging. Is it possible to capitalize on the relative preservation of semantic memory in older adults to support or improve other cognitive functions, episodic memory in particular? It seems intuitive and has been formally argued that semantic memories ordinarily begin as forms of episodic memory, but there is preliminary evidence that semantic memory serves to support the formation of episodic memories as well (Cabeza 2002; Greve et al. 2007). Some recent work has explored the question of whether invoking semantic aspects of information may improve older adults' episodic memory performance (e.g., list learning).

Episodic memory may be tested by having participants study lists with individual words or lists with paired words. Memory for lists containing unpaired items is commonly tested via free recall, but paired-item lists often involve cued recall in which the first item from a word pair is presented as a cue for remembering the associated second word. Relative to young adults, older adults' performance in recalling single items from a study list is impaired, but the deficit is even greater for paired items. This has been attributed to a problem in binding the paired words. Binding is considered essential in linking two, often arbitrarily paired words for subsequent cued recall. Naveh-Benjamin and his colleagues have investigated whether semantic memory support can alleviate older adults' associative deficit in recalling paired items. They examined whether word pairs with existing semantic relationships (e.g., *doctor-nurse*) would improve older adults' cued recall over pairs with no such relationship (e.g., *rock-number*). Their results were mixed. A prior semantic relationship between paired words did help older adults' recall performance relative to the condition in which the paired words had no semantic relationship, but this occurred only for

items in long-term, not short-term memory conditions (Brubaker and Naveh-Benjamin 2014).

All else being equal, the mental clustering of to-be-remembered information from a list according to semantically related categories is well known to improve recall relative to conditions in which no strategy is used, but there are mixed findings regarding the benefit of this strategy in older adults. At first thought, it might seem that older adults would have an advantage in the ability to organize such information based on the strength of their semantic networks. However, strategically utilizing semantic information requires executive resources that are not necessarily resistant to decline over adulthood. Kuhlmann and Touron (2014) investigated whether the semantic clustering of items would improve older adults' recall performance on a list-learning task. Older adults were certainly capable of forming semantic clusters of list items, but this strategy was effective for them only when the words were presented simultaneously on a single screen. When the words were presented individually, the dual task demands of needing to keep the words in mind along with the strategy of forming semantic clusters reduced the older adults' performance to the level found when no semantic clustering was used. (Younger adults' recall was superior to the older adults', and they performed as well regardless of word presentation format.) The above discussion suggests that, within the laboratory at least, older adults' intact semantic processes may be hard pressed to improve the function of episodic processes because using them may rely on diminished processing resources.

Outside of the laboratory, preserved semantic processes likely serve a critical role in older adults' ability to deal with everyday life. Despite copious evidence of adult age-related cognitive decline (in areas other than semantic processing), everyday functioning appears typically spared in older adults. Salthouse (2012) offered several possible explanations for this incongruity. First, even with the diminishment of maximal functioning as measured in laboratory assessments, successful functioning in daily life requires a typical level that is below even older adults' reduced maximal functioning. Everyday life does not regularly present the abstract, novel problems found in formal assessments. Furthermore, there are multiple determinants of successful functioning in everyday life (e.g., motivation, focus, and personality in addition to cognitive abilities), and older adults often make accommodations to declining skills by delegating increasingly challenging responsibilities to others or avoiding difficult tasks altogether. But most relevant to the subject of adult age and semantic memory is Salthouse's point that older adults promote successful functioning in everyday life by adopting a strategy of shifting from novel processing to reliance on their lifetime of accumulated knowledge. As Salthouse points out, "little or no consequence of cognitive declines may be evident when one can draw upon relevant knowledge," and older adults' greater world knowledge and intact ability to draw on it may serve an important role in their success in everyday tasks.

Summary

In normal adult aging, the rich network of information in semantic memory is retained, at least through one's mid-80s. Although some studies suggest that verbal fluency in reporting semantic information may decline earlier, these findings may well be the result of declining executive and language production processes, not the impairment of the semantic memory system itself. Further evidence for the strong preservation of semantic memory into old age comes from studies of semantic priming, an implicit measure of access to semantic information. Using semantic memory's relative strength in the support of other declining cognitive abilities has received limited support from laboratory studies but seems to be critical in maintaining older adults' everyday functioning.

Cross-References

▶ Cognition
▶ History of Cognitive Aging Research

- History of Cognitive Slowing Theory and Research
- History of Longitudinal Studies of Psychological Aging
- Process and Systems Views of Aging and Memory
- Cognitive and Brain Plasticity in Old Age
- Cognitive Compensation
- Cognitive Neuroscience of Aging
- Crystallized Intelligence
- Language, Comprehension
- Language, Discourse Production and Communication
- Language, Naming
- Memory, Episodic
- Normative Cognitive Aging
- Neurocognitive Markers of Aging

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Aging and Slowing of the Neuromotor System

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Synonyms

Neuromuscular system; motor processes; physiological declines; loss of complexity with aging

Definition

The declines observed across numerous motor functions that develop as a consequence of the natural process of aging can be broadly viewed within the context of a general slowing of various physiological processes.

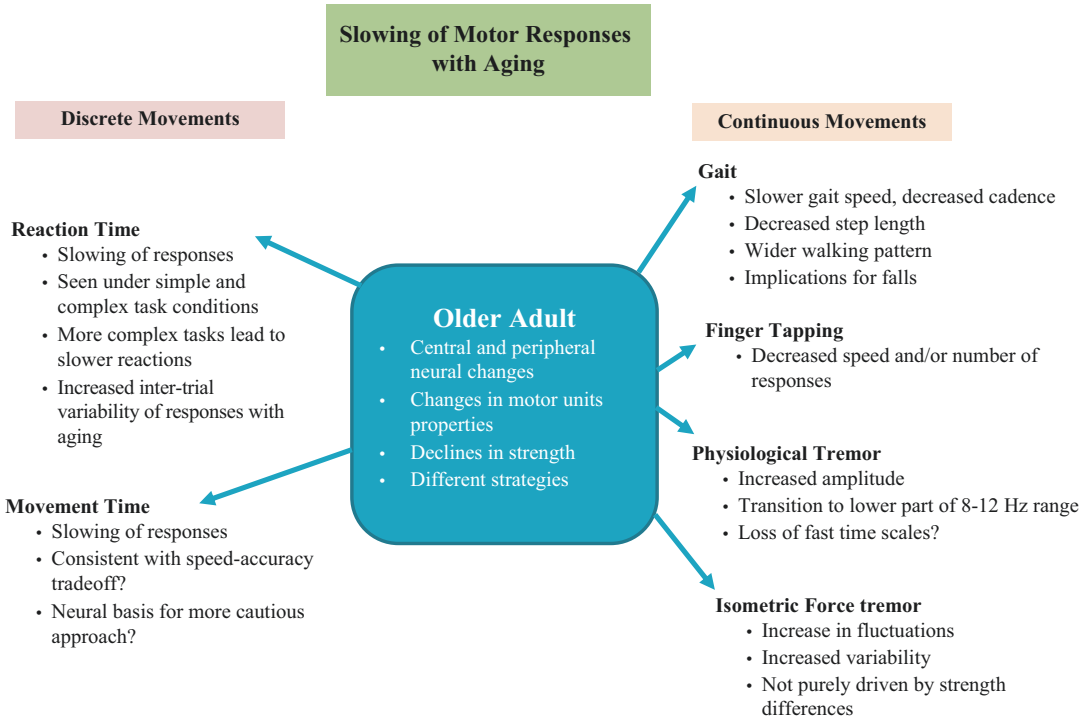
The processes of aging tend to progressively degrade the human motor system and reduce the ability of even healthy elderly individuals to move and perform skillfully in the tasks of everyday life (Spirduso 1985). At the behavioral level of analysis, these detrimental effects of aging are most typically manifest in the decrement of performance outcome, a change in indices of movement variability and/or a loss in the efficiency of movement. There is also an age-related change in the complexity of output of the human physiological and behavioral systems (Lipsitz 2002; Lipsitz and Goldberger 1992; Vaillancourt and Newell 2002).

A pervasive phenomenological change with aging that has been the subject of considerable experimental investigation is the progressive slowing of the neuromotor system (Cousins et al. 1998; Moehle and Long 1989; Deary et al. 2010). The slowing of movement-related properties is found across all levels of analysis of the system (behavioral, neural, chemical, thermal) and from dynamic analyses of the organization of subsystems in the control of movement behavior, such as the muscle, spinal cord, and brain. The slowing of the aging motor system is also apparent in a range of behavioral movement-related properties. Indices of slowing in aging have been reported across the spectrum of movement actions, from eye movements to fine motor skills involving a small number of joints/muscles such as in laboratory reaction time-movement time and finger-tapping tasks and more complex gross motor activities such as walking that involves the coordination and control of multiple elements of the skeletal-muscular system. Figure 1 provides a schematic overview of the predominant qualitative changes in movement tasks and properties of motor control with aging.

The slowing of the motor system in aging leads to a loss of functional capacity, adaptability, and, in the ultimate expression, death (Birren and Fisher 1991). The changes in the timescales of motor output and the multiple processes that support it provide an interdisciplinary window into the motor control of aging. There has been an increasing interest in system's frameworks of analyses to the timescales of change in aging given that it is difficult to ascribe a causal relation (as in the reductionist agenda) of one particular process to the performance decrement with aging.

Discrete Movement Tasks

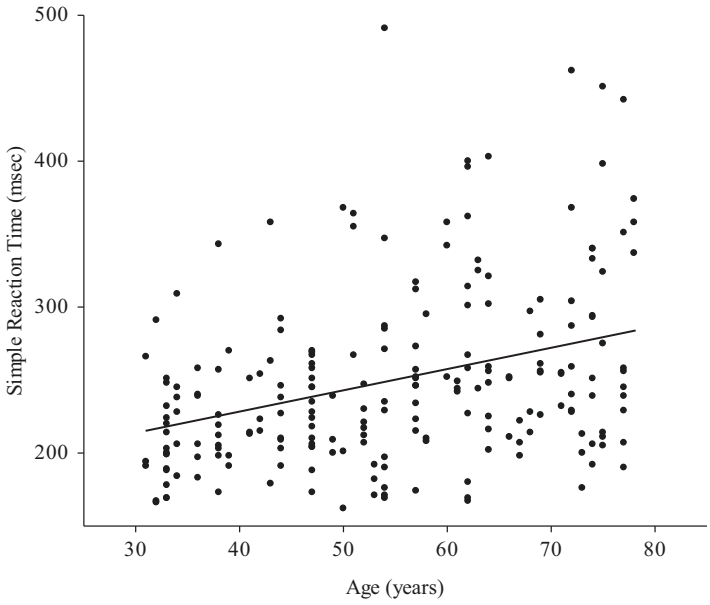
Reaction Time. Assessment of reaction time (RT) in discrete movement tasks has been a



Aging and Slowing of the Neuromotor System, Fig. 1 Schematic illustration of the various changes in motor outputs with aging. The general characteristics of the changes within each movement are also outlined

common approach to determining the impact aging has on cognitive and neuromotor processes (Bunce et al. 2004; Graveson et al. 2015; Hultsch et al. 2002; Spirduso 1980; Spirduso et al. 1988; Williams et al. 2005; Welford 1988). Reaction time measures the latency from the presentation of a "go" signal to the onset of the appropriate movement response (Spirduso 1980, 1985). Typically, investigators assess the response latency of the subject under either simple reaction time (SRT) or choice reaction time (CRT) conditions. SRT consists of a single stimulus to begin the action that is paired to a single possible response. For CRT conditions, more than one stimuli is available to be presented, with each stimuli requiring a different response (e.g., the varying stimuli may relate to performing the action with a different effector or, when performing the action, moving to different targets). The time taken to perform the movement component of the task is referred to as movement time (MT). To minimize any anticipatory actions, the foreperiod (i.e., time from a "ready" signal to the presentation of the "go" signal) is usually varied so the individual cannot predict when the stimulus to start the movement response is provided (Welford 1971, 1988).

Typically, reaction time tends to progressively increase (i.e., individuals get slower in the latency of their responses) from their mid-20 years until the individual passes 70 years of age (Welford 1988). Naturally, the changes in age-related RT are more marked when the task response is more difficult, as where individuals are required to respond under CRT situations (Bunce et al. 2004; Spirduso 1980; Williams et al. 2005). The use of EMG to fractionate RT has shown that the majority of the simple and choice RT age effect is in the pre-motor phase – that is, the time from the onset of the stimulus to begin the action to the initiation of muscle activity (Clarkson 1978). Interestingly, the effects of age on both RT and the time it takes to perform the desired movement (MT) are not the same across genders, with males generally



Aging and Slowing of the Neuromotor System, Fig. 2 Age-related differences in simple reaction time responses. Data were attained from 75 healthy adults ranging in age from 30 to 80 years of age. The reaction time task involved depressing a computer button with the index finger in response to a light stimulus. Three individual trial responses from each person are shown in this figure

exhibiting faster (shorter latency) responses compared to females. However, both males and females are similarly influenced by condition effects such as complexity of stimulus context (Der and Deary 2006). An example of the typical pattern of change in simple RT with age is shown in Fig. 2.

The resultant age-related slowing of motor responses under the various RT situations is not simply reflected by changes in the average latency of the person's response. Increases in intraindividual variability (i.e., trial-to-trial variation in RT performance) are also a function of healthy aging (Graveson et al. 2015; Hultsch et al. 2002; Light and Spirduso 1990). Together, the age-related slowing of RT and increased trial-to-trial RT variability has been linked with a general decline in cognitive functioning, including attentional and/or executive control mechanisms (Bunce et al. 2004; Deary et al. 2010).

Interestingly, the reports of increased intertrial variability with aging are consistent with the general view that the process of aging or the emergence of age-related diseases is reflected by changes in the variability and/or complexity of a given physiological process (Lipsitz 2002; Lipsitz and Goldberger 1992; Vaillancourt and Newell 2002). Indeed, from this perspective, a diverse range of studies have shown how the complexity/variability of such diverse physiological time series such as brain activity (i.e., EEG), neuromuscular function, respiratory and cardiovascular responses, balance, walking ability, physiological/pathological tremor, and hormone secretion is systematically affected by increasing age in adulthood (Hausdorff et al. 2005; Newell et al. 2006; Peng et al. 1995; Pincus 1994).

Movement Time. Within the context of the reaction time discrete movement paradigm, MT captures the time from initiation of the selected response to the termination of the movement (Schmidt and Lee 2011; Spirduso 1985). Similar to the results reported for RT changes with aging, older adults tend to exhibit a slowing of MT (Sleimen-Malkoun et al. 2013a; Temprado et al. 2013; Birren and Fisher 1991; Heitz and Schall 2012; Ketcham and Stelmach 2004). Based upon an understanding of the age-related changes in various physiological processes, a number of different explanations such as neural noise theory and the general slowing hypothesis were developed to explain the slowing of MT with aging (Schmidt and Lee 2011; Spirduso 1985). Aging individuals tend to follow the speed-accuracy relation described by Fitts' (1954) law in aiming tasks, but the effect of task difficulty

(amplitude increase and/or target size decrease) tends to slow the movement more than in young adults (Fitts 1954; Forstmann et al. 2011; Smith and Brewer 1995; Ketcham and Stelmach 2004; Sleimen-Malkoun et al. 2013b).

Continuous Movement Tasks

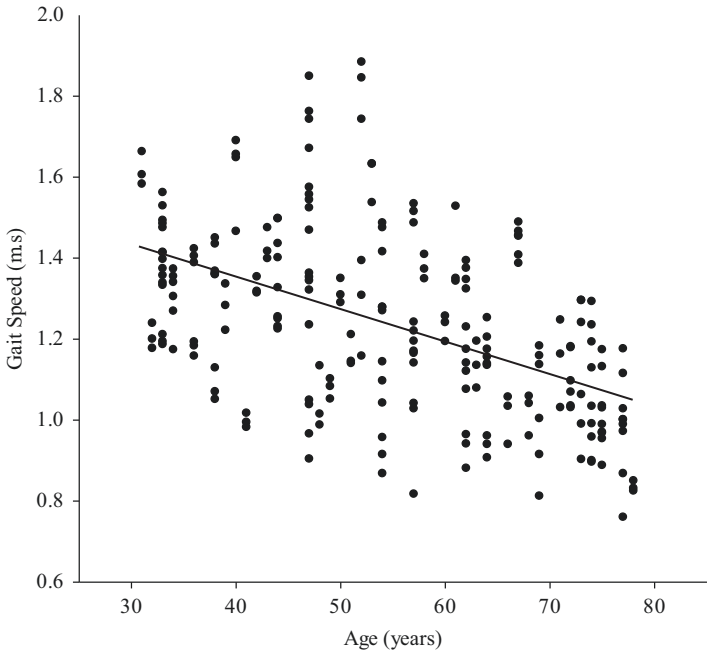
Aging-related effects of the slowing of the neuromotor system have also been studied in sequential and continuous movement tasks. The aging-related slowing of the motor system is observed in both the preferred rhythm and the maximal frequency (or minimal duration) of motor output for a given task.

Finger-tapping. The pattern and frequency of finger-tapping has been widely used to assess how aging or neurological disease impacts on central nervous system function (Aoki and Fukuoka 2010; Arunachalam et al. 2005; Cousins et al. 1998; Moehle and Long 1989). Consistent with the general trend of the observed slowing of movement responses, several studies have reported a decline in finger-tapping speed (i.e., declines in overall rate and longer inter-tap intervals) and increased variability of tapping responses in both healthy older adults and persons with neurological disorders such as Parkinson's disease and Alzheimer's disease and where damage to the cerebrum leads to declines in cognitive function (Cousins et al. 1998; Shimoyama et al. 1990). The basis for this decline appears to be embedded within neuromotor changes rather than being attributed to deficits in peripheral sensory function or force-producing capacity of the muscles involved in the task (Aoki and Fukuoka 2010).

Isometric Force Control. When grasping an object with the hand, there is a requirement to produce a certain level of (isometric) force in order to hold and manipulate the object (Flanagan et al. 1999). In performing these tasks, the resultant force profile is characterized by a series of small fluctuations or oscillations referred to as force steadiness or isometric force tremor (Enoka 1997; Christou and Carlton 2001). Consistent with the pattern of findings for other activities, older adults often exhibit reduced control in force production, as quantified by an increase in the amplitude of these fluctuations (Kinoshita and Francis 1996; Lazarus and Haynes 1997). Interestingly, this decrement in force-producing capacity has been interpreted to reflect changes in motor unit (MU) control and sensorimotor function and not simply in terms of muscle strength. The consequence of these changes is that elderly adults exhibit greater targeting error and isometric force variability.

Gait. Walking performance is another movement activity where declines are observed with increasing age in adulthood. The preferred walking speed of healthy older adults (i.e., over 60 years) tends to be significantly slower than healthy adults in their 20s, and walking speed continues to decline as the person ages further (Murray et al. 1969). One reason for this decrease in speed appears to be that older persons take a shorter step length in preference to altering (i.e., decreasing) step time (Himann et al. 1988; Winter et al. 1990; Owings and Grabiner 2004). Further adaptions utilized by older adults include increasing the proportion of time spent in double stance (i.e., both feet in contact with the surface of support), taking wider steps, and reducing the proportion of time spent in the swing phase during locomotion (Murray et al. 1969; Winter et al. 1990). The goal of these adaptations would appear to ensure an optimal level of dynamic balance during locomotion and prevent falls (Maki 1997). Figure 3 illustrates the general pattern of change in gait speed as a function of the normal process of aging.

However, these decrements in walking performance are not the singular product of chronological aging per se. Several studies have found no gait differences between healthy young and elderly adults when the older individuals have been screened for potential physical impairments (Grabiner et al. 2001; Owings and Grabiner 2004). These findings indicate that factors other than chronological age such as fear of falling, decline in cognitive processing speed, decreased leg strength, and/or reduced leg range of motion are also likely to contribute to the slower walking speeds observed in the average elderly individual



Aging and Slowing of the Neuromotor System, Fig. 3 Pattern of changes in individual walking speed as a function of increasing age. Gait speed data were attained while healthy individuals ($n = 75$) walked at their preferred speed on a 20 f. GAITRite pressure-sensitive walking surface. Three individual trial responses from each person are shown in this figure

(Maki 1997; Kang and Dingwell 2008). These associations of potential causal factors provide indirect evidence that there are multiple contributions to the slowing of neuromotor system with aging.

Generalization of Intraindividual Movement Slowing Across Tasks. The findings on the behavioral slowing of the aging movement system in different motor tasks have typically been reported in isolation. This experimental design does not afford an examination of the generalization of intraindividual movement slowing that is assumed to hold in theories of aging. The limited studies on intraindividual generalization have reported modest correlations of movement slowing over tasks with the effects stronger as aging advances (Bielak et al. 2010; Dykiert et al. 2012).

Physiological Basis for Slowing

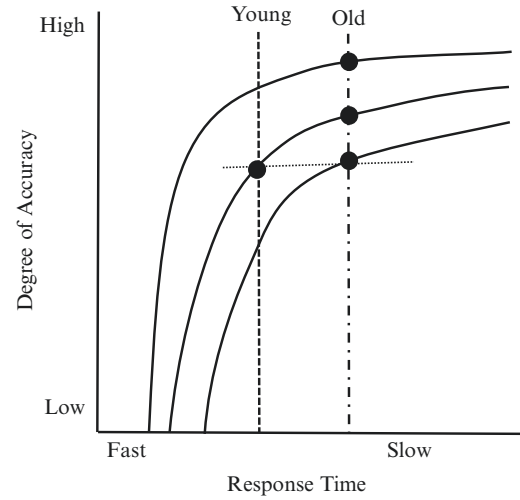
Physiological Function and Structure. While there seems to be little dispute regarding the general slowing of behavioral responses with aging and age-related diseases, the basis for such changes cannot be linked to any single defining factor. For example, the slowing of RT, increased trial-to-trial RT variability, and decreases in tapping speed have primarily been tied to a generalized decline in cognitive function. In contrast, changes in tremor and force production have been attributed to decline in neuromuscular function, particularly with respect to changes in MU capabilities. Many of the reported age-related declines have been linked to structural changes within the CNS itself that can include decreases in overall conduction velocity, age-related losses of white matter and gray matter, and degeneration of neurotransmitter systems (Zimmerman et al. 2006; Soares et al. 2014; Wang and Young 2014; Seidler et al. 2010). A consequence of these structural changes within the CNS is that, when performing the same motor task, older adults demonstrate increased activity across a wider network of motor areas within the brain (including the regions of the prefrontal cortex and basal ganglia) compared to younger adults (Seidler et al. 2010; Riecker et al. 2006; Ward 2006).

In addition to the central changes in function, there are a number of peripheral physiological changes that may impact on the ability of the older adult to respond quickly and appropriately. Central to these changes is the general decline in

skeletal muscle function that leads to an overall decrease in muscle cross-sectional area, a reduction in muscle mass, and a decline in strength. Specific structural and functional neuromuscular changes that can arise with aging include increases in the variability of MU firing, atrophy of fast-twitch MUs, remodeling of MUs, and a decline in the number of alpha motor neurons (Erim et al. 1999). These peripheral changes have been linked to the slowing of gait responses, declines in isometric force control, and the altered dynamical structure of physiological tremor (Himann et al. 1988; Kang and Dingwell 2007; Morrison and Sosnoff 2009; Enoka 1997).

As an example, changes (slowing) in physiological tremor dynamics have been widely reported in healthy older individuals. The primary mechanism for this change has been some compromise in the neural output – the result of a general decline in the functional capacity of the aging system (Elble 1998; Morrison et al. 2006; Raethjen et al. 2000). Physiological tremor is an intrinsic property of a normal functioning nervous system which reflects the aggregated contribution from the mechanical resonant properties of the limb segment, cardiac mechanics, central neural mechanisms, and more peripheral neural contributions from stretch reflexes (Elble and Koller 1990; McAuley et al. 1997). The oscillations of the central neural component of physiological tremor are typically within the 8–12 Hz range and represent output from neural oscillatory structures including the basal ganglia, thalamus, inferior olive, and alpha motor neurons within the spinal cord (Elble 2000; McAuley et al. 1997). For older adults, changes in this intrinsic, involuntary motor output are reflected by increases in overall tremor amplitude and/or a decrease in frequency, with the tremor responses being observed at the lower range of the 8–12 Hz bandwidth (Elble 1998; Morrison and Sosnoff 2009; Raethjen et al. 2000). Thus, the general slowing of motor responses is also reflected by a loss of the fast timescale processes inherent in physiological tremor of postural control.

While the predominant view is that the slowing of movement responses is primarily driven by declines in physiological processes, an alternate (but related) consideration relates to the possibility that older adults select different strategies when performing movement tasks compared to younger adults. Under RT conditions, for example, there is evidence to indicate the older individual is often more careful and cautious in their selection of when to respond – in effect trading speed of movement for accuracy of performance (Bunce et al. 2004; Hultsch et al. 2002; Light and Spirduso 1990; Williams et al. 2005; Spirduso 1985). Thus, in comparison to younger adults, older persons may prioritize minimizing performance errors over moving faster, and so the observed slowing of responses may actually reflect that they occupy a different criterion position on the speed-accuracy continuum (Spirduso 1985; Welford 1988). Figure 4 illustrates this pattern whereby older adults may operate on a different point and/or curve with regard to the relation between speed of response and target accuracy (Salthouse 1979). However, this is not to say that this trade-off is voluntarily driven and occurs independent of any age-related changes in the underlying neurological structures. For example, studies



Aging and Slowing of the Neuromotor System, Fig. 4 Illustration of the potential differences in the speed-accuracy trade-off as a function of increasing age. The increased response time for older adults in comparison to young adults may reflect that they operate on a different point and/or curve. For example, to achieve a similar degree of accuracy as the young adults, older persons may operate on a different curve (*3*), or if they operate on the same curve (*2*), they would trade-off accuracy for speed (Adapted from Spirduso 1985)

have reported that the adoption of a more cautious selection strategy in older adults could also be reflective of alteration in the activation pattern and/or impaired neural connectivity between such regions as the supplementary motor areas and striatum (Bogacz et al. 2010; Forstmann et al. 2011; Heitz and Schall 2012). Supporting this view, van Dyck and colleagues (2008) reported that declines in dopaminergic function within the basal ganglia can be linked to the progressive slowing of RT in older adults (van Dyck et al. 2008).

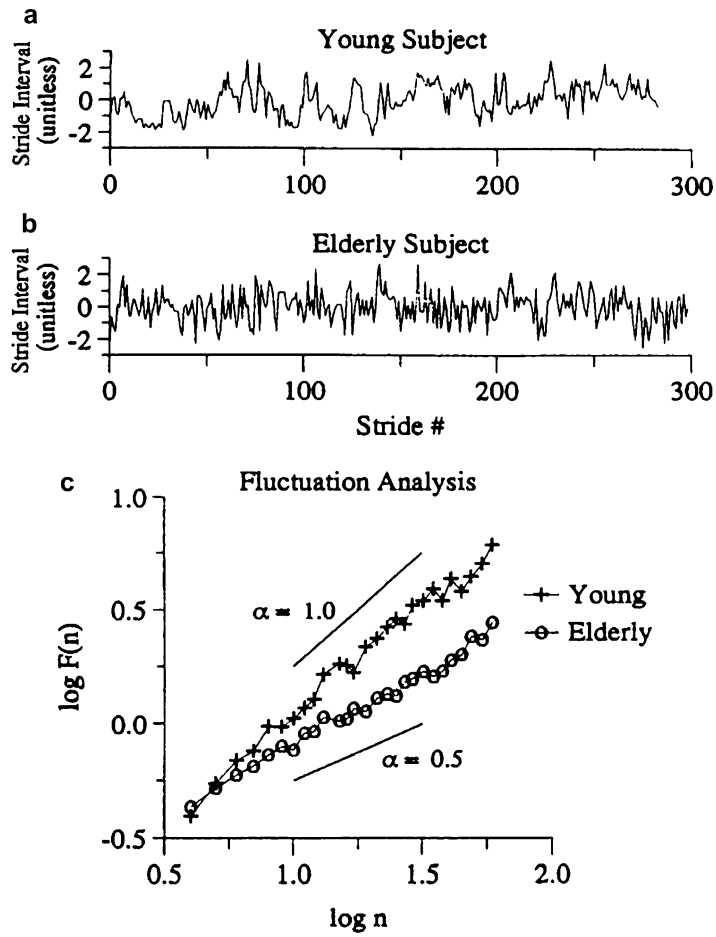
The consequences of the declines across various physiological systems are not simply restricted to performance within the context of a single task. One of the major health concerns for older adults is the likelihood of suffering a fall (Tideiksaar 1998; Tinetti et al. 1988). The trend of a slowing of responses, including decreased strength, slowing of reactions, walking slower, loss of physiological variability, impaired balance, changes in visual and/or sensory function, and declines in cognitive functioning all are factors that are linked with (and contribute to) increased falls risk for older individuals (Close et al. 2005). There is little doubt that the combined gradual slowing of responses across a range of physiological and behavioral outputs are driving factors underlying the increased occurrence of falls in older adults. However, the consequences are not simply limited to the immediate outcomes of suffering a fall (e.g., injury, death), as the long-term effects can be just as problematic. Indeed, a previous fall can be the precursor for a downward cascade of decline, as many people become less physically active, which can lead to further losses of muscle strength, adopting a slower, more cautious walking pattern, and exhibit increased tiredness following a fall. All these outcomes can ultimately lead to a further increased risk of falling and are viewed as markers for the descent into physical frailty (Fried et al. 2001).

Aging and the Adaptation of Multiple Timescales

The preceding sections show the pervasive and well-established examples of behavioral and physiological slowing of the neuromotor system as a function of aging. For the majority, these examples rest on the traditional distributional analyses of temporal components of behavioral responses and activities that are driven by the mean and standard deviation of the dependent variable in question (e.g., RT, MT, finger-tapping rates, average gait speed, and cadence). This standard approach, however, takes out the roles of time- and frequency-dependent structure in a time series of behavioral output in spite of being concerned about the role of time in aging and, more generally, developmental processes.

Since the early 1990s, there has been a concerted effort to introduce a new view to understanding the problems of aging that is formulated around the general umbrella theoretical constructs of self-organization and the emergent complexity (Lipsitz and Goldberger 1992; Vaillancourt and Newell 2002). The construct of self-organization in behavior is tied to the emergent dynamics, their change over the life span, and the contribution of different timescales to this process. The timescales provide a window into the role of different processes in a systems framework to movement behavior and its change over time. In this view, a timescale is not merely the duration of an event as in the typical psychological framework, but is an interval that arises from the intrinsic dynamics of the system (growth-decay and/or oscillatory processes).

This approach incorporates the use of nonlinear dynamics, frequency analysis, and time series analysis to provide additional insight as to process of aging and/or disease. While distributional analysis of variables through a mean and SD is still useful, it does not directly address the time- and frequency-dependent properties of physiological and behavioral data that are often more sensitive to age-related change. Moreover, Gilden et al. (1995) showed that even the pattern of RT responses, rather than exhibiting a normal distribution, was more appropriately characterized by complex frequency and nonlinear tendencies (the pattern was referred to as an example of 1/f noise). Subsequently, there have been many developments around this dynamic theme to traditional human performance variables in different experimental paradigms.



Aging and Slowing of the Neuromotor System,
Fig. 5 Differences in the pattern of stride interval (*top*, **a**) during walking in healthy young and older adults. Plots of the resultant differences in signal complexity (*bottom*, **b**) using detrended fluctuation analysis are also shown (Figure adapted from Hausdorff et al. 1997)

Hausdorff and colleagues (1997) studied the increase in the degree of variability of the gait pattern in aging adults and disease states such as Huntington's and Parkinson's disease (Hausdorff et al. 1997). They used spectral analysis and detrended fluctuation analysis to reveal the structure in the gait cycle beyond mean and SD of stride length (see Fig. 5). Their central finding was that the variability of the gait cycle exhibits properties of a self-similar system. That is, fluctuations of the gait cycle exhibit long-range correlations such that the stride properties of any given cycle are dependent on a cycle previously at rather remote times, perhaps hundreds of cycles earlier in the locomotion sequence. Their analyses showed, as others have since, that the dependence of the stride interval decays as function of a power law, suggesting a fractal pattern to the structure of the variability of the gait cycle over time. An important consequence of this finding is that it shows that the variability of the gait cycle is not that of a signal plus noise process, as has been viewed traditionally in studies of gait variability and assumed more generally in age-related performance decrements. Rather, this result highlights that there is an inherent dynamic structure to the variability of movement patterns and that deviations from the typical pattern of complexity may reveal insights as to the impact aging and disease on the selected motor output.

Sosnoff and Newell (2008) examined the age-related loss of adaptability to fast timescales in the motor variability of isometric force production (Sosnoff and Newell 2008). The sensorimotor outputs to differing time and frequency properties (1/f noise structures) of target-force

waveforms were studied. By having force-tracking pathways that followed different fractal noise structures, the manipulation of timescales in the task demands could directly be accomplished (i.e., changing the relative contribution of long- and short-frequency processes). The results showed that, when compared to younger adults, the older persons were progressively less able to approximate the lighter-color noise force targets and utilize information in the higher frequencies of the target signal.

The findings of Sosnoff and Newell (2008) are consistent with aging and the loss of complexity hypothesis of Lipsitz and Goldberger (1992), given that there was a declining ability with aging to use the faster timescales of sensorimotor control in force output. However, several studies have now shown that the particular directional effect of the loss or gain of complexity of force is moderated by the differential impact of task demands (Vaillancourt and Newell 2002). This is consistent with the general view that behavior is an emergent property of the confluence of constraints of the individual, environment, and task and that complexity is an emergent feature of the interaction of the three classes of constraint and not a property that should be viewed as within the body.

Concluding Comments

An inevitable consequence of the aging process is that behavioral movement speed slows across all movement domains. Although the lifestyle of the older individual in terms of health status and exercise habits can slow this decline in movement speed to some degree (Spirduso 1980, 1985), the degradation across all levels of the central-peripheral nervous system means that slowing of movement responses in the aging adult is pervasive and has many specific manifestations, only the major ones of which are addressed here. It follows then that all theories of aging, whether psychological, physiological, biological, or more general systems accounts, have tended to address this important phenomenon (Spirduso 1985, 2005).

The challenge is that correlates of the slowing of movement speed with aging can be found at many theoretical levels of analysis thereby lending support to the veracity and relevance of all theories of aging although no single unified theory has adequately captured the full scope of the declines seen across the various movement domains. Spirduso (1985, 2005) has proposed that the most compelling hypotheses to explain the age-related behavioral slowing are to be found in the various manifestations of biological deterioration that induce the slowing of movement in action seen in the aging adult. The system's approach to the loss of complexity (Lipsitz and Goldberger 1992) provides a complementary framework for investigating the array of age-related changes found for physiological and behavioral processes. Contemporary research on movement and aging is still focused on hypotheses of network signal and connectivity issues in the aging neuromotor system.

Cross-References

- ▶ Age and Intraindividual Variability
- ▶ Age-Related Changes in Abilities
- ▶ Age-Related Slowing in Response Times, Causes and Consequences
- ▶ Healthy Aging
- ▶ Neurocognitive Markers of Aging
- ▶ Physical Activity and Aging
- ▶ Physiological Effects on Cognition

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Aging and Strategy Use

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Synonyms

Strategic processing; Strategic variations

Definition

Strategy use refers to the sets of procedures employed to accomplish a cognitive task. With aging, changes in every strategy dimensions are observed.

Research in cognitive aging aims at knowing what changes in human cognition with age and how age-related changes occur. Determining what changes in human cognition entails examining which cognitive functions decline and which ones remain stable (or even improve) with age. Deciphering how changes occur means trying to understand mechanisms underlying both age changes and age invariance in cognitive performance. Investigating strategy use in young and older adults contributes to achieve these two main goals. In this article, strategy use and other strategic variations in human cognition and when strategic variations occur during cognitive aging are first discussed. Then, an elaboration on factors and mechanisms driving strategic variations during adulthood is provided.

Strategic Variations in Human Cognition

When children and adults of varying ages accomplish cognitive tasks, they use a wide variety of strategies (Siegler 2007). A *strategy* can be defined as "a procedure or a set of procedures for achieving a higher level goal or task" (Lemaire and Reder 1999). When researchers adopt a strategy perspective on cognitive aging, above and beyond determining what changes and what remains constant with age in cognitive performance, they investigate the following strategy dimensions (Lemaire and Siegler 1995; (Lemaire 2010):

- *Strategy repertoire* includes all available strategies to accomplish cognitive tasks.
- *Strategy distribution* refers to how often each strategy is used.
- *Strategy selection* characterizes how strategies are selected among on each item.
- *Strategy execution* concerns performance (i.e., speed and accuracy) yielded by each strategy.

A strategy perspective is useful to understand cognitive aging for several reasons. First, it enables to characterize cognitive changes during aging, as it helps uncovering mechanisms responsible for age-related changes in cognition. Second, a strategy perspective enables to distinguish cognitive processes that decline with age from

those not affected during aging. Moreover, the strategy perspective is fruitful to understand individual differences during adulthood, as research has found that some people age better than others. Finally, a strategy perspective offers a deeper understanding of when age-related declines in cognitive performance result from age-related decrease in processing resources like processing speed and when they result from changes in how tasks are accomplished. This article presents age-related changes and invariance in strategic variations by examining when young and older participants differ (or not) in strategy repertoire, distribution, selection, and execution when they accomplish cognitive tasks (Lemaire 2010); (Duverne and Lemaire 2005).

Strategy Repertoire

Age-related differences in strategy repertoire are seen in differences in the type of strategies used and/or in the number of strategies used by young and older individuals. Age-related differences and similarities in strategy repertoire have been found both when strategies can be observed directly with external behavioral evidence (via video recordings or verbal protocols) and indirectly when no external behavioral evidence are available (i.e., via performance variations as a function of task or stimuli parameters).

To give one example, previous research has found that both young and older adults' strategy repertoires include the following nine strategies when people are asked to solve mentally two-digit addition problems like 17 + 51: retrieving the product directly from long-term memory (e.g., people retrieve 68 directly from memory as a correct sum), rounding the first operand down (or up) to the nearest decade and then adding (or subtracting) the units (e.g., doing 10 + 51 + 7 or 20 + 51–3), rounding the second operand down (or up) to the nearest decade and then adding (or subtracting) the units (e.g., 17 + 50 + 1 or 17 + 60 – 9), rounding both operands down (or up) to the nearest decades and then adding (or subtracting) the units (e.g., doing 10 + 50 + 7 + 1; 20 + 60 – 3–9), using columnar retrieval (e.g., adding 1 + 5 for decades and then adding 1 + 7 for units), or borrowing units from one operand to increment the other (e.g., 18 + 50). What is interesting is that both young and older adults, as a group, used these nine strategies (Lemaire and Arnaud 2008); (Hodzik and Lemaire 2011). However, examining the number of strategies used by each individual revealed that older individuals used fewer strategies than young individuals. This suggests that strategy repertoire used in a given task can be smaller in older than in young adults, even if both age groups know all available strategies.

Changes in strategy repertoire with age have been found not only in the number of strategies used by individuals but also in the type of strategies. For example, when they want to make a decision regarding a product to purchase, older adults tend to adopt simpler strategies (e.g., they tend to search fewer pieces of information) than young adults. Note though that older adults do not always use simpler strategies. For example, if they are asked to verify arithmetic problems like 8 + 4 = 19 vs. 8 + 4 = 13, young adults tend to use calculation strategies to determine that the second equation is false and fast, easy plausibility-checking strategies on the first equation. Older adults tend to use the harder, calculation strategies, even when basic arithmetic skills are comparable in both age groups.

Differences in strategy repertoire have been found in a number of cognitive domains, ranging from low-level sensorimotor tasks (e.g., Fitt's pointing tasks) to higher-level inferential tasks (e.g., deductive reasoning tasks). Note though that age changes in strategy repertoires are not always found. Sometimes young and older adults accomplish cognitive tasks using the same and same number of strategies. For example, in episodic memory, where participants are asked to learn pairs of words like *dog basket*, both young and older adults use sentence generation (i.e., they make a sentence with each pair of words like "the dog sleeps in her basket"), interactive mental imagery (i.e., constructing a mental image with each word of the pairs), or repetition (i.e., continuously repeating pairs of words) strategies, as well as other or no strategies (Hertzog and Dunlosky 2004).

One fascinating feature of cognitive aging regarding strategy repertoire is that both differences and similarities in young and older adults' strategy repertoires can be found in the same domain and sometimes with the same task. For example, when participants verify arithmetic problems like $4 \times 13 = 54$ or $4 \times 13 = 57$, both young and older adults are faster on the latter than on the former (Hinault et al. 2015). Presumably, both age groups verify the parity rule (i.e., when at least one of the two operands is even, the product is even; otherwise the product is odd like in $4 \times 13 = 52$) in such arithmetic problem verification tasks. This means that, depending on the domain, on the task, as well as on the task environment, young and older adults can use the same or different strategy repertoires. In order to best characterize participants' performance, it is crucial to determine how young and older adults accomplish cognitive tasks and if they use the same strategy repertoires.

Strategy Distribution

Even when both young and older adults know and use the same strategies and the same number of strategies, they may differ in how often they use each available strategy. Indeed, studies in a variety of domains found that older adults do not use available strategies as equally often as young adults.

Differences in mean percentages with which young and older adults use available strategies have been found in domains as varied as decision making, reasoning, memory, problem solving, language processing, or numerosity estimation. For example, research has found that, compared to young adults, older adults tended to use the optimal strategy (i.e., the strategy that consists in asking the most informative question) less often in inductive reasoning tasks, to use the less efficient computational estimation strategies or numerosity estimation strategies more often when participants were asked to find approximate products to two-digit problems like 57×89 or to find the approximate number of dots in dot collections briefly displayed on a computer screen, to use more often the retrieval strategy (i.e., retrieving the correct solutions directly from long-term memory) (Geary and Lin 1998) when asked to solve simple one-digit addition or multiplication problems, to use plausibility-checking strategies more often to answer comprehension questions about a text they had just read, and to use sentence generation, rote repetition, or interactive imagery strategies to judge sources of information in source-memory tasks.

Note that sometimes, in the same cognitive domains, both age- and no age-related differences in strategy distributions are found. For example, in episodic memory, some research found that to encode pairs of words, young and older adults did not differ in how often they used the sentence generation, interactive mental imagery, repetition, as well as other or no strategies. Other research (Bouazzaoui et al. 2010) found that young and older adults did not use these strategies equally often either when participants encoded pairs of words or accomplished other episodic memory tasks like recognition tasks or like when they had to determine how they use external aids (e.g., drawing lists of items to purchase) in daily-life memory tasks (like remembering grocery shopping lists).

It is important to note that there is no general rule that can be stated regarding the contexts in which young and older adults use available strategies to different extents. Indeed, researchers found that older adults tend to use sometimes simpler strategies more often than young adults and sometimes more difficult strategies more often, independently of relative strategy performance. Thus, age-related differences is characterized sometimes by older adults using simpler and easier strategies more often, sometimes using more complex and harder strategies more often, irrespective of which strategy is most efficient. The only important thing to remember is that it all depends on a number of factors, like characteristics of participants (e.g., their level of education, their profession, their health), the domain and tasks in these domains (e.g., finding a solution vs. determining whether a proposed solution is correct or incorrect), the situations and task instructions (e.g., emphasizing speed vs. accuracy), the type of (easy vs. hard) items, and the cognitive costs incurred by available strategies.

Strategy Selection

Strategy selection concerns how one strategy is chosen among available strategies on each item. Age-related differences in strategy selection can be assessed by determining how often young and older adults are able to calibrate their strategy choices to task parameters (e.g., instructions, items, type of strategies) and how often to select the most efficient strategy on each item. Crucial to strategy selection are the abilities to choose strategies on a trial-by-trial basis. Such trial-by-trial strategy choice process is in sharp contrast with selecting a given strategy applied on the whole set of items, or with selecting a strategy executed on the first half of items and a second strategy used on the second half of items, or with any other variants of such processes that would dispense participants from making strategy choices on each item. It also differs from random and inconsistent strategy choices across items. Systematic trial-by-trial strategy choices require participants to be able to flexibly switch between different strategies on successive items when the best strategy on successive items differs and to use the same strategy on successive items when the best strategy is the same on these items.

Only in domains where young and older adults have reached a high level of expertise do we find that most participants use a given strategy on almost all items. For example, in simple arithmetic tasks, where participants have to find solutions to simple one-digit addition or multiplication problems like 3×4 or $5 + 2$, did previous research find that participants use retrieval strategy (i.e., they retrieve the correct answer directly from memory) on over 95% of trials. In some studies, most likely due to cohort effects, older adults have been found to use retrieval on 100% of trials and young adults on around 80–90% of trials (Geary and Lin 1998). Such lack of trial-by-trial strategy selection in older adults most probably stemmed from high level of expertise in arithmetic that made one strategy most efficient on all items, rather than from strategy inflexibility.

In most domains, some strategies are more efficient on some items and other strategies on other items. In such domains, previous research has found strategy flexibility and calibration of strategy choices to task parameters in both young and older adults. Previous research has also found both age-related differences and similarities in strategy selection. For example, in arithmetic, when participants were asked to select the better of two available rounding strategies to find approximate products to two-digit multiplication problems like 62×86 (e.g., rounding both operands to the nearest smaller decades, like doing 60×80 and providing 4800 as an estimate), older participants selected the best strategy on each problem less often and less systematically than young adults (Lemaire 2010). Similarly, when asked to select encoding strategy to memorize lists of words, to search information about items to purchase, to combine premises to make inductive inferences, to use linguistic cues to understand sentences or texts, and to accomplish mental rotation and sentence-verification tasks, older adults were less systematic in selecting the best strategy on each item. Some research recently found that, when they selected the best strategy less often than young adults, older adults adopted an easier, cognitively less-demanding approach. They tended to repeat the same strategy on consecutive items even if the best strategies were not the same on these consecutive items, or to use the easiest strategy to execute even if this easiest strategy was not the most efficient (Lemaire 2015).

In many studies, older adults have been found to be less able than young adults to calibrate their strategy choices to item or situation characteristics. For example, when they were asked to encode lists of words, older adults tended to use interactive mental imagery to encode concrete words and sentence generation to encode abstract words less systematically than young adults (Hertzog and Dunlosky 2004). Similarly, when time to encode items in episodic memory tasks was limited, relative to older adults, young adults tended to more systematically and more efficiently adjust their strategy choices relative to an unlimited encoding time condition.

Finally, it is important to note that in a few experiments where participants were instructed to use a given efficient strategy (e.g., “use

interactive mental images to encode as many words as possible when you memorize this list of words"), both young and older adults increased their use of interactive mental imagery to comparable extents (Hertzog and Dunlosky 2004). When the best decision-making strategy was taught to young and older adults, both age groups used it more systematically than when they were not taught such strategy. More generally, in several domains, when information about relative strategy efficacy was provided prior to the experiment, age-related differences in how often young and older adults used the best strategy on each item tended to decrease and sometimes to disappear.

Strategy Execution

Differences between young and older adults in strategy execution are the strongest and most robust of all age-related differences in strategic variations. Strategy execution refers to relative strategy speed and accuracy. Above and beyond general slowing, previous research has found that older adults tend to be slower and less accurate when they execute strategies. Age-related differences are increased not only when participants execute harder strategies, but also when they execute strategies in most demanding conditions. Examples of most demanding conditions include harder items, situations with high-speed/high-accuracy pressures, under stress, or tasks that are less familiar to participants.

For example, when participants use rote repetition, mental imagery, or sentence generation to memorize pairs of words, older adults obtain poorer performance with each of these strategies than young adults (Hertzog and Dunlosky 2004). When participants are forced to execute rounding-up strategy (i.e., rounding both operands to the nearest larger decades) to find product estimates to all two-digit multiplication problems (i.e., doing $80 \times 40 = 3200$ to estimate 72×34) of a given set and to use the rounding-down strategy on all problems of another, matched set of problems, older adults are slower and less accurate than young adults, especially with the most difficult rounding-up strategy. These age differences are larger if participants are asked to execute the poorer strategy (e.g., the rounding-up strategy on small-unit problems like 72×34 and the rounding-down strategy on large-unit problems like 54×69) (Hinault et al. 2015). Similarly, in episodic memory, age-related differences are larger when participants are asked to execute the interactive imagery strategy on concrete words than when executing it on abstract words (Hertzog and Dunlosky 2004). As another example, as participants had encoded lists of words, age-related differences in participants' performance were larger after using a deep-encoding strategy (e.g., find a synonym of each word) than after using a shallow-encoding strategy (e.g., count the number of syllables in each word), and these differences were magnified in recognition compared to recall task. As a final example, participants are slower when they switch strategy from one item to the next than when they repeat the same strategy, irrespective of which strategy is the best on each item. Such so-called strategy switch costs have been found to be of comparable magnitudes in young and older adults when participants were allowed to choose among two strategies but to increase in older adults as soon strategies could be chosen among three available strategies on each item (Ardiale and Lemaire 2012). All these findings showed that age-related differences in strategy execution are modulated by a wide variety of contextual factors. Note though that not all contextual factors change age-related differences in strategy execution. For example, participants tend to execute a strategy on a current item more slowly if a harder strategy has been executed on the previous item. Such so-called strategy sequential difficulty effects seem to influence strategy execution in young and older adults to the same extents (Uittenhove and Lemaire 2012).

Sources of Strategic Variations During Cognitive Aging

In all cognitive domains in which strategic variations have been adequately investigated, researchers have found age-related differences and similarities. These include older adults using fewer strategies, simpler (but sometimes harder) strategies, and some strategies more often than

others, executing strategies more poorly, selecting best strategies less often, and calibrating strategy choices to task constraints less systematically than young adults. These age-related differences in strategic variations are correlated with age-related differences in cognitive performance. Crucial to a deeper understanding of cognitive aging, and age-related changes in cognitive performance, are the sources of these strategic variations during aging. Previous research has shown that age-related differences in strategic variations are modulated by a variety of tasks parameters, such as strategy, participants, problems, and situation characteristics.

Strategies differ in the number of processes they include as well as the nature of these processes. Some processes are harder to trigger and execute. Therefore, relative strategy complexity is first determined by the number and nature of cognitive process strategies included. A strategy including more and/or harder processes will be taking more time to execute and might be harder to select appropriately. As seen above, aging effects are larger on more complex strategies.

Relative strategy complexity often does not act in isolation on age-related differences in strategic variations. It often interacts with other factors like participants' characteristics. One such participants' characteristic that has recently been greatly investigated is so-called cognitive reserve (Stern 2009). Cognitive reserve refers to the ability to cope with age-related structural and functional changes in the brain with larger neural recruitment to preserve functional abilities. Proxies of cognitive reserve include factors such as education or lifestyle, so that older adults with a better education have higher levels of cognitive reserve. Older adults with higher levels of cognitive reserve have been found to be better able to select the best strategies on each problem and to execute strategies more efficiently (Barulli et al. 2013). One important difference between older adults with high- and low-cognitive reserve concerns available processing resources (Salthouse 2010). Processing resources include working-memory capacities, processing speed, and some crucial executive (e.g., inhibition) and sensory (e.g., visual, auditory acuity) functions. Older adults with high level of cognitive resources, who often obtain comparable cognitive performance relative to young adults, are also older adults with much less decreased processing resources than other older adults (Park and Reuter-Lorenz 2009). This enables them, for example, to be more efficient at inhibiting irrelevant information, disengaging more quickly from a just-accomplished task to engage in another task or from a just-executed strategy to activate and execute a new more efficient strategy, to be able to temporarily hold more information in working memory as well as to update content information within working memory, to quickly activate relevant information from long-term memory, and to execute cognitive processes more quickly.

Another participants' characteristic that has in some research been found to influence magnitudes of strategic variations during aging is age-related differences in metacognitive skills (Hertzog and Dunlosky 2004). Metacognition refers to cognition about cognition. This includes beliefs as well as knowledge about cognition and cognitive processes and monitoring processes. Such influence may include participants' belief that the selected strategy is the most efficient strategy leading them to not change strategy, independently of whether it is the better or poorer strategy, or the belief that they are unable to select the best strategy on most items leading them to not devote cognitive efforts to systematically try to select the best strategy on each item. It may also include lack of knowledge or partial knowledge of relative strategy efficacy either for a particular item or a set of items (e.g., concrete words are better memorized with mental imagery than with sentence generation). Finally, older adults may be poorer than young adults at performance monitoring, seen in their more poorly determining that they are not executing the selected strategy most efficiently.

Whichever process resources (metacognitive skills, expertise, processing speed, executive functions, working memory) enhance age-related changes in strategic variations, age-related differences in strategic variations, and as a consequence on cognitive performance, may be exacerbated in some situations (like when participants are tested

under high-speed pressures). Such situations usually place greater demands in processing resources, and these increased demands are larger in older adults because of their age-related decrease in available processing resources. Of course, there are individual differences in how greater demands in processing resources influence strategy use and strategy execution in older adults, as some older adults with larger available processing resources are less detrimentally affected by these situations than other older adults. Note that some situation characteristics can also be more beneficial to older adults' performance via greater use of most efficient strategies. To take just one example, instructions encouraging older adults to try to be the most accurate led them to increase their best strategy use relative to no accuracy pressure more often than young adults in arithmetic problem solving tasks.

Conclusions

Age-related changes in cognitive performance are often accompanied by changes in how young and older adults perform cognitive tasks. When researchers have tried to understand cognitive aging by determining how young and older adults accomplish cognitive tasks, they have found age-related differences in what we called strategic variations (Lemaire 2010). These include strategy repertoire (or which strategies people use to accomplish a task), strategy distribution (or how often they use each available strategies), strategy selection (or how they choose among strategies on each item), and strategy execution (or how they apply each strategy).

In many cognitive domains and tasks, relative to young adults, older adults have often, though not always, been found to use fewer strategies, simpler (though sometimes more complex) strategies, and simpler strategies more often than harder strategies, execute available strategies more poorly especially harder strategies, and select strategies less appropriately (leading them to select the best strategy on each item less often and less systematically) (Uittenhove and Lemaire 2015). These strategic variations during aging are exacerbated in some situations (e.g., like when young and older adults are tested under speed pressures) and in some participants (with some older adults showing patterns of strategic variations close to young adults and other older adults showing poorer strategic behaviors).

One of the crucial underlying features of exacerbated poorer strategic behaviors in older adults seems to be how older adults' available processing resources match demands in processing resources made by the task environment. In some situations, for some items, and for some strategies, the demands in resources will exceed older adults' available resources and more so for some older adults who have low level of cognitive reserve. This leads older adults to be poorer at selecting the best strategy and at efficiently executing strategies, to use fewer strategies, and/or to use the simpler (though less efficient) strategy most often. In other words, age-related changes in strategic variations seem to be a consequence of age-related changes in processing resources. At a more general level, if as often assumed in cognitive sciences, the brain is an optimizing device (i.e., a device that tries to optimize deployment of available resources to cope with necessary demands to successfully accomplish cognitive tasks); age-related changes in strategic behaviors suggest that the brain remains an optimizing device throughout life.

Cross-References

- ▶ Cognition
- ▶ Cognitive Control and Self-Regulation
- ▶ Psychological Theories of Successful Aging

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Ageing in a Community Environment Study (ACES) Cohort

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Definition

Aging

There is no consensus on the definition of aging. Researchers and disciplines define aging differently and often disagree with each other. Based on Kirkwood, aging is defined as a progressive, generalized impairment of function, resulting in a loss of adaptive response to stress and in a growing risk of age related disease. The overall effect of these changes is summed up in the increase in the probability of dying, or age-specific death rate, in the population (Kirkwood TBL 1995). The author of this chapter agrees with Kirkwood 's thesis as this definition best suit the context of community-based prospective cohort study.

Introduction

An aging population with increased life expectancy is leading to higher healthcare spending and an increased expenditure in long-term care. Singapore is one of the fastest aging countries in the world. By 2030, it is projected that 1 in 4 Singaporeans will be 65 years or older with only 2 working adults supporting each elderly resident. The country's healthcare system has to face a growing attendance of elderly with a range of comorbid disorders that may lead to greater physical disability, functional impairment, and subsequent dependency. High quality data are urgently needed for a better understanding of aging and aging-related processes among community-living senior Singaporeans. The Ageing in a Community Environment Study (ACES) is a longitudinal cohort study of community

dwelling elderly Singaporeans that aims to: (1) study the markers and predictors of healthy and functional aging in a community environment; (2) describe the trajectories of cognitive and physical function decline in normal and abnormal aging; (3) identify modifiable risk and protective factors such as diets and life styles for the prevention of cognitive decline, dementia, depression, frailty, and disability.

Method

ACES is a community-based longitudinal cohort study. Baseline recruitment was started in July 2011 and will be completed by the end of 2016. Subjects are recruited through door-to-door census from Jurong area of Singapore. Inclusion criteria are: (1) Singaporeans or Permanent Residents aged 60 years and above and (2) able and willing to provide written informed consent. Interviews and assessments are performed at a community-based study center in Jurong Point Shopping Center: the Training and Research Academy at Jurong Point (TaRA@JP). ACES cohort has recruited and assessed over 950 study subjects as of 31 December 2015. The first follow-up of the cohort was started in July 2015 and will be completed by the end of December 2019.

Procedures

There are six study visits at ACES baseline. The *first* study visit involves questionnaire interview and physical performance assessments: (1) Demographic data; (2) Self-rated overall health and health changes; (3) Medical conditions, medications, and supplements; (4) Depression symptoms: the Geriatric Depression Scale (GDS); (5) Anxiety symptoms: the Geriatric Anxiety Inventory (GAI); (6) A Food Frequency Questionnaire (FFQ); (7) Attitude and knowledge of healthy diet; (8) Physical performance: handgrip strength and 6-m walking speed test; (9) Personal and Parents' Parenting Style; (10) Subjective cognitive impairment: the Perceived Deficits Questionnaire (PDQ); and (11) Mini-Mental State Examination (MMSE). The *second* study visit involves cognitive tests, mental health, and clinical measures: (1) Montreal Cognitive Assessment (MoCA); (2) Repeatable Battery for the Assessment of Neuropsychological Status (RBANS); (3) The Global Mental Health Assessment Tool (GMHAT); (4) Brief Informant Screening Test (BIST); (5) Pittsburgh Sleep Quality Index (PSQI); (6) Vital Signs: blood pressure, pulse rate, body temperature; and (7) the collection of stool sample. Trained medical assessors conduct detailed neurocognitive assessment for all participants who obtained a MMSE total score lower than education specific cutoff values ($\leq$27 for subjects without formal education, $\leq$ 28 for primary school education level, and $\leq$ 29 for secondary school and above) or a preliminary diagnosis of dementia based on GMHAT. This will take place at the *third* study visit. The assessment session consists of history taking, brief physical examination, Clinical Dementia Rating (CDR), and a battery of standard neuropsychological tests. Qualified medical assessors conduct psychiatric assessment on participants who have a GDS total score >= 3, or a GAI total score >= 5, or a preliminary diagnosis of depression/anxiety disorder based on GMHAT. This takes place at the *fourth* visit. The assessment session consists of history taking, and selected modules from the Structured Clinical Interview for DSM Disorder (SCID). All participants who are eligible for neurocognitive assessment or psychiatric assessment are invited to the study center (the *fifth* study visit) for blood sample collection. Regular case conferences are held to obtain consensus diagnosis of dementia, mild cognitive impairment, depressive disorders, and anxiety disorders. Subjects with mild cognitive impairment and age-gender matched controls are selected for the *sixth* study visit as a substudy that focuses on the role of biological markers such as telomere length, oxidative stress, inflammatory cytokines, fatty acids, oxylipins, plant-based bioactive compounds, etc. A total 19 ml blood sample is collected from each subject following standard venipuncture procedure.

At the first follow-up of the ACES cohort, each subject has three sessions of assessment with the

study research nurse or research associate/assistant. The first session (study visit 1) involves questionnaire-based interview on demographics and life styles, clinical measurements (weight, height), screening tests (Geriatric Depression Scale, Geriatric Anxiety Inventory, Mini-Mental State Examination), and physical performance assessment (hand grip strength, 6-m walking speed test, Timed Up and Go Test). Within 2 weeks after the first visit, venous blood and urine are collected from the subjects. Trained research staffs will conduct neurocgontive assessment at the third visit. The assessment session consists of Clinical Dementia Rating (CDR) and a battery of standard neuropsychological tests. Brian magnetic resonance imaging (MRI) are provided to selected subjects who are diagnosed with amnestic mild cognitive impairment or early Alzheimer's diseases, and age-gender matched controls.

Measures

A brief summary of psychology-related measures in the study protocols are provided as follows:

The 15-item version of the Geriatric Depression Scale (GDS) is used to index the level of depression (Sheikh and Yesavage 1986). This version of the GDS consists of 15 yes/no questions – each worth a point, giving a maximum possible total score of 15. This version has been validated and has demonstrated good psychometric properties in the local context.

The Geriatric Anxiety Inventory (GAI) is used to index the level of anxiety (Pachana et al. 2007). There are 20 agree/disagree items in the GAI, each is worth a point, giving a maximum possible total score of 20. The GAI was validated and has shown good psychometric properties in a similar Asian population.

Sleep-related variables are assessed by the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al. 1989). The PSQI, consisting of 19 questions, assesses sleep components such as sleep duration, sleep latency, sleep disturbance, sleep efficiency, quality of sleep, daytime dysfunction, and use of sleep medications. Each of these is scored from 0 to 3; a global score is obtained by totaling the component scores.

Modified local versions of the Mini-Mental State Examination (MMSE) (Feng et al. 2012) and the Montreal Cognitive Assessment (MoCA) (Liew et al. 2015) are administered as global measures of cognitive function. The MMSE consists of 11 items across cognitive domains such as orientation, memory, attention, and language. The test has a maximum score of 30 with higher scores corresponding to better cognition. The MoCA is a brief cognitive screening tool that assesses cognitive functions in the domains of visuo-executive, naming, attention, language, abstraction, delayed recall, and orientation. The MoCA is scored on a 30-point scale and higher scores correspond to better cognitive status.

Subjective cognitive complaints (SCC) are assessed using the Perceived Deficits Questionnaire (PDQ) (Sullivan et al. 1990). This scale consists of 20 items making up 4 subscales: attention/concentration, retrospective memory, prospective memory, and planning/organization. Subjects are asked to rate on a Likert scale ("0" never, "1" rarely, "2" sometimes, "3" often, "4" almost always) how often they experienced each cognitive problem during the past 4 weeks. Individual item ratings are summed to produce four subscale scores ranging from 0 to 20 and a total score ranging from 0 to 80, with a larger score indicating higher severity.

The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) is administered as a short battery of cognitive tests (Lim et al. 2010). The battery consists of 12 subtests across 5 indexes: (1) Immediate memory – list learning and story memory; (2) Visuospatial/Constructional – figure copy and line orientation; (3) Language – picture naming and semantic fluency; (4) Attention – digit span and coding; and (5) Delayed memory – list recall, list recognition, story memory, and figure recall. The tests thus yield subtest scores, index scores, and total scaled scores. Individuals were tested with form A of the RBANS. This battery of tests had previously been normed on elderly Chinese in Singapore.

A standard neuropsychological test battery is used to provide more detailed information on

major cognitive domains that decline in aging (Feng et al. 2006, 2009a, 2010). In the Rey Auditory Verbal Learning Test (RAVLT), the examiner reads a semantically unrelated word list (list A) to the examinee in a series of five trials. After each learning trial, the examinee is asked to repeat all the words he or she can remember (RAVLT immediate recall). A second distracter word list (list B) is then presented. In Digit Span Forward, the examiner reads strings of numbers in series with increasing length, and the examinee is asked to repeat the string in the exact order. In Digit Span Backwards, the examinee is asked to say the strings in reverse order. The Color Trails Test (CTT) uses numbered colored circles and universal sign language symbols. For the Color Trails 1 trial, the examinee uses a pencil to rapidly connect circles numbered 1 through 25 in sequence. For the Color Trails 2 trial, the examinee rapidly connects numbered circles in sequence, but alternates between pink and yellow colors. For the Block Design test, the examinee is asked to replicate models or pictures of two-color designs with blocks. The designs progress in difficulty from simple two-block designs to more complex, nine-block designs. Rey Auditory Verbal Learning Test (RAVLT)–Delayed Recall & Recognition: The examinee is asked to recall all the words he or she can remember from list A again (RAVLT delayed recall), followed by the recognition task in which the examiner read aloud a list of 50 words (this list included words from both list A and B and words phonemically or semantically related to them) from which the participants had been instructed to identify the words in list A. In the Verbal Fluency test, the examinee is asked to produce as many words as possible in 1 min from a defined category (the category is animal for this study). In the Boston Naming Test, the examinee is told to tell the examiner the name of each of a series of pictures. The examiner writes down the patient's responses in detail, using codes. In the written version of the Symbol Digit Modalities Test (SDMT), the examinee is asked to write as many numbers as he or she can in the boxes below a series of symbols according to the key provided at the top of the page within 90s. In the oral version, the examiner records the numbers spoken by the subjects.

A local version of the Clinical Dementia Rating (CDR) scale is used to assesses the severity of dementia (Feng et al. 2009b), with CDR global score 0 = dementia, 0.5 = questionable dementia, 1 = mild dementia, 2 = moderate dementia, and 3 = severe dementia.

Results

Table 1 presents a summary of demographic and psychological characteristic of the first 900 participants from the ACES cohort. There are more female subjects in this cohort and the years of formal schooling is only 6.06 years. The subjects obtained higher scores on MMSE as compared to MoCA. They reported 1.38 depressive symptoms and 1.15 anxiety symptoms on average.

The study team and collaborators are currently working on over 20 original research articles using data from cohort baseline. Research topics include sleep problems, mild cognitive impairment, subjective cognitive complaints, handedness, depression, anxiety, dietary patterns, nutrients intake, etc. Selected results from current analysis shows:

1. Geriatric Depression Scale and Geriatric Anxiety Inventory scores were both significantly correlated with sleep disturbance (Yu et al. 2015). Geriatric Depression Scale

Ageing in a Community Environment Study (ACES) Cohort, Table 1 Demographic and psychological characteristics of the study sample

Variable	Value
Age, mean (SD)	68.01 (5.83)
Female,%	66.9
Years of education	6.06 (4.24)
MMSE score	27.9 (2.47)
MoCA score	25.5 (4.01)
GDS score	1.38 (1.93)
GAI score	1.15 (2.47)

scores were uniquely associated with daytime dysfunction, and Geriatric Anxiety Inventory scores were uniquely associated with perceived sleep quality, sleep latency, and global Pittsburgh Sleep Quality Index scores.

2. Subjective Cognitive Complaints (SCC) were associated with older age, lower education level, poorer perception of current and past health, greater number of medical problems, and lower cognitive activity in elderly Chinese Singaporeans. Of these, poorer perception of current health showed the best prediction. SCC was not found to be related to current cognitive impairment, depressive, or anxiety status.
3. The accuracy of detecting mild cognitive impairment was significantly improved when results from multiple tools and demographic information were included in the statistical model. Area Under Curve (AUC) value of the best model was 0.91; the predictors in this final model were MMSE score, MoCA score, Perceived Deficits Questionnaire (PDQ) score, age, gender, race, education, and years of schooling.
4. There were 121 MCI cases and 20 dementia cases from the first 936 subjects (Table 2). The prevalence rate of nonamnestic MCI was higher than that of amnestic MCI. The relative low rate of dementia reflects selection bias as only those who were able to provide written informed consent and visit our study center for interviews and basements were enrolled into the study cohort. So, moderate and severe dementia cases were naturally excluded.
5. The prevalence rates of psychiatric disorders were relatively low: 1.1% for depressive disorders, 0.3% for anxiety disorders, and 0.7% for all other disorders such as mixed anxiety depressive disorder, adjustment disorder, mood disorder due to a general medical condition, etc. Again, the low prevalence rates reflect selection bias as individuals with severe psychiatric disorders were excluded from taking part of the research study.

Ageing in a Community Environment Study (ACES) Cohort, Table 2 The prevalence of MCI, dementia, and other psychiatric disorders

Diagnosis	N	Prevalence rate[a] (%)
Amnestic MCI	46	4.9
Nonamnesic MCI	65	6.9
MCI – subtype not specified[b]	10	1.1
Dementia	20	2.1
Depressive disorders	10	1.1
Anxiety disorders	3	0.3
Other psychiatric diagnoses	7	0.7

[a]Prevalence rates were calculated using 936 as the denominator based on the last assessed subject
[b]Subtype of MCI was not determined because subjects refused neuropsychological assessments

Future Plan

A subgroup of subjects from the ACES cohort will join the SG70 Community Ageing Cohort which will be formed in 2017. Deep, longitudinal phenotyping and biosampling will be instituted on a regular basis. The SG70 Community Ageing Cohort will allow the validation of the biological signatures of healthy aging identified in an oldest-old cohort – the SG 90 Longevity Cohort, – as well as providing a platform for further discovery in science. Selected subjects will undergo further tissue biopsies for nested case–control studies.

Cross-References

- ▶ Alzheimer's Disease, Advances in Clinical Diagnosis and Treatment
- ▶ Mild Cognitive Impairment

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Aging, Inequalities, and Health

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Synonyms

Ageism; Aging; Aging stereotypes; Older adult discrimination; Older adult health disparities; Older adult stereotypes

Definition

Aging, according to the Oxford English Dictionary, is defined by the process of getting older, the process of making something appear older than it is, or in reference to something that has reached the end of its usefulness (Oxford English Dictionary n.d.). "Ageism" refers to discrimination of a person based on age, and in the context of this chapter, to the discrimination of older adults, this is also sometimes called, "gerontophobia." In Western society, and especially the United States, it is commonly accepted that the greater society is youth oriented, and thus, older adults are less respected (Hillier and Barrow 2011; Nelson 2002). Stereotypes refer to beliefs and opinions

about people or groups, which may stem from personal experience or societal beliefs. The act of stereotyping may come from a basic need for categorization important for survival; however, stereotypes are often inaccurate, oversimplifications of individual characteristics, as in the case of older adults. Stereotypes are often negative and harmful, causing discrimination toward older adults (Hillier and Barrow 2011). Inequality refers to a difference between the ways in which people, in this case, older adults are treated from other segments of the population. For older adults, inequalities may be based on stereotypes regarding aging but may also be perpetrated between groups of older adults (Hillier and Barrow 2011).

Background

In modern industrialized nations, humans now live longer than ever before. During the early 1900s, the average life expectancy was between 47 and 55 years (Stuart-Hamilton 2006). In just 100 years, life expectancy has increased on average by 30 years (Aging 2012). This is due, in part, to a better understanding of sanitation but also due to medical and technological advances. Older adults, aged 65 and older, make up an increasing percentage of the world's population, yet negative attitudes toward and stereotypes surrounding older adults, their role in society, and the aging process have sustained. Older adults are more likely than other age groups to experience inequalities on a daily basis, including in healthcare, largely due to age stereotypes and "ageism," an accepted and systemic form of discrimination (Butler 1969; Hillier and Barrow 2011; Nelson 2002, 2015; Stuart-Hamilton 2006). Although stereotypes, whether positive or negative, may not overtly seem harmful, they can negatively impact the way other people interact with older adults and subsequently create additional psychological and medical problems (Hillier and Barrow 2011; Schaie and Willis 2011).

Aging Stereotypes

When one thinks of older adults, one is bound to think of grandparents or other older adults who have made an impression on his or her life, whether positive or negative; these experiences are likely to be the basis of some stereotypes of older adults. In addition, pervasive messages in popular media promote "age reversing" products and send the message that aging is undesirable. Younger adults who may not have had as many interactions with older adults may often form their impressions of older adults based on caricatures of older adults in television, movies, or print. Limited interactions with older adults, coupled with images presented in the media, may shape a young adult's understanding of older adults completely and may be the difference between an affinity for and or aversion to older adults.

Stereotypes of aging begin in childhood as people begin to develop expectations about their own aging. These stereotypes can be carried into adulthood, where the stereotypes are reinforced by the predominantly negative stereotypes present in North American and European cultures (Levy 2003). Older adults still hold these negative stereotypes formed in childhood and have been found to hold the same negative views of aging as young- and middle-aged adults (Cavanaugh and Blanchard-Fields 2002). Age stereotypes often surround how an individual will function physically, emotionally, and cognitively as an older adult. As such, it is possible that chronic activation of these stereotypes can affect how an older adult actually functions (Levy 2003). Generally, when speaking of stereotypes, negative stereotypes are the first to come to mind and are the most common (Nelson 2002). There are, however, some "positive" stereotypes associated with older adults.

Three main "positive" aging stereotypes have been identified in younger adults. These include the "golden ager," who is active, alert, capable, and independent; the "perfect grandparent," the older adult who is kind, loving, interesting, wise,

and family-oriented; and the "John Wayne conservative," who is patriotic, religious, conservative, and proud (Schaie and Willis 2011, p. 250). While these ideals many not be viewed as inherently damaging, they may still influence the way younger people interact with older adults, nevertheless (Hillier and Barrow 2011; Schaie and Willis 2011).

The same set of studies identified four main "negative" aging stereotypes consistently reported among younger adults: the "severely impaired" older adult who is slow, incompetent, senile, or feeble; the "despondent" older adult who is depressed, sad, hopeless, and lonely; the "curmudgeon" who complains and is demanding, inflexible, ill-tempered, or prejudiced; and the "recluse" who is quiet, keeps to him- or herself, and is naïve. These stereotypes can negatively affect not only how others view and interact with older adults but how they view themselves (also referred to as "stereotype threat").

Impact of Aging Stereotypes on Healthcare

Aging stereotypes not only affect the way the general public view older adults but also how medical and mental healthcare providers and healthcare systems deliver services. Older adults are more apt to be labeled with conditions such as mild cognitive impairment, dementia, or depression than younger adults, even in the absence of strong evidence (Hillier and Barrow 2011). These perceptions are likely to affect the way that healthcare is delivered, sometimes causing more harm than good (Robb et al. 2002).

Effects on Healthcare: Healthcare providers are not immune to ageist stereotypes. They often fall into the trap of generalizing older adults to be difficult or noncompliant. This is suggested to be one of the reasons there is a shortage of medical and nursing students interested in focusing on geriatric medicine (Eymard and Douglas 2012; Kydd and Wild 2012; Nelson 2011). Many students in the medical field believe that older adults are more difficult to treat, despite training to improve attitudes toward them (Eymard and Douglas 2012). Additionally, some studies have shown that providers believe that caring for older adults is somehow less technical, less interesting, or more depressing, even though clinicians who work primarily with older adults overwhelmingly agree that they are a fulfilling and rewarding population to work with (Eymard and Douglas 2012; Kydd and Wild 2012). On these grounds, many medical programs have done away with geriatrics programs, instead relying upon one or two courses in medical school to provide didactics on older adult issues

Inaccurate views of older adults have been suggested to negatively impact their ability to access care or, at the very least, access equal care (Nelson 2015; Kydd and Wild 2012; Eymard and Douglas 2012). Many studies have shown that older adults receive unequal care when compared to younger adults (Robb et al. 2002). This type of discrimination occurs across medicine specialties such as oncology, endocrinology, or surgery, to name a few. In many cases, diagnostic testing is not provided to adults over the age of 75 (Robb et al. 2002). This has been attributed to the belief that it would be a "waste" of resources to treat someone who seems to be near their end of life (Kydd and Wild 2012; Robb, Chen, and Haley 2002). Additionally, medical clinicians are more apt to spend less time with older adults, in part due to age bias, increasing the risk of over- or underdiagnosing, which would also lead to an inadvertent withholding of treatment (Robb, Chen, and Haley 2002).

Additionally, research has shown that a lack of training in the area of geriatric pharmacology may lead to medication errors and adverse medication interactions (Keijsers et al 2012). This fear may result in physicians withholding medications especially in older adults with chronic conditions, such as diabetes or emphysema. Older adults with chronic conditions are often denied treatment for unrelated disorders due to a fear of drug interactions; however, this is often an overreaction and alternate formulations may usually be found (Robb et al. 2002). Furthermore, in an extensive review of geriatric pharmacology training, it was found that very little specific training is made in this area, and even though interest in

pharmacology has increased, interest in geriatric pharmacology has not (Keijsers et al. 2012).

While there is an overall disparity between care provided to older adults and that for younger aged adults, this may not be due simply to a negative attitude toward older adults. Lack of experience with older adults is also a contributor. Some medical programs have attempted to combat geriatric-related medicine by incorporating didactics aimed at increasing awareness and exposure to older adults through experiential learning (Robb et al. 2002). Even when there is a desire to work with older adults, there is a paucity of training in geriatric medicine and a lack of opportunity to learn about issues that older adults may face. Compounding this problem is the fact that formerly required courses in geriatric medicine have been discontinued and the Accreditation Council for Graduate Medical Education (the governing body which oversees postgraduate medical training) cited geriatric medicine training as one of the top ten areas that lack compliance (Bragg and Warshaw 2005).

Effects on Mental Healthcare: Medical professionals are not the only ones who are susceptible to age stereotypes; mental health professionals may also fall into the same trap (Eymard 2012; Nelson 2011).

While older adults experience many of the same emotions as younger adults, there are unique factors that generally affect older adults more than other age groups. For example, they tend to experience more loss than other age groups and are likely to have more comorbid medical diagnoses than younger adults (Butler et al. 1998; Robb et al. 2012). Although sadness, grief, and depressive reactions in older adults can increase in frequency with the increases in loss (Butler et al. 1998), it has also been shown that as adults age, they focus more selectively on positive interactions, relationships, and experiences to regulate emotions and compensate for negative experiences (Carstensen, Isaacowitz, and Charles 1999). A prevailing stereotype about older adults is that they are more prone to grief and depression or are more likely to isolate themselves (Siegel 2004), which may influence the way that mental healthcare professionals approach working with older adults.

Aging stereotypes are also apt to influence the way that psychological researchers design research studies, as well as the way results are interpreted. For example, many past research studies indicated that older adults were more prone to depression, causing many mental health providers to believe that rates of depression among older adults were greater than other age groups, a view still commonly held today. However, once factors such as gender and socioeconomic status were adjusted for, older adults had significantly lower rates of depression than other age groups (Hillier and Barrow 2011). This is an important point because if researchers are subject to implicit stereotypes of older adults, they will be unlikely to combat these unsubstantiated points of view. Thus, it is important that clinicians and researchers are aware of their own biases, to reduce the likelihood of psychiatric misdiagnosis.

However, even when psychiatric symptoms are correctly diagnosed, age stereotypes can contribute to suboptimal treatment for older adults (Butler et al. 1998). Mental healthcare providers may believe that older adults are more difficult to work with and have a biased view about their presenting symptoms (Siegel 2004). Older adults are often viewed as "stubborn," "set in their ways," and "resistant to change." Similarly, they may be viewed as unresponsive and incapable of self-reflection (Butler et al. 1998) or unwilling to participate in psychotherapy (Robb et al. 2002). Although adult personality is relatively stable, older adults show an ability to change and adapt, and healthy aging has been characterized by flexibility, resourcefulness, and optimism (Butler et al. 1998). Some studies have found that mental healthcare providers, when presented with vignettes of different aged clients, preferred to work with younger clients and often had significantly more negative reactions toward the older adults client (Robb et al. 2002). These implicit biases are likely to cause a barrier for the provider to be open and willing to make a therapeutic bond with his or her patient (Eymard 2012). Older adults are, in fact, capable of actively participating and making meaningful changes in psychotherapy.

Additionally, chronic medical conditions and illnesses can also affect psychological

functioning, given the close association between medical and psychosocial problems (Cavanaugh and Blanchard-Fields 2002; Nelson 2002). Being the first point of contact for many older adults, primary care providers are often responsible for diagnosing older adults with psychological disorders or syndromes, rather than a mental health professional (Nelson 2002). Accordingly, they are also responsible for mental healthcare treatment decisions, and as a result referrals to psychologists or psychiatrists are not regularly made (Nelson 2002). Primary care providers may view reactive emotional responses as symptoms of a chronic and untreatable state (Butler et al. 1998), causing them to over-pathologize symptoms. For example, medical providers are more likely to confer diagnoses of dementia or psychosis on older adults than on younger adults (Butler et al. 1998; Robb et al. 2002). As a consequence, older adults may not receive the appropriate medical and/or mental health treatment.

Finally, inequalities in healthcare also occur within groups of older adults, with evidence of gender inequality in particular. Psychological diagnoses may be informed by gender stereotypes, which can be compounded over a lifetime as one ages (Hillier and Barrow 2011). These issues are likely to result in misdiagnoses, with disproportionate numbers of older women being diagnosed with a psychiatric disorder (e.g., psychoses), when compared to men of similar age (Robb et al. 2002).

Effects on Health Insurance: Health insurance fees, which tend to increase with worker age, can constitute a high cost for retaining older workers. Thus, the older worker can be quite vulnerable in a tight labor market, particularly during times of recession. However, as more data is collected and analyzed on health patterns in the work force, the evidence finds that older adults may cost no more in medical benefits than younger employees. Use of sick leave is also more highly correlated with lifetime patterns developed at a young age than with age itself, again not supporting the stereotypical view of the older adult as subject to illness and absenteeism. However, despite the accumulating evidence to counter the negative stereotypes of older adults in the workforce, and legal safeguards, age discrimination is often difficult to establish and many cases are not proven (Hillier and Barrow 2011).

Most older adults, in the United States, utilize government insurance programs such as Medicare or Medicaid to help pay for medical care. While this is a helpful service, these programs only cover a specific dollar amount for very specified services and medications. This can cause difficulties if specialty services are required. Some reports indicate that medical care providers may exaggerate claims for services or may order more tests than are needed in an attempt to recoup costs because of the small percentage reimbursed by Medicare or Medicaid, for medical services (Hillier and Barrow 2011). However, this misuse of government-subsidized insurance contributes to tighter regulations of the types of services that Medicare and Medicaid is willing to pay for, which may reduce the care that older adults can access, again, putting them at risk. Some older adults may be able to afford supplemental insurance to cover services and medications that are not accepted by Medicare or Medicaid. However, the cost for supplemental policies is often greater than the benefit received. Additionally, the increasing number of older adults also taxes this system, again, decreasing the per service fee that is paid by Medicare or Medicaid and decreasing access for those older adults who cannot afford to purchase supplemental insurance (Hillier and Barrow 2011).

Conclusions

It is important to consider the role of how one thinks of older adults, whether implicitly or explicitly, as these ideas may interfere with, or affect, treatment of one's clients or patients. Even the most "well-meaning" stereotypes (e.g., the sweet grandparent or the stoic older adult) may lead to inequalities in care and therefore may lead to preventable detrimental effects. Many studies have shown the effectiveness of geriatric education and/or clinical experiences in changing attitudes of care providers toward older adults. Often times, it is a lack of knowledge or experience with

older adults that creates a reliance upon stereotypes. Time and again, research focused on this area has indicated that didactics and experiential exercises focused on interactions with older adults combat against ageist stereotypes and can change the attitudes of students and clinicians, alike. As a large proportion of the world's population become older adults, focused training on the specific issues that older adults face will be in increasing demand. Additionally, an increase in positive experiences during training programs with older adults, coupled with clinicians specializing in gerontology and/or geropsychology moving into mentorship roles, will prove to be valuable resources and may help to increase the numbers of future clinicians and researchers focused on older adults.

Cross-References

- ▶ Age Stereotyping and Discrimination
- ▶ Attitudes and Self-Perceptions of Aging

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Agnosia and Related Disorders

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Synonyms

Disorders of recognition, disconnection syndromes

Definition and Background

Agnosias are relatively rare disorders of recognition that can be described as the brain's inability to interpret information received through various sensory channels. By definition, inability to identify a stimulus occurs in the absence of primary sensory deficit. Patients with agnosia have intact vision, hearing, etc. In addition, agnosia cannot be explained by attentional disturbance, language disturbance, general cognitive impairment/dementia, or lack of familiarity with the stimulus. The term "agnosia" was coined by Freud (1891); however, recognition deficit had been described prior to him and referred to as "asymbolia" (Finkelnburg 1870), "imperception" (Jackson 1876), and "mindblindness" (Munk 1881). The conceptualization and interpretation of agnosias changed over time as a function on existing models of perception. For example, Lissauer (1890) described two stages of recognition: apperception, which involves constructing visual attributes into a whole, and association, which involves linking the content of perception to semantic knowledge. Based on this model, he distinguished between apperceptive and associative agnosias. In the former, failure in recognition results from some impairment in perceptual representation of the stimulus, although at a higher level than sensation. In other words, patients cannot synthesize what they see into a whole. As a result, they are unable to copy a stimulus or match a sample. Associative agnosia, in contrast, is characterized by failure in recognition despite preserved perceptual representation due to inability to attribute meaning to the correctly perceived stimulus. Patients with associative visual agnosia are able to copy a stimulus but not identify what they copied. Despite preserved copy, there is evidence that perception is not entirely normal in patients with associative agnosia (Farah 2004). Patients often present with visual field deficits, most commonly right homonymous hemianopia. Lissauer also posited that focal lesions and combinations of focal lesions could impair visual, auditory, or somatosensory perception or recognition without affecting these abilities in other modalities. Geschwind (1965) defined agnosia as a disconnection syndrome. He posited that recognition involves matching perception input to stored knowledge and that agnosia results from disconnection between visual (perceptual) and verbal processes. Geschwind argued, for example, that left mesial occipital lobe damage not only results in right homonymous hemianopia but also prevents visual input perceived by the intact right hemisphere from reaching verbal areas. While disconnection models are compelling, they cannot explain all agnosia syndromes (Catani and Ffytche 2005). The advancement in cognitive neuroscience and neuroimaging technology allowed better understanding of processing networks involved in recognition. New data suggest that it is not necessarily a two-step process but includes parallel processing at cortical and subcortical levels. For instance, Damasio (1989) suggested that perception involves activation of specific neural patterns combined in "convergence zones." He believed that recognition results from activation of neural patterns in a time-locked fashion in response to a specific stimulus.

Agnosia Types

Agnosias can occur in all sensory systems but are typically modality specific, meaning that while recognition through a particularly sensory modality is impaired, recognition through other sensory channels is intact. For example, patients with visual agnosia would not be able to recognize an object placed in front of them. However, they would be able to pick it up and to identify it through the tactile modality, the sense of touch, once they are holding it. Within each modality, recognition deficits can be general or specific, involving a whole semantic class or individual items within a class.

Visual agnosias are the most common agnosia type defined as inability to identify visually presented material. The impairment can be specific to objects (object agnosia), colors (color agnosia), faces (prosopagnosia), or words (pure word blindness). Each of these conditions may occur in isolation or in various combinations.

The distinction between apperceptive and associative visual agnosias remains useful. Apperceptive visual agnosia usually results from diffuse posterior damage to occipital lobes and surrounding areas, while associative visual agnosia involves left or bilateral inferior occipitotemporal lesions. Both have been associated with carbon monoxide poisoning, mercury intoxication, cardiac arrest, bilateral cerebrovascular accident (CVA), basilar artery occlusion, or bilateral posterior cortical atrophy.

Patients with color agnosia are unable to identify colors by naming or pointing to colors named by the examiner. Several color disturbance syndromes have been described. Central achromatopsia refers to the loss of color vision and is associated with lesion in the optic nerve or chiasm or unilateral or bilateral lesions in the inferior ventromedial sector of the occipital lobe. Color anomia refers to inability to name colors despite intact color perception. Another of visual-verbal disconnection syndromes originally described by Geschwind (1965), this deficit usually results from a lesion interrupting communication between visual cortex and language areas such as infarction in the left posterior cerebral artery. Specific color aphasia is seen in the context of aphasia, with disproportionate deficit in color naming. It usually results from left (dominant) parietal lobe lesions.

The term prosopagnosia, or face blindness, describes inability to recognize familiar faces, including one's own. While individuals with prosopagnosia are able to recognize that a face is a face and to describe some of its characteristics (e.g., beard), they are unable to identify a face by visual input alone. The deficit cannot be attributed to memory loss/dementia or Capgras syndrome, in which the patient believes that familiar persons have been replaced by imposters. Because patients can compensate by relying on voice and other non-facial characteristics, prosopagnosia can be unrecognized for a while and may not be revealed until a family member is encountered in a different context, in the absence of familiar cues. Prosopagnosia can also be more broadly characterized by difficulty identifying objects within a semantic category, which can include both living beings and inanimate objects (Borenstein et al. 1969). Prosopagnosia is typically acquired and involves bilateral lesions to fusiform gyrus at the junction of occipital and temporal areas. Cases of unilateral lesions to both dominant and nondominant hemisphere have also been described, with greater impairment in right-sided lesions. Developmental/inherited cases have also been reported. Prosopagnosia has been interpreted as a visual-limbic disconnection syndrome. Supporting it is the fact that patients with prosopagnosia appear to have reduced emotional responsiveness to visual stimuli.

Another agnostic syndrome is agnosia for words, also known as pure alexia, alexia without agraphia, or pure word blindness. While it can be considered a linguistic impairment, most patients do not show impairment in other aspects of language. Alexia without agraphia is another example of a disconnection syndrome, wherein the left hemisphere is deprived of the visual input. It involves lesions in the dominant occipital lobe and the splenium of the corpus callosum.

Visual agnosia syndromes demonstrate that different brain structures and pathways are involved in processing of various aspects of visual stimuli. They also support the distinction into ventral and dorsal visual pathways (Ungerleider and Mishkin 1982) that involve different types of visual information. The ventral (what, how) stream projects to the inferotemporal cortex; is involved in the processing of color, texture, etc.; and plays a major role in constructing a perceptual representation of the visual world. Object and color agnosias and prosopagnosia result from damage to this pathway. The dorsal stream projects to the posterior parietal cortex and is involved in processing location, orientation, movement, and object parameters important for visual guidance of movement. Damage to the dorsal visual stream results in deficits in visual spatial processing. Simultanagnosia is often discussed among agnosias and refers to inability to process more than one object or aspect of objects at a time and consequently to integrate objects into coherent visual scenes (Kinsbourne and Warrington 1962). Other disorders of the dorsal visual stream include hemispatial visual

neglect, dressing apraxia, optic apraxia, and optic ataxia. The latter two and simultanagnosia are collectively known as Balint's syndrome.

Auditory agnosias involve impairment in recognition of sounds in the presence of adequate hearing. Verbal auditory agnosia, also known as pure word deafness, describes deficits specific to speech processing. Patients with this rare condition are unable to understand speech, while recognition of other sounds is preserved. The term "pure" refers to the freedom of aphasic symptoms, as reading, writing, and speech are relatively preserved. The disorder is typically associated with bitemporal lesions involving primary and secondary auditory association cortices but has also been documented in unilateral lesions of the dominant temporal lobe. Both lesions result in disconnection of auditory input from language areas of the left perisylvian cortex. While signs of aphasia might be present, the patients are able to recognize linguistic information when audition is not required (written language). Some patients may recognize foreign language and the person speaking but not the semantic content. Paralinguistic aspects of speech (prosody, intonation) can be preserved. Auditory agnosia or environmental sound agnosia is a very rare condition characterized by inability to identify nonspeech sounds. Perceptive-discriminative and semantic-associative forms have been described (Vignolo 1969), characterized by acoustic and semantic errors, respectively. Amusia describes agnosia specific to music perception and refers to inability to appreciate characteristics of heard music. Oftentimes, patients are no longer able to enjoy music. Specific deficits such as vocal amusia, loss of instrumental ability, or the ability to read and write music (musical alexia and agraphia) have been described (Midorikawa and Kawamura 2000). Interestingly, cerebral organization of musical ability depends on degree of experience and skill, with skilled and musically trained individuals more likely to rely on the dominant hemisphere and perceive music analytically. The term cortical deafness has been applied to patients with extreme lack of awareness of auditory stimuli of any kind. It is most often seen in bilateral cerebrovascular disease affecting the primary auditory cortex. Phonagnosia refers to the loss of ability to recognize familiar persons by voice and is associated with right parietal lesions (Van Lancker et al. 1989).

Tactile or somatosensory agnosias include a less well-understood group of disorders that involve impairment in object recognition through touch that cannot be explained by sensory-motor disturbance. Similarly to visual and auditory agnosias, apperceptive (astereognosis) and associative dichotomy has been described (Wernicke 1895). Subtypes based on the specific features have been proposed. Thus, cortical tactile disorders involve deficits appreciating distinct attributes such as size or shape. There is no evidence of hemispheric lateralization, although spatial attributes are usually impacted in right hemisphere lesions. Lesions in the contralateral postcentral gyrus produce the most severe disorders of cortical tactile sensation, particularly when lesions occur in the hand area. Tactile agnosia refers to inability to identify objects placed in hand. It typically results from lesions to the parietal lobe, particularly primary somatosensory cortex (postcentral gyrus) and somatosensory association cortex. In the last decade, patients who would meet criteria for olfactory and gustatory agnosia have been described in the context of temporal resection for seizure control. The discussion of agnosia syndromes usually includes anosognosia, which refers to lack of awareness into one's deficit and is common in all sensory agnosias. Another similarity is that despite disability in direct object identification, many patients with agnosia demonstrate some knowledge about the stimulus, thus demonstrating implicit or "covert recognition."

Assessment of Agnosia

When examining a patient with agnosia, it is important to rule out alternative explanations to a recognition deficit such as primary sensory deficit, inattention, aphasia or anomia, memory loss

or dementia, and lack of familiarity with the stimulus. Neuropsychological evaluation/neurobehavioral exam to assess general intellect, memory, linguistic competence, and sensory-perceptual processing is important. To rule out aphasia, it would be important to demonstrate comprehension of commands not requiring objects and the use of objects. Drawing might be impacted by constructional and visuomotor deficits. The possibility of confabulation may need to be considered. Referrals for sensory-perceptual testing (ophthalmologic, audiometric) may be needed. In the tactile domain, each hand should be assessed separately in the performance of basic somatosensory function and discrimination of weight, texture, shape, and substance. Once the presence of agnosia is determined, it is important to assess the nature and extent of the recognition impairment. The process of recognition is complex and includes a wide range of skills. Recognition can be assessed at different levels including the ability to overtly identify a stimulus, semantic knowledge about the object, and covert recognition, which can be shown by correct use in the absence of direct object identification. As discussed earlier, agnosias are usually modality specific. Thus, multimodal deficits are more likely to be due to other causes (Bauer 2009).

Agnosia and Neurodegenerative Illness

The most common etiologies of agnosia are cerebrovascular accidents and traumatic brain injury followed by herpes simplex encephalitis (auditory agnosia), carbon monoxide poisoning (visual agnosia), and hypoxia. Progressive visual agnosia has also been associated with neurodegenerative disorders. Agnosia together with aphasia and apraxia is sometimes referred to as the "A triad" of deficits in Alzheimer's disease (AD). Disturbances in basic visual, complex visual, and oculomotor functions have all been described in AD, and visuospatial difficulties are often reported by caregivers. Not surprisingly, visual system disorders have been associated with concentration of neuropathology in visual association cortex. Mendez and colleagues (1990) found that 43% of community-based AD patients had visual complaints. Despite preserved visual acuity, patients showed impairment in recognition of objects (57%), famous faces, spatial locations, and complex figures. More severe dementia was associated with more complex visual disturbances.

Apperceptive visual agnosia is a core symptom of posterior cortical atrophy (PCA), neurodegenerative disease characterized by disproportionate atrophy or parieto-occipital cortex (Benson et al. 1988). The disorder is sometimes considered a variant of AD, and AD pathology is present in approximately 80% of cases. Other etiologies include Lewy body disease, subcortical gliosis, corticobasal degeneration, and prior disease. PCA is characterized by complex visual disturbances, including object agnosia, simultanagnosia, alexia without agraphia, and environmental agnosia. Basic vision remains intact, although visual field deficits may be present. Memory and other cognitive areas are usually preserved until later in the disease when symptoms of various dementia syndromes overlap. Early common symptoms include reading difficulty or difficulty reading an analogue clock. Associative visual agnosia can be observed in semantic dementia before disturbance in semantic memory. Visual spatial deficits can also be observed in other neurodegenerative disorders, as the disease process advances and impacts relevant brain structures and networks. Visual symptoms can occur in the absence of other cognitive deficits but are usually associated with greater dementia severity and contribute to functional impairment.

Patients with visual agnosia may not recognize and misuse common objects (e.g., use detergent instead of shampoo, not be able to use a key). They may misrecognize their surroundings and get lost, particularly in the context of any changes such as road construction or a new billboard sign. Driving for someone with visual agnosia presents significant safety concerns. Simultanagnosia is also associated with significant impairment. Patients are often functionally

blind and unable to navigate their environment. Simultanagnosia also impacts reading ability. Complex visual hallucinations are common in neurodenegerative disorders and usually suggest Lewy body pathology. Patients vary in the extent of visual system pathology and symptoms, and a comprehension interview and assessment are important both for characterization of specific challenges and for compensation strategies.

Recommendations

While therapeutic success in treating agnosias is often limited by anosognosia, targeted recommendations may improve the quality of life and alleviate some of the difficulties and caregiver burden. Burns (2004) offered three categories of recommendations for agnosia, including alternate cues, verbal, and organizational strategies. Alternate cueing uses cues from other modalities. The rationale for using alternate cues is that agnosias, as discussed above, are modality specific. As such, relaying on preserved information pathways may be beneficial. For example, for a patient with visual agnosia, feeling an object by touch may assist with recognition. Patients with pure alexia can learn to read through letter tracing tactually. Many patients with agnosia discover this strategy instinctively. For example, patients with prosopagnosia learn to recognize family members by the sound of their voice and other non-facial characteristics. Patients with pure word deafness may learn lipreading and rely on pragmatic (intonation, gestures) and contextual cues. Tactile cues, such as a piece of Velcro attached to the stove or the doorframe of an area the patient may wish to avoid, can be used to indicate danger. Similarly, soft fabric may be used to mark "friendly objects," such as a telephone. Preserved aspects of object recognition within the affected modality may also be used. For example, if color recognition is preserved, color cues may assist patients with object visual agnosia. For example, red cues might be used to signal danger (e.g., stove), while green cues might signify objects that are safe to use. Verbal descriptions may help patients with visual agnosia and simultanagnosia to recognize their surroundings such as a particular room in the home. Audio books might substitute reading for a patient with pure alexia.

Organizational strategies include any techniques aimed at organizing the patient's living environment to increase their independence. For example, to organize closets, matching garments may be placed on the same hanger. Organizational strategies may be used in combination with alternate cues. For example, organizing clothing by different hangers may provide tactile cues. Color or tactile cues may be used to mark drawer contents. Pantry/refrigerator may be organized so that a patient learns the specific location of certain foods (e.g., fruits are always kept on the bottom shelf). For dementia patients, these strategies might need to be implemented by caregivers. Learning paradigms such as spaced retrieval training might be helpful to teach association between cues. Our search did not reveal any currently available commercial programs or applications for remediation of agnosia; however, this is certainly an area that might see development in the future.

To summarize, agnosias are rare disorders of recognition resulting from brain damage. Agnosias can be found in all sensory systems but are typically modality specific. While cerebrovascular accidents are the most common etiology, agnosias can also be a symptom of neurodegeneration. No disease-modifying therapies are available; however, compensatory strategies might improve patients' quality of life and alleviate caregiver stress.

Cross-References

- ▶ Alzheimer's Disease, Advances in Clinical Diagnosis and Treatment
- ▶ Cognition
- ▶ Cognitive Compensation
- ▶ Dementia and Neurocognitive Disorders

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Altruism and Prosocial Behavior

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Synonyms

Benevolence; Charity; Civil service; Compassion; Cooperation; Generosity; Helping; Kind acts; Philanthropy; Selflessness; Self-sacrifice; Volunteering

Definition

Prosocial behavior is voluntary, intentional behavior that results in benefits for another person. Such behavior is considered to be altruistic if it is motivated by a genuine desire to benefit another person, without any expectation of benefits to oneself (Feigin et al. 2014; Eisenberg and Miller 1987).

Prosocial behavior is the "social glue" that enables people of different ages to live together peacefully and productively. Specifically, prosocial behavior has been defined as "voluntary, intentional behavior that results in benefits for another person" (Eisenberg and Miller 1987, p. 92). The purpose of this entry is to examine motivators or antecedents of prosocial behavior, possible benefits or consequences for the helper, and how the underlying processes may differ across different phases of the adult lifespan.

Imagine the following scenario: For the past 38 years, Charlie, a consumer protection lawyer, has made pro bono work an important part of his law practice, working with disadvantaged clients making claims against large corporations. Early in his career, Charlie's track record of winning these pro bono cases earned him much prestige and was central to his success as an emerging professional. Although career building is no longer a concern for him, Charlie has continued providing free legal counsel to people who could not otherwise afford it and also to his extended family and friends. Being retired now, he gives legal aid to the people he feels close to and cares about, such as his grandson, who recently sought his counsel when suing a fraudulent credit union.

Prosocial behavior can come in many different forms, ranging from small acts of kindness, such as letting someone in a rush go ahead at the cashier, to more sustained acts, such as volunteering for a charitable organization, and even to things one might take for granted, such as looking after one's grandchildren. However, the above example clearly illustrates that motivations for engaging in prosocial behavior may change across the lifespan.

Antecedents of Prosocial Behavior

There is strong evidence for systematic changes in prosocial behavior across the adult lifespan, suggesting that older adults behave more prosocially than young adults (Midlarsky and Kahana 2007; Sze et al. 2012). The next section reviews a spectrum of possible motivations for engaging in prosocial behavior, from genuinely psychological mechanisms to evolutionary accounts, examines potential age-related differences in these mechanisms, and reviews frequently chosen methodological approaches for studying them.

Altruism

Social psychological theories often distinguish between altruistic and egoistic motivations for prosocial behavior. Altruistic behavior is typically thought of as the type of prosocial behavior that is motivated by a genuine desire to benefit another person, without any expectation of benefits to oneself (Feigin et al. 2014; Eisenberg and Miller 1987). Coming back to the above hypothetical scenario, Charlie may be motivated to engage in pro bono work out of compassion for disadvantaged clients who particularly need his support. There is ongoing debate among psychologists over whether purely altruistic behavior does in fact exist (Feigin et al. 2014), and most researchers agree that prosocial behavior tends to also be driven by egoistic (non-altruistic) motivations. These can include a desire to feel good about oneself, to improve one's social standing (such as Charlie wanting to build a reputation at the beginning of his career), or to avoid uncomfortable feelings of sadness, anxiety, or guilt (Feigin et al. 2014; Penner et al. 2005).

Research seeking to disentangle altruistic from egoistic motivations of prosocial behavior typically uses experimental paradigms that manipulate aversive arousal, social evaluation, or rewards and link them to prosocial intentions, prosocial responses to hypothetical scenarios, or actual prosocial behavior (Penner et al. 2005). Furthermore, survey methods have been used to explore volunteering motivations including egoism and altruism (Konrath et al. 2012; Midlarsky and Kahana 2007).

Empathy

An alternative approach to examining antecedents of prosocial behavior is to delineate the specific skills that enable individuals to understand complex social situations and behave prosocially. For example, individuals may be empathic (de Waal 2008) independently of whether their prosocial behavior is primarily altruistically or egoistically motivated. Hence, Charlie might have offered pro bono services over the years because he is the kind of person who has a very sensitive radar for other people's needs.

A large body of research has investigated the empathy-altruism link across species, including humans (Feigin et al. 2014), suggesting that there may be an evolutionary basis for this ability (de Waal 2008). In humans, emotional empathy, defined as a merging of emotional contagion and

compassion, seems to be particularly closely associated with prosocial behavior (Eisenberg and Miller 1987). Unlike cognitive empathy (the ability to engage in perspective-taking), emotional empathy has been shown, in cross-sectional but not in longitudinal research, to be higher in older adults than in younger adults and seems to account for age-related differences in prosocial behavior (Grühn et al. 2008; Sze et al. 2012). This increased emotional empathy in today's cohort of older adults, as compared to young adults, may reflect older adults' desire to help others and engage in emotionally meaningful experiences or age-graded cultural expectations to recognize and fulfill others' needs (Sze et al. 2012). Emotional empathy is frequently assessed via physiological arousal (skin conductance, heart rate), nonverbal emotional cues (facial movements, gestures, vocalizations), or self-reports of empathy (de Waal 2008; Eisenberg and Miller 1987).

Kin Selection

Unlike the psychological theories described above, evolutionary accounts of prosocial behavior have focused on the survival benefits of prosocial behavior. For example, kin selection theory (Feigin et al. 2014; Penner et al. 2005) holds that individuals are particularly motivated to help members of their own family because this ultimately helps their own genes survive. Linking this back to the altruism-egoism distinction, kin selection then becomes, in a sense, both altruistic and egoistic. It is altruistic to the extent that an individual may sacrifice his or her own well-being to help a blood relative; at the same time, kin selection may also be seen as egoistic because it serves to propagate one's own genes (Feigin et al. 2014). Several studies have documented preferential helping for kin over unrelated individuals, even when this contradicts social norms (Penner et al. 2005).

Of note, kin selection theory can be extended to apply to prosocial behavior directed toward grandchildren. In other words, post-reproductive adults can still improve their inclusive fitness (the likelihood that others who share some of their genes will survive) by investing resources in their grandchildren (Coall and Hertwig 2010). This idea is also in line with the "grandmother hypothesis," which explains the relatively long post-reproductive period of women based on the survival benefits for not just their own children but also for their grandchildren (Coall and Hertwig 2010). Although particular attention has been paid to the role of grandmothers, evolutionary-based theories of grandparental investment also apply to grandfathers, although this depends on paternity certainty (how sure the grandfather is that the child in fact carries his genes; Coall and Hertwig 2010). Going back to the example of Charlie, the help he devotes to protect his grandson could be an illustration of kin selection. This is assuming that Charlie believes that his grandson is biologically related to him; kin selection theory would not apply to adopted grandchildren. One could make a stronger case for kin selection if Charlie were a woman because the maternal grandmother, for example, is certain of her relationship with her daughter and her daughter's relationship with her grandchildren. Regardless of Charlie's gender, however, kin selection theory cannot account for the time Charlie spends with other young pro bono clients to whom he is not biologically related. To explain this, one would need to invoke other, more psychological mechanisms.

It is not possible to directly test or falsify evolutionary theories of prosocial behavior in human beings. However, in line with kin selection predictions, experimental work has found that people are more likely to help those to whom they think they are more genetically related (Penner et al. 2005). Animal models and research in the area of genetics have supplemented these findings to provide more support for the overall concept of kin selection (de Waal 2008; Penner et al. 2005).

Age- and Future Time Perspective-Related Differences in Prosocial Motivations

There is solid evidence for age-related differences in prosocial behavior in the literature (Wilson 2000). Below, the authors introduce two prominent lifespan theoretical models that provide potential explanations for why this may be the case. The model of generativity is built on the idea that adults have to master distinct challenges

as they move across different life phases, with the mastery of earlier challenges predicting the likelihood of succeeding with later challenges (Erikson 1982). Generativity, which is thought to peak in mid-life and continue until later in life, may be defined as the need to make a contribution to the well-being of the next generation, along with a sense of responsibility for those younger in age (McAdams et al. 1998). Hence, by virtue of their position in the life course, middle-aged and older adults may be particularly motivated to engage in behaviors that help younger individuals thrive (Schoklitsch and Baumann 2012). Going back to the legal aid example, Charlie may indeed be driven by generative goals when he assists younger clients – does he perhaps wish to bestow a tradition of social justice-oriented legal action that will inspire generations to come? Generativity may also reflect a desire to leave a lasting legacy, thus combining altruistic with egoistic connotations (Maxfield et al. 2014). Nevertheless, the end result is that society reaps the benefits of older adults' generative investments. Survey methods have been used to investigate associations between generativity and prosocial behavior across the lifespan, indicating that both tend to peak in mid-life and continue to be high in older age (Keyes and Ryff 1998), although cohort effects cannot be ruled out because age differences in generativity have been found mainly cross-sectionally, not longitudinally (Schoklitsch and Baumann 2012). Generative motivations have typically been investigated through autobiographical methods, self-reported motivations and behavior, and personal goal analysis (Schoklitsch and Baumann 2012).

According to socioemotional selectivity theory, the recognition of future time becoming more limited prompts motivational shifts away from autonomy or knowledge acquisition goals typically found in young adults and toward emotionally meaningful social goals that focus on close others, possibly including generative themes (Carstensen et al. 2003; Lang and Carstensen 2002). Coming back to the illustrative scenario, Charlie's motivation to provide pro bono services may have been guided by knowledge acquisition goals early in his career, whereas later in life, he may have come to the conclusion that his limited time left is too valuable to be spent on anything but the people he really cares about and feels close to, like his grandson. Predictions originating from socioemotional selectivity theory have frequently been tested using cross-sectional survey methods and experimental methods (Carstensen et al. 2003). For example, hypotheses derived from this theory have been tested directly in a study of volunteering motivations (Okun and Schultz 2003). Although socioemotional selectivity seems to be a very relevant framework for understanding prosocial behavior across the lifespan, to our knowledge, no research has yet directly investigated the effects of changing future time horizons on prosocial behavior; correlational and experimental work is needed to fill this gap.

Consequences of Prosocial Behavior

When one thinks of prosocial behavior, the implication typically is that this kind of behavior benefits the recipient, whether emotionally, financially, or otherwise (Penner et al. 2005). Importantly, however, behaving prosocially may also benefit the actor – the person who is helping or giving to others. Indeed, prosocial behavior has well-documented physical health, cognitive, and psychological well-being benefits, particularly in old age (Midlarsky and Kahana 2007; Van Willigen 2000; Wilson 2000). The benefits of prosocial behavior for the giver, if known, may also drive motivation to engage in such behavior, thereby reinforcing a positive cycle that builds both prosocial behavior and health and well-being. The following section describes some of the key benefits of prosocial behavior that have been documented in experimental, experience-sampling, and longitudinal work, using volunteering as a case study for prosocial behavior.

Volunteering, Health, and Well-Being

The majority of research on prosocial behavior in older adults looks specifically at volunteering, which can be defined as "any activity in which time is given freely to benefit another person,

group, or organization" (Wilson 2000, p. 215). Typically, volunteering involves some commitment of time and effort (not just a single act of kindness) and serves to benefit people outside of one's family. Hence, volunteering is a special, but readily recognized, form of prosocial behavior. Volunteering is especially relevant for today's aging population as it may be a vehicle to stay connected and make an active contribution to the functioning of society past retirement (Fried et al. 2004; Midlarsky and Kahana 2007). Furthermore, volunteering has recently attracted a lot of attention for its health-promotion potential in old age (Midlarsky and Kahana 2007; Wilson 2000). This section will discuss some of the key documented benefits for physical health, cognitive functioning, and social integration and well-being.

A well-known volunteering program for older adults is the Experience Corps (Fried et al. 2004), which successfully integrated older volunteers into public elementary school programs to help vulnerable children improve their reading, problem solving, and other social-cognitive skills. Findings from this program document a host of benefits for the older adult volunteers themselves, including but not limited to physical health benefits such as increased physical activity and reduced declines in measures of physical strength and health (Fried et al. 2004).

Volunteering has also been linked to reduced cognitive decline in old age. For example, findings from the Georgia Centenarian Study reveal that, among the oldest old, leading an engaged lifestyle (which involves volunteer work) is associated with higher cognitive functioning in domains that typically have a strong age gradient, namely, orientation skills, attention, memory, arithmetic, motor skills, and language abilities (Martin et al. 2009). This is in line with the idea that volunteering encourages people to learn and adapt to new situations and to make use of their knowledge and skills, thereby helping to maintain cognitive abilities.

Volunteer activities also have well-documented social and well-being benefits. For example, participants in the Experience Corps program, compared to controls, reported having more people to whom they could turn for help (Fried et al. 2004). It seems that a key benefit of volunteering is that it facilitates building high-quality social relationships that may serve as social support resources in old age (Fried et al. 2004). Furthermore, participating in volunteer work can make older adults feel needed and appreciated, which can improve their overall sense of well-being (Midlarsky and Kahana 2007). For instance, findings from the Americans' Changing Lives study demonstrate positive associations between volunteering and both life satisfaction and perceived health (Van Willigen 2000). Importantly, this study revealed that participating in volunteer work had greater well-being benefits for adults over age 60 years than for their younger counterparts, which further speaks to protective effects of prosocial behavior in old age specifically (Van Willigen 2000). With few exceptions (Fried et al. 2004; Midlarsky and Kahana 2007), the vast majority of research on the social and psychological well-being benefits of volunteering has employed cross-sectional and longitudinal survey methods.

Other Forms of Prosocial Behavior and Links with Well-Being

In line with the research on volunteering described above, recent longitudinal and experimental work has also demonstrated the benefits of other, more discrete forms of prosocial behavior. For example, spending money on others has been shown to have a more positive impact on happiness than spending money on oneself in cross-cultural samples across the lifespan (Dunn et al. 2008). Other experimental work looking at young adult samples has revealed that engaging in small acts of kindness can increase positive emotions in individuals who are socially anxious (Alden and Trew 2013), and dyadic studies confirm that short-term prosocial behaviors give an emotional boost to the helper as well as the recipient (Weinstein and Ryan 2010). The benefits of small or short-term prosocial behaviors on well-being continues to be a hot topic, and these recent trends in social psychology could be fruitfully extended to older samples. Further research is needed to also explore potential cognitive and

physical health benefits of small, short-term prosocial behaviors.

Future Directions

The literature on motivations and consequences of prosocial behavior is rich in findings and in implications for social engagement and well-being across the lifespan. This next section will selectively focus on some avenues that may be worth pursuing.

Methodological Directions

While experimental paradigms are typically used to study discrete prosocial acts, such as donating to charity or helping a confederate (Dunn et al. 2008; Weinstein and Ryan 2010), more sustained prosocial behavior, such as formal volunteering, is more often studied using cross-sectional and longitudinal designs that incorporate a variety of data sources (Wilson 2000). There are challenges and limitations to each of the above research designs, for example, laboratory and field experiments are limited with respect to the conclusions that can be drawn regarding how and to what extent people behave prosocially in their everyday lives. Prosocial behavior has been found, in fact, to be very situation specific and hence can vary from day to day or from hour to hour. The use of methods such as experience sampling can help resolve this issue; a key advantage of experience sampling is that it allows researchers to investigate behavior and associated cognitions and emotions as they arise naturally in participants' daily lives (Bolger and Laurenceau 2013). An experience-sampling study could be used, for example, to investigate the short-term, dynamic emotional antecedents and consequences of lawyers' engagement in different kinds of pro bono work over the course of a 2-week period. A promising avenue of research involves combining experience-sampling and experimental methods, in order to assess prosocial behavior (and its antecedents and consequences) in the most scientifically rigorous manner while taking into account the daily life context in which it occurs.

Lifespan Development Knowledge Gaps

In order to understand lifespan developmental changes in prosocial behavior, its antecedents, and its consequences, it is important to include participants of varying ages in a given study. However, the current literature tends to use different approaches when investigating prosocial behavior in young adult samples as compared to older adult samples. Specifically, the vast majority of experimental work in psychology relies on the recruitment of university student samples, who also tend to be WEIRD: from Western, Educated, Industrialized, Rich, and Democratic societies (Henrich et al. 2010). Experimental investigations of older adult volunteers in the Experience Corps (Fried et al. 2004) and field studies of older adults' helping behavior (Midlarsky and Kahana 2007) are notable exceptions to this trend. Further intervention studies (with appropriate controls) in this vein are needed to look at long-term outcomes of sustained volunteerism in older adults. Furthermore, such studies should include middle-aged adults in order to better understand what will motivate them to be active volunteers by the time they leave the labor force and to what extent the benefits of volunteering might extend to this age group.

Many studies of volunteering in older adults also investigate underlying motivations (Wilson 2000). However, although much is known about the benefits of volunteering, less is known regarding whether achieving these benefits depends on volunteers' motivations for their work. For example, it might be interesting to determine whether volunteering that is driven by generativity or that which is driven by socioemotional selectivity produces greater benefits – or if perhaps both sources of motivation need to be there in order for volunteering to be maximally satisfying for older adults. There are a few intriguing studies in this area showing, for example, that volunteering may reduce mortality in old age, but only when volunteers are driven by other-oriented (more altruistic) reasons for volunteering (Konrath et al. 2012).

Emotion Regulation and Cognitive Decline

Behaving prosocially is potentially an effective means of regulating one's emotions, as it can

activate neural pathways related to reward (Moll et al. 2006), reduce the emotional distress of seeing a person in need (Feigin et al. 2014), and help solidify positive relationships with others. However, effective emotion regulation (such as the ability to deal with emotional complexity and high-arousal negative emotion) relies on cognitive resources that decline with age (Charles 2010; Labouvie-Vief 2003). As a result, older adults might find it more difficult to put their emotion-regulation skills into action (Charles 2010). Hence, despite their great capacity for empathy and altruism, age-normative cognitive decline could become an obstacle to older adults pursuing and reaping the emotional rewards of prosocial behavior. Further research is needed to investigate the possibility of direct linkages between emotion-regulation abilities and prosocial behavior as people age.

Implications for Policy and Practice

Given what is known about the health and well-being benefits of volunteering and other forms of sustained prosocial behavior in old age, what can be done to encourage these kinds of behavior in an aging society? From a public policy perspective, society might do well to offer more opportunities for volunteering, as well as leisure activities with a generative focus, for older adults. Businesses, schools, or nonprofit organizations could provide volunteering opportunities through which retired experts can make meaningful contributions. For example, senior experts could provide counsel to young individuals who are starting a new business. Older adults who held management or other high-level positions during their careers could also continue applying their supervisory skills in community volunteering settings, maintaining their status as leaders. Such programs can capitalize on older adults' skills and experience in ways that benefit them and also society at large (Fried et al. 2004).

Conclusion

Prosocial behavior is a fundamental ingredient of life across the adult lifespan. This entry has explored the antecedents or motivations of prosocial behavior and how these may shift over the lifespan, and has discussed various health and well-being benefits of behaving prosocially. Further research in this area needs to directly examine developmental trajectories and outcomes of prosocial motivation and behavior by including older, middle-aged, and young adults in the same study, making use of longitudinal methods whenever possible. It will also be interesting to expand our current knowledge by looking at a variety of short-term as well as sustained kinds of prosocial behavior in the context of adults' daily lives. This area of inquiry promises to inform a social model of health promotion that fosters active social engagement throughout adulthood and into old age and that at the same time benefits society.

Cross-References

- ▶ Aging and Psychological Well-Being
- ▶ Intergenerational Relationships
- ▶ Loneliness and Social Embeddedness in Old Age
- ▶ Psychological Theories of Successful Aging
- ▶ Socioemotional Selectivity Theory

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Alzheimer's Disease, Advances in Clinical Diagnosis and Treatment

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Synonyms

Dementia of the Alzheimer's type

Definition

Alzheimer's disease (AD) is a progressive, irreversible brain disorder that is the most common cause of dementia in later life. It is characterized clinically by a profound impairment in new learning and memory recall along with deficits

commonly in expressive language, complex problem-solving, and visuospatial functions. Neuropathologically the signature of the disease includes abnormal processing and aggregation of two proteins: β-amyloid and tau protein, which leads to the formation of amyloid plaques and intraneuronal fibrillary tangles. Fluid and imaging biomarker tests are now available to measure these abnormalities to facilitate reliable AD diagnosis and staging across the disease continuum.

Introduction

Alzheimer's disease (AD) is a progressive, irreversible brain disorder that is the most common cause of dementia in later life. Although typically conceptualized as a disorder of old age with symptom onset commonly in the eighth decade of life, AD is now recognized to be a chronic disease in which the underlying neuropathology begins to accrue decades before memory problems are appreciated. Clinically the disease begins insidiously, generally when the individual is in their mid-60s or older. The earliest signs typically include impaired recent memory function and trouble in word retrieval. These problems become increasingly more pronounced as the disease progresses, leading to deficits in complex problem-solving, spatial judgment, and motor performance. Ultimately, as the neural destruction evolves, increasing levels of disability result, culminating in total dependence on others for basic needs related to nourishment, toileting, and self-care. Individuals who survive to the late stages of AD eventually are bedbound and in a vegetative state. They typically succumb to the disease due to complications related to severe brain compromise, such as aspiration pneumonia.

With advances in healthcare, more and more people are living into old age (after age 65) and late old age (after age 80). This increase in longevity brings with it a concomitant rise in age-associated illnesses. As a result, Alzheimer's disease is now the leading cause of late-life dementias globally, and it is overall the sixth leading cause of death in the USA, following heart disease, cancer, lower respiratory disease, accidents, and stroke. At present, the disease is estimated to affect nearly 5.4 million Americans and over 36 million individuals globally (G8 Dementia Summit 2013). As the world population continues to age, the numbers are expected to climb dramatically over the next 40 years. By the year 2020, over 76 million individuals will have AD globally, and this number will nearly double to over 135 million by 2050, a number which does not include individuals in the milder stages of disease. The annual costs for medical care will be staggering. In the USA alone, the healthcare costs (Medicare and Medicaid) for AD are currently estimated at 148 billion dollars (Alzheimer's Association Facts and Figures 2015). Absent a treatment to slow the trend, these numbers will exceed 1.1 trillion dollars annually by the year 2050.

Despite considerable advances in understanding the basic biology of the disease, there is currently no cure for the disease nor are there any disease modifying treatments available that can alter the inevitable course of the disease. Without a way to mute the effects of the disease, the public health outlook is grim. Families will bear the greatest burden for care and costs, providing informal care to those affected by the disease, often at personal expense as they exit the work force early to respond to the "around the clock" care needs. In anticipation of the growing economic and social impact of this disease as the population ages, national plans addressing Alzheimer's disease have been enacted by the G8 countries in Europe and by the USA. Each plan is aimed to reduce the numbers of individuals affected by Alzheimer's disease with stated goals of developing effective therapeutics by the year 2025 that could limit the impact of the dementia by either halting Alzheimer's disease altogether or slowing its inexorable progression.

This entry provides a conceptual overview of the clinical, neuropsychological, and neuropathological features of Alzheimer's disease. In this context, we discuss the advances in understanding the genetics and underlying pathogenesis of disease which have resulted in the development of

antemortem biomarkers to facilitate diagnostic reliability across the continuum of disease. The last section of the entry then turns to consider treatments, summarizing the currently available medications and the continuing efforts to identify disease modifying therapies that will delay the onset and progression of disease once it has begun.

Characteristic Features of Alzheimer's Disease

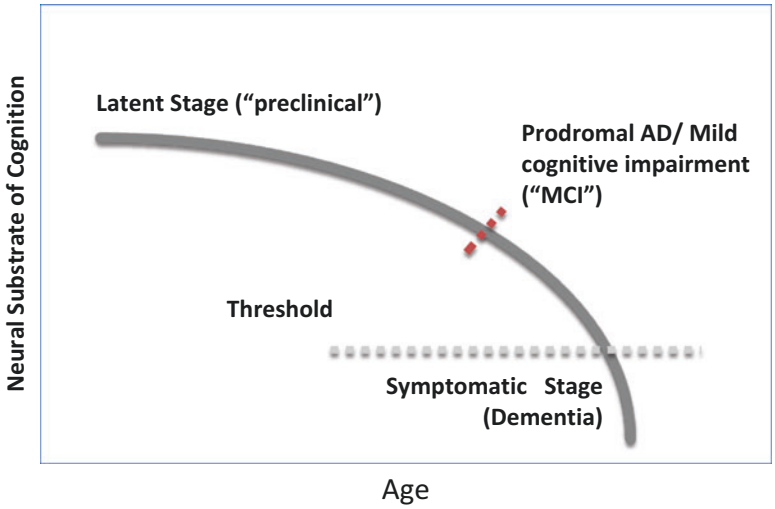
Alzheimer's disease (AD) was first described in 1906 by Dr. Alois Alzheimer who reported the clinical characteristics and the underlying brain pathology in his patient, a 51-year-old woman who progressed to end-stage dementia and eventually succumbed to the disease (see Ballard et al. 2011 for review). Initially believed to be a rare problem, AD is now recognized as a common disorder of late-life that involves the slow, indolent progression of neuropathological change over the course of decades in the brain. Beginning with subtle memory problems, the fully expressed clinical syndrome includes prototypical impairments in four key cognitive domains, referred to as the "4 As" of Alzheimer's disease*:* "Amnesia, Aphasia, Agnosia, and Apraxia." The memory disorder, or the "amnesia" of AD, is characteristically a pronounced anterograde memory disorder involving difficulties in the learning and retention of new information. This problem is consistently one of the earliest and most distinguishing features of AD throughout the disease course, with deficits detectable in the presymptomatic stages. Later, expressive aphasia emerges along with difficulties in form vision and recognition (agnosia) and impairments in problem-solving and the execution of common tasks involving motor integration (apraxia).

At postmortem examination, the disease is characterized by three pathological hallmarks, appreciated since the early descriptions of Alzheimer in 1906. They include (1) an abnormal aggregation of a viscous small peptide, β amyloid, surrounding by cellular debris outside the neuron, termed the "amyloid plaque"; (2) tangled bundles of neurons called "neurofibrillary tangles"; and (3) a loss of synaptic connections between neurons. These changes are not uniformly distributed across the brain but rather are regionally confined to specific cellular laminar areas within the medial temporal lobe area and throughout the associational cortices of the frontal, temporal, and parietal lobes (Arnold et al. 1991). Essentially spared, even into the late stages of the disease, are the sensory and motor cortices.

Although the disease follows a fairly predictable course, there can be some variability in the clinical expression of symptoms, depending on the regions of the brain affected. Regardless of the profile of impairments expressed, the clinical course of disease is one of the inexorable progression which passes through essentially three identifiable stages of disease (see Fig. 1), defined on the basis of a combination of both clinical and biological features. These stages include a latent or "preclinical" stage (Sperling et al. 2011), a prodromal or "mild cognitive impairment" stage (Albert et al. 2011), and the full symptomatic stage of AD dementia (McKhann et al. 2011). Each of these stages is described below along with the role of biomarkers in enhancing diagnosis reliability at each stage (Jack et al. 2010).

Preclinical AD

The preclinical stage of the disease is the clinically silent stage of the disease, in which the affected individual appears cognitively healthy despite the appearance of cortical β-amyloid (Aβ) deposition within discrete regions of the cerebral cortices along with tau pathology and tangle formation in the trans-entorhinal cortices, brain circuits responsible for learning and memory function (Hyman et al. 2012, for review). Prospective, longitudinal data collections within large epidemiological cohorts and clinical series indicate that subtle changes in neurocognition may be observed for nearly a decade before a diagnosis of AD is made, even though the individual's performance may remain within the normal range (Vos et al. 2015). Analysis of cognitive trajectories across a number of studies suggests that the



Alzheimer's Disease, Advances in Clinical Diagnosis and Treatment, Fig. 1 Alzheimer's disease chronic disease model. Alzheimer's disease is now recognized as a chronic disease developing over decades in brain and divided into three stages: preclinical stage where disease is latent, prodromal disease where mild cognitive symptoms are apparent, and a fully symptomatic stage when dementia is evident. Each stage provides avenues for therapeutic intervention. Prior to the silent stage, there is an opportunity for primary prevention in subjects at risk for the disease. As symptoms or pathology express, secondary prevention approaches are aimed at stopping, reversing, or slowing disease progression. At the symptomatic stages, typically the target for therapies is to delay or slow progression

earliest changes are typically in episodic memory performance and aspects of higher executive function, occurring on the order of 7–9 years prior to receiving a clear AD diagnosis. Other cognitive domains, including verbal fluency, change more proximally to dementia onset, within approximately 3 years, whereas simple attention and speed domains remain relatively unchanged until dementia is diagnosed (see Attix and Welsh-Bohmer 2006, for review).

Prodromal AD/Mild Cognitive Impairment

The prodromal stage of AD or "mild cognitive impairment (MCI)" is the early symptomatic phase of the disease at which time the memory impairment for recent events or other cognitive disorders are particularly prominent but function remains fairly to normal. The individual is able to attend to their usual activities unassisted but may be less efficient and is often more reliant on auxiliary aids, such as reminders and calendars, to bolster function (Albert et al. 2011). Clinically, the symptoms can be highly variable early in the process, and hence MCI may be confused on routine screening for the more common experience of age-associated forgetfulness. However, more detailed clinical evaluation with the inclusion of neuropsychological assessment permits the detection and discrimination of mild cognitive impairments from the more benign effects of normative aging. The recent introduction of new AD diagnostic criteria (see Table 1) facilitates diagnostic reliability through a consideration of the clinical signature specific to AD and the incorporation of available fluid and imaging biomarker information. Depending on the criteria used, the early symptomatic stage of the disease is either referred to as the "prodromal" AD (Dubois et al. 2007), "mild cognitive impairment" due to AD (Albert et al. 2011), or a "mild neurocognitive disorder" due to AD (American Psychiatric Association 2013). The criteria differ in some aspects from one another as can be seen in Table 1, with the DSM-5 capturing a broader spectrum of transitional disorders, whereas both the NIA-AA

Alzheimer's Disease, Advances in Clinical Diagnosis and Treatment, Table 1 Diagnostic criteria for mild pre-dementia stage of Alzheimer's disease

IWG-criteria Prodromal AD (Dubois et al. 2007)	NIA-ALZ Association Mild Cognitive Impairment (Albert et al. 2011)	DSM-5 Mild Neurocognitive Disorder (APA DSM5 Manual 2013)
Presence of early and significant episodic memory impairment (alone or with other cognitive/behavioral problems) and includes both (i) a gradual and progressive course from family or patient report over > 6 months and (ii) there is objective evidence of impaired memory on memory tests such as cued recall or encoding tests	Cognitive concern reflecting a change in cognition from usual baseline reported by the individual, a knowledgeable informant (such as a family member) or the clinician's own observation. This can be based on historical information from subject and/or informant or it includes actual observed evidence of decline	Evidence of modest cognitive decline from previous level of performance in one or more cognitive domains based on either an informant report or objective evidence such as neuropsychological testing
		Capacity to perform everyday activities (instrumental activities of daily living) is maintained although greater effort or compensatory strategies may be needed
In vivo evidence of AD pathology, from either: (i) CSF tau/AB levels studies (ii) Amyloid PET imaging (iii) AD autosomal dominant genetic mutations	Objective evidence of impairment in one or more cognitive domains, typically including episodic memory early in the course. This can be established by formal or bedside testing of multiple domains	Not occurring exclusively in the context of delirium
		Not explained by another mental disorder such as major depression of schizophrenia
No sudden onset or early occurrence of gait disturbance, seizures, or major or minor prevalent behavior changes	Preservation of function in abilities to carry out instrumental activities of daily living although greater effort, time, and/or compensatory strategies are needed	The disorder is not better explained by cerebrovascular disease, another neurodegenerative disorder, or another medical explanation
No focal neurological signs, no early extrapyramidal signs, and no early hallucinations or cognitive fluctuations	Etiology is consistent with AD pathophysiological process with evidence of longitudinal decline when possible and history of AD genetic factors when relevant	Probable AD as cause of the mild neurocognitive disorder is supported if there is a genetic mutation from family history or genetic testing
No other medical condition that is severe enough to account for the presentation	Vascular, traumatic, and other medical causes responsible for cognitive decline are excluded	Mild neurocognitive disorder due to possible AD is diagnosed in the absence of a causative gene and all three of the following are met: (i) Clear evidence of decline in learning/memory and one other domain based on history or serial neuropsychological testing (ii) Slow and indolent decline in cognition without extended plateaus (iii) No evidence of mixed etiology
	Biomarkers indicating a high likelihood that the MCI is due to AD include a positive biomarker of Aβ deposition (CSF $A\beta_{42}$, PET amyloid imaging) and a positive biomarker of neuronal injury (CSF tau/phosphorylated tau; hippocampal volume or medial temporal atrophy by volumetric measures or visual rating; FDG-PET imaging)	

criteria of MCI and the Dubois criteria for prodromal AD are focused on diagnosing early symptomatic disorders due specifically to Alzheimer's disease.

Fully Symptomatic AD Dementia

At the fully symptomatic, dementia stage of the disease, the memory problems remain prominent; however, there are also pervasive impairments across areas of problem-solving, language expression, visuospatial function, and other aspects of intellectual ability (Attix and Welsh-Bohmer 2006, for review). These cognitive issues, superimposed on the episodic memory disorder, make it increasingly difficult for the patient to function normally in everyday life (McKhann et al. 2011). Patients become increasingly reliant on others to assist in daily routines, including meal preparation, transportation, bill paying and financial decision-making. By definition, the individual has progressed to "dementia" when the ability to function independently is no longer possible.

This stage of the disease typically lasts for 8–10 years and covers a broad range of functional disability, from mild disruption in instrumental activities of daily living (e.g., bill paying) to some dependence on others for self-care, to end-stage total care. To assist in tracking disease course, the severity of the dementia is often parsed using different methods, such as the Clinical Dementia Rating Scale (CDR; see Attix and Welsh-Bohmer 2006). The CDR breaks the dementia of AD into severity stages, ranging from very mild (CDR = 0.5), mild (CDR = 1.0), moderate (CDR = 2), and severe (CDR = 3), depending on functional abilities within six different domains (memory, communication, independence in self-care, interest in home and hobbies, bladder and bowel function, and overall awareness with the environment). A global composite score, referred to as the sum of boxes (CDR-SB), can be generated by summing ratings across each of the six domains, permitting a continuous measure of observed cognition and functional abilities. This composite score is more sensitive than categorical ratings of dementia (mild, moderate, severe) in detecting changes in function over time and is useful in staging the disease in practice, research, and clinical trials.

Clinical Variants of AD

It should be noted that AD can present in an atypical fashion, where memory is not the prominent early feature. Although less common, visual, language, and frontal variants of AD have been described. In these instances, the initial presenting symptoms may consist of a complex visual system disturbance, such as Balint's syndrome, a fluent aphasia, or a notable dysexecutive disorder, respectively. These variants of AD are very rare and typically have an earlier age of onset than the common form of the disease. Determining the true prevalence of these unusual forms of AD has been difficult due to very few neuropathological studies which permit firm conclusions as to causation of what is presumed to be atypical AD (see Attix and Welsh-Bohmer 2006 for review). However, on both imaging and postmortem evaluation, the brain areas affected by the pathology tend to parallel the abnormal symptoms such as involvement of left hemisphere language areas in instances of aphasia and parietal/occipital involvement in conditions with complex visual system disorders.

Neuropsychological Characterization

Neuropsychological evaluation is an important first step in the characterization of memory disorders occurring in normal aging and AD. This assessment permits the systematic documentation of deficits across multiple cognitive processing domains which can then be mapped to their associated brain systems. AD and other common causes of dementia in later life, including vascular disease, Parkinson's disease, and depression, have unique cognitive signatures reflecting differing underlying neurobiology and neural systems involvement. Consequently, based on both the pattern and extent to which a patient's

performance deviates from age- and education-based normative values, the clinician can draw inferences as to the likely explanation for the cognitive disorder and the degree of impairment.

The characteristic neuropsychological profile of AD dementia is among the best understood of the neurodegenerative conditions of aging (Attix and Welsh-Bohmer 2006). The memory processing problem of AD is one involving impaired "consolidation" of new information from a limited capacity, short-term memory store into a more permanent, longer-term memory store for later use and retrieval. Problems in consolidating information can be demonstrated on verbal episodic learning measures, such as story recall and supra-span word list learning tests, with rapid forgetting of the verbal information over a span of 30 min or less (Attix and Welsh-Bohmer 2006, for review).

Contrasting the memory disorder of AD, forgetfulness in cognitive aging is ascribed to inefficiencies in "encoding" new information (learning) and "retrieval" of this information from a more permanent memory store. Tests such as the Free and Cued Selective Reminding Test (FCSRT) as well as other memory procedures that have built in prompts or recognition procedures are clinically useful in distinguishing between AD and other disorders. These procedures permit distinctions between recall deficits due to AD, encoding/retrieval inefficiencies observed in normal aging, and attentional deficits that can occur in situations of anxiety or depression. Cognitively normal subjects are able to demonstrate recall of newly learned information when retrieval and encoding supports are applied, whereas the use of these same techniques does not appreciably change recollection in AD subjects (Dubois et al. 2007). Building on these observations, some of the newly emerging diagnostic criteria for AD now include recommendations for specific memory techniques to include in the standard assessment of early staged AD to facilitate diagnostic certainty (Dubois et al. 2007).

As mentioned, although memory impairment is the cornerstone of the AD diagnosis, many other aspects of cognition are affected in the disease and need to be assessed, both to secure the diagnosis and to facilitate treatment and medical management efforts. Acquired problems in expressive language often emerge early in the disease course and leads to blocking on words or "anomia." As the problem becomes more acute, the patient will often resort to circumlocution, a tendency to describe the word eluding recall. To assess language expression, tests of visual naming and word fluency are commonly used (Attix and Welsh-Bohmer 2006). Typically, patients with the anomia of AD will do poorly on tests of visual memory and category fluency where they are required to generate examples of items in the category of interest (e.g., animals). Curiously, word generation to a letter such as the commonly used F-A-S task remains intact, suggesting that the problem is not in language retrieval but rather in retrieval of specific examples from semantic knowledge stores. Comprehension and repetition also remain preserved at this point in the illness. However, these abilities also change as the disease progresses. Ultimately, deficits in speech expression become more extreme and the burden of conversation falls increasingly on the listener. Impairments in verbal comprehension begin to emerge during the later stages of dementia, making it increasingly difficult for patients to process more than one task at time. These problems in performing single and multistep commands can be established with tests of verbal comprehension such as the Token Test.

Subtle issues with visuospatial function often surface early in the disease leading to issues in spatial navigation even in familiar territory. Later in the disease these problems become more pronounced, and difficulties involve impaired vision perception difficulties in well coordinating motor movements. The problems in perception can contribute to "agnosia" which refers to the ability to understand the environment. And the deficits in spatial and motor coordination lead to "apraxia," the ability to complete common motor tasks such as manipulating utensils, dressing correctly, and navigating effectively in a familiar environment. While at the later stages of the disease, when the full syndrome of AD dementia is expressed, neuropsychological testing may not be required for documenting and characterizing these obvious

problems. Within the early stage of disease, neuropsychological testing of visuospatial, construction, and perceptual functions can be quite useful in documenting subtle processing problems that are not at all obvious in conversation or on mental status screening. Deficits in visuospatial function can be elicited using tests of constructional copy, involving simple and more complex designs. Other tests examine judgments of spatial alignment, form vision, or visual conceptualization and abstraction.

Neuropathological Signature

Biological Basis of Alzheimer's Disease

Although the cognitive signature of AD is now very well understood, the biological causes underlying this complex condition are not completely resolved. Three dominant hypotheses of disease causation include what are called the cholinergic, amyloid cascade, and tau hypotheses. The first of these hypotheses, the cholinergic hypothesis, conceptualized AD as a disease involving the cholinergic system, the main neurotransmitter system innervating the hippocampal memory system. The hypothesis was supported by two fundamental observations. First, age-dependent memory change had been shown to be closely related to cholinergic system integrity. Second, the pathology of AD was correlated with the extent of cell loss in the nucleus basalis of Meynert, the source of cholinergic afferents to the hippocampal memory system. The cholinergic hypothesis drove initial drug development in the 1980s–1990s (Schneider et al. 2014, for review), but was found to be an incomplete explanation of the aggregation of amyloid and tau pathology seen in the disease.

More recent hypotheses focus around the abnormal processing of amyloid and tau, as the key constituent proteins involved in amyloid plaque formation and neurofibrillary tangles, respectively (Ballard et al. 2011). The amyloid hypothesis has been the most influential of the hypotheses in the last decade, leading to the identification of drug treatment targets, and is the basis of many of the current drug development efforts. The hypothesis essentially proposes that there is a chain of cellular events in predisposed individuals which results in an abnormal processing of the amyloid precursor protein (APP) leading to an incorrectly cleaved peptide product, amyloid-β (Aβ). The increased production and impaired clearance of Aβ, particularly the oligomeric form of the peptide, proves neurotoxic. As a consequence, this abnormal Aβ deposition initiates a pathogenic cascade which results in tau phosphorylation, neurofibrillary tangle development, cell death, and the concomitant emergence of clinical symptoms. Support for the amyloid hypothesis of AD pathogenesis has come from the field of genetics. Known mutations in genes encoding APP accelerate amyloid-β production in gene carriers and result inevitably in an early onset form of AD. Other gene mutations have been identified in two other genes, presenilin 1 (PSEN 1) and presenilin 2 (PSEN 2), each of which has a primary effect on Aβ processing and plaque formation and also leads to an early onset form of the disease (Vos et al. 2015, for review).

Although the amyloid hypothesis is well accepted as an explanation of the plaque formation occurring in AD subjects (Jack et al. 2010), this hypothesis is a source of debate as an explanation that can fully explain the neurodegeneration occurring in the disease. By definition, amyloid plaque formation is present in all cases of AD, but aggregation of Aβ is also observed in aged individuals who do not manifest any clinical signs of the disease. There also is poor correlation between the level of overall aggregation of Aβ and both the extent of clinical impairment and apparent neurodegeneration upon which the dementia rests (Small and Duff 2008; Ballard et al. 2011, for review). Further, if Aβ accumulation is an essential "upstream" event in AD, it is unclear how this aggregation incites intracellular hyper-phosphorylation of tau, a key cellular event observed in AD. The failure of a number of recent clinical trials using Aβ lowering agents gives further pause to the amyloid hypothesis (Cummings et al. 2014). In these trials, there was no clinical improvement in patients with mild to moderately severe staged disease, despite an overall reduction in Aβ deposition indicating appropriate target

engagement. Although it is argued that the compounds were aimed at the wrong stage of the disease and should be implemented in the preclinical stage to be effective, an alternative interpretation is that amyloid dysregulation alone may be an insufficient explanation for the neurodegeneration occurring in AD. Other mechanisms may need to be considered to explain the emergence of clinical dementia.

The tau hypothesis has generated considerable attention and is focused around abnormal processing of tau protein within neurons resulting in tangle formations. Tau protein is an important constitutional protein within the neuron, playing a role in microtubule stabilization and cellular transport (see Small and Duff 2008, for review). In its abnormal phosphorylated state, as occurs in AD, the protein forms cross-linkages leading to microtubule instability, impaired axonal transport, loss of synaptic connections, and cell death. Support of this hypothesis is a tight correlation between the extent and distribution of tangle formations, loss of synapses, and the cognitive disorder of AD. For this reason, tau is considered crucial to AD pathogenesis. However, as in the other hypothesis, it remains unresolved as to how tau processing and amyloid aggregation are linked together (Small and Duff 2008).

Other hypotheses under investigation include (1) a role of genetics in driving both tau phosphorylation and Aβ clearance, (2) impaired homeostasis of cerebral iron and problems with myelin repair, (3) environmental influences altering blood–brain barrier permeability to opportunistic pathogens, and (4) altered immune response and an unresolved inflammatory response or some combination of these and other mechanisms. While each explanation has some support for observed cellular abnormalities in AD, none of these explanations are considered mutually exclusive. Rather, the pathogenesis of AD is now conceptualized as involving a number of complex events mediated by unique cellular pathways that ultimately involve amyloid aggregation, tangle formation, synapse loss, and cell death. Triggering events, while not completely known, are likely influenced by a number of host risk conditions including genetic factors as mentioned. Understanding the pathophysiological pathways involved in AD and the interactions between these pathways to cause the disease is crucial for the development of effective treatments.

Genetics of Alzheimer's Disease

Whatever its role in AD pathogenesis, it is now well understood that genetics has a fundamental effect in AD risk and symptom onset. As already described, gene mutations in APP, PSEN1, and PSEN2 are causal linked to both an overproduction of Aβ and an early onset form of AD. However, these genes account for less than 5% of all cases of AD, leaving the vast majority of AD cases unexplained by genetic mutations. In the more common late-onset form of AD, common variations in several other genes have been identified as increasing risk of disease and leading to an earlier symptom onset (see Ballard et al. 2011; Lambert et al. 2013 for review). The most consistently associated risk gene is *ApoE*, a gene that is important in cholesterol metabolism and also plays a role in immunity, inflammation, and endosomal vesicle recycling. The gene also appears to have an effect on APP trafficking and AB production.

For nearly 15 years, this gene was the only established risk factor for late-onset AD. With the advent of new genome-wide sequencing approaches, other gene loci have been identified. In a recent meta-analysis involving over 74,000 cases of AD and controls, 19 loci including APOE were identified as reaching genome-wide significance as associated with AD (Lambert et al. 2013). Interestingly, the second strongest signal to date is within the *SORL1* gene, a gene that is associated with increased risk of both autosomal dominant and sporadic forms of AD. It is the first gene related to late-onset forms of AD that directly connects abnormal trafficking of APP to the late-onset form of AD. Other genes identified have roles in amyloid and tau processing and in inflammation and immune function. Some new genes were identified with roles in other fundamental cellular functions, including hippocampal synaptic function, cytoskeletal function, and

axonal transport. This now provides new mechanistic insights into late-onset disease and possibly some new target pathways for drug development.

Biomarkers of Alzheimer's Disease

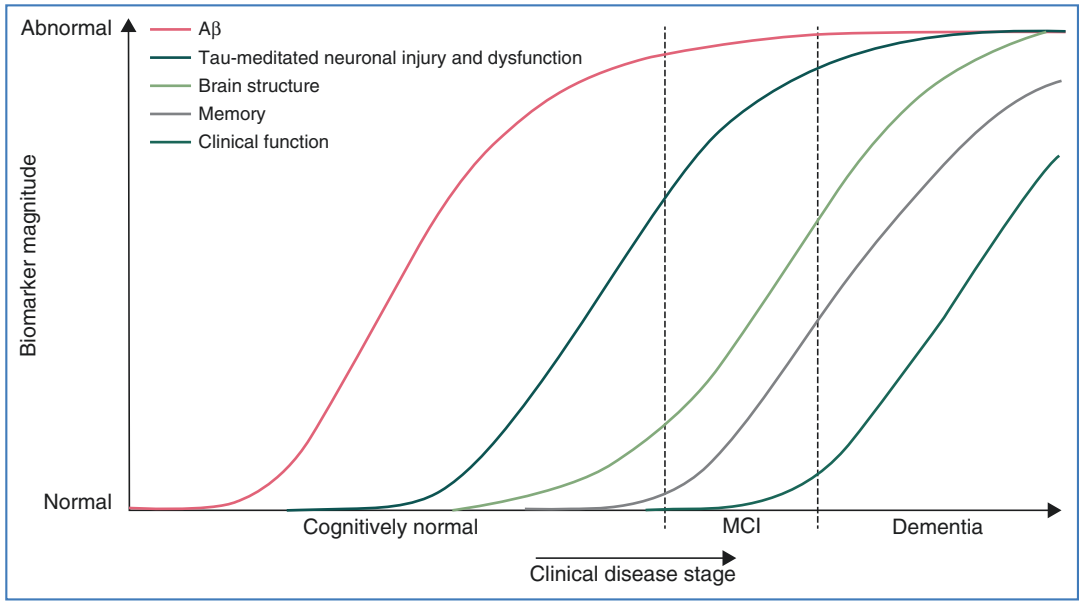
Based on a better understanding of the underlying biology of AD, biomarkers are identified which track the disease and can be applied to facilitate diagnostic decision-making and disease staging. The five scientifically established biomarkers included in the new diagnostic criteria for AD are (1) cerebrospinal fluid (CSF) measures of Aβ42, (2) CSF level of total tau (t-tau) and phosphorylated tau (p-tau), (3) position emission tomography (PET) amyloid imaging, (4) structural magnetic resonance imaging (MRI) measures of hippocampal volume loss and cerebral atrophy, and (5) regional hypometabolism on fluorodeoxyglucose (FDG) PET. The use of these biomarkers in clinical diagnosis is based on a theoretical model of how AD unfolds pathologically over time (Jack et al. 2010; Fig. 2).

According to the initial model, Aβ deposition is an early initiating event in the pathogenic cascade, measured by low levels of CSF Aβ42 or high uptake of amyloid PET tracers. Shortly thereafter, once amyloidogenesis has commenced, there are detectable elevations in levels of CSF t-tau and p-tau, markers correlated with postmortem neurofibrillary tangle burden and neuronal degeneration at autopsy. Later, as neuronal dysfunction becomes more pervasive and neurodegeneration ensues, there are measurable changes in memory, brain volume on MR imaging, and glucose utilization on FDG-PET imaging. Validation of the model is based on accumulating evidence that the biomarkers mirror the pathophysiological progression of the disease. Although the relative temporal emergence of the biomarkers is still debated, the presence of these biomarkers in the context of clinical disease helps affirm a diagnosis of MCI or AD dementia. Their presence in cognitively healthy subjects suggests preclinical disease and provides a testable framework for *in vivo* staging of asymptomatic illness (Vos et al. 2015). As clinical trials in earlier stages of disease get underway, these biomarkers are being used to improve subject identification (Sperling et al. 2011). Change in these markers in response to therapy may also serve as indicators of target engagement as well as surrogates tracking disease progression.

Treatments for Alzheimer's Disease

Treatment trials leverage genetic risk factors and evidence of AD biomarkers as interventions move to earlier stages in the disease course (Reiman et al. 2016). Currently approved medications were developed in symptomatic disease and are prescribed in mild AD and in MCI. All four compounds are considered symptomatic treatments, improving attentional focus but not altering the underlying neuropathology of the illness (Schneider et al. 2014). Each has demonstrated modest effects on cognition over the course of 6 months in patients with mild to moderate AD. The cholinesterase compounds include donepezil, introduced in 1996 (1997 in the UK), rivastigmine approved in 2000 (1998 in Europe), and galantamine made available in 2001 (2000 in Europe). Later, in 2002 in Europe and 2003 in the USA, the N-methyl-D-aspartate (NMDA) receptor antagonist, memantine, was approved for use in moderate to severe AD (Schneider et al. 2014). No other new compounds have been approved for AD over the last 13 years, despite a number of promising agents that have effectively engaged therapeutic targets.

The reasons for the lack of recent AD clinical trial successes are likely complex and involve a combination of (1) imperfect study designs, such as heterogeneous patient populations with an admixture of diagnoses, (2) focus on compounds that are targeted on wrong disease mechanisms, and (3) attempt to implement therapies that alter the pathological targets but are introduced at the wrong stage of disease. In overcoming these challenges, the current generation of trials uses AD biomarker evidence to improve patient selection, focuses on a broad array of disease targets, and attempts to match the right treatment to the right stage of disease, based on current models of the



Alzheimer's Disease, Advances in Clinical Diagnosis and Treatment, Fig. 2 Original dynamic biomarkers of the AD pathological cascade model. Aβ amyloid is identified by CSF Aβ42 or PET amyloid imaging. Neuronal injury and dysfunction are identified by CSF tau or FDG-PET. Neurodegenerative atrophy is measured by structural MRI (Republished with permission of Lancet Neurology from article entitled "Hypothetical model of dynamic biomarkers of the Alzheimer's pathological cascade" Author: Clifford R. Jack Jr et al., Lancet Neurology 9:119–128, 2010; permission conveyed through Copyright Clearance Center, Inc., April 13, 2016, # 11555434)

unfolding of the disease pathophysiological cascade over time.

Many of the current therapeutic efforts are now positioned earlier in the disease continuum to test the efficacy of therapeutic compounds in postponing, reducing risk, or completely preventing the clinical onset of AD (Reiman et al. 2016). These so-called "secondary prevention" trials include the Anti-Amyloid Treatment in Asymptomatic Alzheimer's "A4" study which is testing amyloid-based therapeutics for the sporadic form of the disease in individuals with high amyloid deposition visualized on functional brain imaging. The Alzheimer's Prevention Initiative (API) of the Alzheimer's Disease Cooperative Study (ADCS) is a program that includes cognitively healthy participants who are at high risk of AD based on their genetic background and age. The API-ADAD study examines large families or "kindreds" with evidence of autosomal dominant AD transmission; the API-APOE4 study examines subjects who have at least one e4 allele. The Dominantly Inherited Alzheimer Network Trials Unit (DIAN-TU) is examining promising treatments in individuals with known causative mutations for AD in the PSEN1, PSEN2, or APP genes. All three clinical trial programs described are supported through public–private partnerships positioned between the US National Institute of Health and industry partners. Another global trial to delay the onset of clinical signs of MCI due to AD is the TOMMORROW study. This investigation, unlike the others summarized, is entirely industry sponsored. It is designed with two goals. The first of these is to qualify a genetic biomarker risk algorithm comprised of two AD risk genes (APOE, TOMM40) for assigning 5 year risk of developing MCI due to AD. The second concurrent goal is to evaluate a novel agent which acts on cellular bioenergetics, a low-dose pioglitazone, in delaying the onset of MCI due to AD in cognitively normal, high risk individuals based on the genetic risk algorithm.

Non-pharmaceutical Approaches: Modifiable Risk Factors of Alzheimer's Disease

Beyond pharmaceutical trials, large-scale epidemiological studies have suggested a host of both modifiable and unmodifiable factors that contribute to the lifetime risk of AD and different mechanistic aspects of the disease. The most consistent behavioral health factors tied to AD risk include (1) smoking, (2) poor diet (high saturated fat and low vegetable intake), (3) cognitive inactivity, (4) diabetes, (5) physical inactivity, and (6) depression (Xu et al. 2015). Because these factors represent treatable conditions, the implication is that by addressing these factors when present, it may be possible to reverse some of the adverse health trends and, when done on a large scale, could have a substantial impact on global public health. Recent public health statistical models support this premise (Norton et al. 2014). A modest theoretical reduction (10–20% over the next several decades) in the prevalence of the seven major risk factors associated with AD (low education, diabetes, smoking, midlife hypertension, obesity, physical inactivity, and depression) could have a remarkable impact on the future prevalence of AD in 2050, amounting to potentially 8–15% fewer cases worldwide or 9–16 million fewer affected individuals (Norton et al. 2014).

At the individual patient level, the ultimate test of the clinical effectiveness of these interventions in reducing AD risk rests on the results of randomized clinical trials. To this end, a number of trials are underway examining individual behavioral interventions involving diet, exercise, cognitive interventions, or their combination. Recent findings from a large clinical trial in Finland, the FINGER study, are particularly encouraging. This study examined the impact of modifying unhealthy lifestyle behaviors with a multicomponent approach. Preliminary data after 2 years of observation suggests that such intensive interventions can have a measurable influence on cognitive and vascular health (Ngandu et al. 2015). In this trial of over 600 cognitively healthy individuals at high risk for vascular disease, those individuals who were randomized to lifestyle interventions involving diet, exercise, cognitive training, and vascular risk monitoring showed significant neuropsychological improvements over 2 years compared to those who received regular health monitoring and information about healthy lifestyle (Ngandu et al. 2015). Future studies are needed to determine the impact of behavioral approaches such as these on individuals with either mild memory disorders or with brain evidence of preclinical disease. However, the current data suggest that attention to modifiable health conditions may serve to preserve optimal brain health in aging and may be important in forestalling dementia in patients who are at risk of AD and related conditions.

Conclusions

AD is a highly complex, chronic disease evolving over decades in the brain and involving not only multiple pathological mechanisms but a broad network of interconnected brain systems. Progress in understanding the neuropsychological expression of disease and the neurobiology of the disease now permits early detection of true cases of disease and more confident diagnoses. The early identification of silent preclinical disease provides a strategy for drug development during a point in the illness when intervention is most likely to have an impact. Success in treating AD will likely require a range of therapeutic agents which are applied strategically either alone or in combinations at different points in the illness. Additionally, it is likely that the therapies applied will not be confined to pharmaceuticals. Rather, optimal approaches will likely need to use a personalized approach that considers the entire patient, existing health conditions, lifestyle, and other variables. Treatments will need to be multimodal and involve both drug compounds and behavioral lifestyle approaches. The challenges ahead will be in determining the optimal combinations and how to personalize these therapies to each patient at differing stages of disease. Tools developed through neuropsychology and brain imaging will continue to be fundamental to patient care and will likely provide the optimal

metrics both for tracking response to treatment as well as for gauging overall function and quality of life in the various stages of this chronic progressive disease.

Cross-References

- Behavioral and Psychological Symptoms of Dementia
- Dementia and Neurocognitive Disorders
- Frontotemporal Dementia (FTD)
- Person-Centered Care and Dementia Care Mapping
- Semantic Dementia
- Vascular and Mixed Dementia

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Andropause, Understanding the Role of Male Hormones in the Aging Process

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Synonyms

Late-onset hypogonadism (LOH); Partial androgen deficiency of the aging male (PADAM)

Definition

Andropause or late-onset hypogonadism (LOH) is frequently defined as low serum testosterone (T) accompanied with symptoms. Symptoms may include reduced sexual function, loss of vigor, muscle weakness, osteoporosis, low mood or depression, weight gain, insulin resistance, and potential cognitive symptoms.

Serum levels of total testosterone and bioavailable T (T that is not bound to sex hormone-binding globulin) decrease with age in men (Moffat et al. 2002; Tenover et al. 1987; Tenover 1992). While there is some variability with regard to the criteria for andropause, there is general consensus that a diagnosis of andropause in older men requires the presence of low T accompanied by the presence of symptoms of low testosterone (Matsumoto 2002). The European Male Ageing Study (EMAS) defined the diagnostic criteria for LOH to include the simultaneous presence of reproducibly low serum T (total T $<$11 nmol l-1 and free T $<$220 pmol l-1) and three sexual symptoms (erectile dysfunction, reduced frequency of sexual thoughts, and morning erections). By these criteria, only 2% of 40- to 80-year-old men have LOH (Huhtaniemi 2014). Common causes of LOH in older men include obesity and impaired general health, and these are more common causes of low T than chronological age.

In addition to the impact on health factors, there is some evidence of an association between low T and low mood or depression (Khosravi et al. 2015) as well as impaired cognition (Cherrier 2009) although findings are equivocal. Several epidemiological, cross-sectional studies involving large groups of healthy older males have reported bioavailable or free T to be significantly and positively correlated with tests of global cognitive functioning (Yaffe et al. 2002; Barrett-Connor et al. 1999) and measures of attention (Hogervorst et al. 2004) and measures of visuospatial ability and semantic and episodic memory (Moffat et al. 2002; Thilers et al. 2006). Older hypogonadal men evidence significantly poorer performance for visual memory, verbal memory, divided attention, and visuospatial rotation compared to eugonadal men and are at greater risk for developing dementia (Moffat et al. 2004).

Indications, and consideration for treating andropause with T supplementation, can include patient motivation to improve symptoms and prevention or reduction of risk for frailty, immobility, and improvement of cognition. Several studies have revealed a beneficial impact of T treatment in older men for sexual functioning, muscle strength, and quality of life (Srinivas-Shankar et al. 2010; Kunelius et al. 2002).

In addition, there is some indication of beneficial effects on cognition for older men with low or low normal T levels and with mild cognitive dementia and/or Alzheimer's disease (Cherrier et al. 2005, 2015) although not all studies have shown a beneficial effect (Maki et al. 2007; Kenny et al. 2004).

T treatment, like all interventions, includes medication-related effects which may include acne, polycythemia (increased red blood cells), possible increase in prostate-specific antigen or prostate growth, edema, gynecomastia, and sleep apnea. Consideration of treatment for andropause or LOH should be discussed with the medical provider with consideration given to the treatment goal and all the important health factors of the patient (Cunningham 2013).

Cross-References

► Gender Differences in Memory and Cognition

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Anxiety and Cognition

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Synonyms

Neurocognitive functioning in late-life anxiety disorders; Neurocognitive functioning in the context of late-life anxiety symptoms

Definition

Older adults reporting elevated anxiety symptoms have been shown to exhibit lower global cognitive functioning and lower performance in specific cognitive domains, namely, speed of information processing, memory, and effortful cognitive abilities known collectively as cognitive control (Beaudreau and O'Hara 2008). Anxiety is also frequently observed in older individuals with cognitive impairments, such as dementia (Beaudreau and O'Hara 2008).

Global Cognitive Performance

Scientific evidence bridging late-life anxiety and cognitive performance has focused primarily on nonclinical older samples without cognitive impairment (Beaudreau and O'Hara 2008). Even among older adults with no psychiatric diagnosis, greater severity of self-reported anxiety symptoms correlates with worse global cognitive functioning in most cross-sectional studies (Beaudreau et al. 2016). Further, clinical levels of anxiety were found to increase the risk of global cognitive decline 1–5 years after baseline testing in one study (Sinoff and Werner 2003). Other longitudinal studies did not find an effect of anxiety on global cognitive decline (DeLuca et al. 2005; Okereke and Grodstein 2013). Thus, while elevated anxiety may be associated with worse global cognitive performance, findings regarding anxiety severity and global cognitive trajectories are mixed.

Attention and Information Processing Speed

Studies on specific cognitive abilities suggest that older adults with elevated anxiety perform worse in some cognitive domains relative to older adults reporting minimal anxiety (Beaudreau and O'Hara 2008). Community-dwelling older adults who report more severe anxiety symptoms have been noted to have slower information processing speed (Beaudreau et al. 2016) and greater declines over time (Petkus et al. in press), with some evidence that more anxiety and depressive symptoms together impact speed of processing in community samples (Beaudreau and O'Hara 2009). Poorer divided attention and simple attention for spatial information also have been reported in older adults with higher anxiety (Beaudreau and O'Hara 2008; Derousene et al. 2004). Elevated anxiety, however, was not significantly associated with simple attention for repeating digits aloud (Derousene et al. 2004; Wetherell et al. 2002) or sequencing digits by connecting the dots on a trail-making task (Mantella et al. 2007).

Thus, performance on tasks that are more complex or require more effortful attention might be lower with elevated anxiety, but there is limited evidence that anxiety influences simple tasks of attention.

Cognitive Control

Complex cognitive processes, collectively referred to as executive functioning or cognitive control, have been of increasing interest with regard to late-life anxiety (Beaudreau et al. 2013). Though many definitions for these abilities exist, the most recent conceptualization includes tasks that require a person to maintain a goal or switch goals. This conceptualization of cognitive control has been examined using the Stroop task, which requires the person to say the ink color of color words that are purposely incongruent (i.e., the word "blue" written in red ink). In older nonpsychiatric community samples, inhibitory ability appears to be lower in those with more severe anxiety symptoms (Beaudreau and O'Hara 2008). This association is not attributable to depressive symptoms as an independent predictor or in interaction with anxiety symptoms in community elders, suggesting that anxiety may be uniquely related to inhibition. Ability to shift set (i.e., alternating between numbers and letters sequentially) is worse in individuals with generalized anxiety disorder (GAD) than in nonpsychiatric controls (Mantella et al. 2007) and also poorer in elders with more anxiety symptoms (Booth et al. 2006; Yochim et al. 2013). Nevertheless, poorer set shifting was also found in individuals carrying a diagnosis of major depressive disorder (MDD; Mantella et al. 2007) or with greater depressive symptoms (Yochim et al. 2013) suggesting that these findings are not anxiety specific. Further, in the Mantella et al. study (2007), the MDD group performed worse than the GAD and nonpsychiatric control groups on a very basic cognitive control battery. This finding suggests that the nature of cognitive control difficulties in anxiety compared with depression is distinct and likely more global in late-life depression than in anxiety.

Memory

Memory is another complex cognitive ability that might be compromised with elevated anxiety (Beaudreau and O'Hara 2008; Beaudreau et al. 2016). Nonclinical older samples have demonstrated worse learning and delayed memory for verbal information in the context of more severe anxiety symptoms (Booth et al. 2006), though the association might not be linear. Specifically, mild and severe anxiety could both be detrimental to memory performance, and moderate levels could be facilitative in older adults – potentially best represented as an inverted U-shaped relationship (Bierman et al. 2005). Other nonpsychiatric older adult studies have also found an association, independent of depressive symptoms, between higher state anxiety and greater declines in visual recognition memory over time (Petkus et al. in press). In psychiatric samples, general memory performance has been shown to decline faster in older individuals with MDD and a co-occurring anxiety disorder (GAD or panic disorder) than MDD alone (DeLuca et al. 2005). In an investigation comparing older individuals with GAD, MDD, and nonpsychiatric controls, Mantella and colleagues (2007) found that both GAD and MDD groups had poorer delayed memory performance compared with controls; thus, memory issues may not be specific to anxiety. Only the GAD group (and not those with MDD), however, had significantly poorer immediate memory recall compared with controls. This could be due to older persons with GAD having trouble encoding new information due to attentional problems, or because they lose recent information more quickly, possibly due to inefficient learning strategies related to poorer cognitive control abilities. The latter hypothesis of inefficient learning strategies being unique to anxiety is posited from recent evidence showing that in nonpsychiatric elders, elevated anxiety and depression were both associated with more difficulty in learning new information; however, anxiety alone was associated with less efficient categorization strategies (Yochim et al. 2013). Future studies that examine the underlying memory processes in GAD would help determine mechanisms behind the findings regarding memory performance in GAD.

Other Cognitive Abilities

Less research has focused on other cognitive abilities such as language and visuospatial abilities.

Though one investigation found that the ability to generate synonyms for words was poorer in the context of greater state anxiety (Wetherell et al. 2002), other studies found that confrontational naming of objects based on line drawings was not associated with anxiety severity in nonpsychiatric (Beaudreau and O'Hara 2009) or psychiatric older samples (i.e., Mantella et al. 2007). Thus, generally speaking, there is no clear evidence that anxiety impacts language in older adults.

Visuospatial ability may potentially be compromised in the presence of elevated anxiety, although only one study has reported on this to date. Older adults with higher state anxiety demonstrated poorer visuospatial skills based on a block design task (Petkus et al. in press). Preliminary findings from an investigation of community-residing older adults, however, found no associations between anxiety symptom severity and visual-spatial abilities based on a line orientation task (Beaudreau et al. 2015).

Cognitive Models

Eysenck's processing efficiency and attentional control theories are broadly applicable to late-life cognitive performance in individuals with both nonpsychiatric and psychiatric anxiety. Eysenck proposed that anxious states divert cognitive resources to threatening stimuli and away from cognitive tasks. He postulates that this overtaking of cognitive resources interferes with attentional control during inhibition, task shifting, and working memory monitoring or updates (Eysenck et al. 2007). Marchant and Howard (2015) extended Eysenck's theory to hypothesize that worry or anxiety incurs a cognitive debt with regard to compensatory strategies. Specifically, a person's ability to compensate for cognitive losses due to neurodegenerative disease diminishes in the presence of anxiety because it taxes cognitive resources. This tendency for anxiety to usurp precious cognitive resources, combined with normal, age-related cognitive loss, has been proposed as a double jeopardy in anxious, older individuals (Beaudreau et al. 2013).

Summary

Late-life anxiety has associations with global cognitive performance and with more complex cognitive processes, namely, divided attention and information processing, cognitive control, and memory. Late-life anxiety and depression overlap in some areas identified as reduced for cognitive control ability, such as set shifting. Other areas of reduced cognitive control performance appear unique to anxiety, for instance, inhibitory ability and categorization. These dampened cognitive control abilities in late-life anxiety could potentially drive lowered performance in other complex cognitive processes, such as memory. Evidence for associations of anxiety with other cognitive abilities, including simple attention, language, and visuospatial ability, derives from few studies and less theoretical support. Continued development of a framework that combines theoretical work regarding anxiety grabbing attentional resources and cognitive decline due to normal aging is most salient to understanding these associations.

Anxiety in Individuals with Cognitive Impairment

A second line of inquiry with regard to anxiety and cognition in older adults has been to determine if anxiety is more common in older individuals with cognitive impairment and more recently whether anxiety increases the likelihood of incident cognitive impairment. This research has mostly focused on dementia, but mild cognitive impairment (MCI) has been studied as well. Higher rates of anxiety symptoms are observed with more severe cognitive impairment, i.e., dementia (Beaudreau and O'Hara 2008). In particular, the likelihood of clinically significant anxiety triples in MCI compared with older adults with no cognitive impairment (Geda et al. 2008). The presence of anxiety in MCI and dementia has been reported as high as 43% and 80%, respectively (Lyketsos et al. 2002). Both amnestic and non-amnestic subtypes of MCI have been linked to chronic and severe anxiety (Andreescu et al. 2014).

The presence of anxiety symptoms also increases over time in dementia (Brodaty et al. 2015), and these symptoms have been

shown to lead to additional behavioral and cognitive issues (Ferretti et al. 2001), which can create further challenges to the person with dementia, the caregiver, or both. In addition, anxiety symptoms double the risk of Alzheimer's disease in persons with MCI over a 3-year time frame (Palmer et al. 2007). Anxiety emerged as an independent risk factor for Alzheimer's disease (AD) in participants with amnestic MCI enrolled in the Alzheimer's Disease Neuroimaging Initiative (ADNI), a longitudinal investigation with recruitment sites around the world (Mah et al. 2015). The median follow-up was 3 years. Anxiety remained significant after accounting for memory loss, depression, and baseline volume for areas of the brain typically associated with AD pathology and neurodegeneration (hippocampus and, within it, the entorhinal cortex). Remarkably, anxiety predicted faster atrophy of the entorhinal cortex. Results suggest that anxiety exerts an effect on the entorhinal cortex both directly and indirectly. The authors contend that these results argue for anxiety as a risk factor for dementia rather than a prodromal stage of dementia.

Biological Models

Neurotoxic effects of habitual stress on the brain have been a popular model linking late-life anxiety and cognitive impairment (Carlson 2004). In particular, the hypothalamic-pituitary-adrenal (HPA) axis produces the stress hormone cortisol. Chronic elevation of cortisol due to stress anxiety can have damaging effects on the brain, especially the hippocampus (Lupien et al. 1998), a critical area for learning and memory, and the prefrontal cortex (Kremen et al. 2010), important for cognitive control.

Genetic factors are also implicated in the association between anxiety and cognitive dysfunction. Shared genetic vulnerabilities have been shown to explain as much as 36–80% of the correlation between anxiety and cognitive performance (Petkus 2014). Genetic factors common to anxiety and dementia partially explain the increased risk of developing dementia in older adults with elevated anxiety (Petkus et al. under review). Gene polymorphisms, particularly Val66Met polymorphism of the *BDNF* gene (Suliman et al. 2013; Ward et al. 2014) and the *Apolipoprotein E ε4* variant (Michels et al. 2012; Reynolds et al. 2006), have been identified as potential contributors to both anxiety and cognitive impairment. These and other genetic vulnerabilities likely interact with environmental risk factors, particularly early life stress or abuse (Heim and Nemeroff 2001), setting the stage for both anxiety and cognitive impairment.

Chronic medical conditions, such as cardiovascular disease (Mozaffarian et al. 2015) and high blood pressure (Carmichael 2014), are also associated with elevated anxiety and poorer cognitive performance. Both of these medical conditions have been associated with white matter changes in the brain that have been implicated in reduced cognitive control abilities (Carmichael 2014). In addition, thyroid disease has been linked to both anxiety and cognitive functioning. Thyrotoxicosis and Graves' disease, diseases with hyperthyroidism, have been associated with more severe levels of anxiety symptoms in younger (Gulseren et al. 2006) and older adults (Brandt et al. 2014). Hyperthyroidism may also produce cognitive problems, although the results have been mixed (Yudiatro 2006; Lilesvant-Johansen 2014). Though not a medical condition per se, it is worth noting that amyloid beta deposits, common in AD, may be moderated by anxiety symptoms (Pietrzak et al. 2015). In particular, older individuals with no cognitive impairment demonstrated faster cognitive decline in the presence of high amyloid beta concentration and high anxiety. Thus, biological models suggest that the etiology underlying association between anxiety and cognitive decline is multifactorial including, but not limited to, the neuronal, environmental, genetic factors and specific chronic medical conditions.

Conclusion

To date, there is overwhelming support for associations between elevated anxiety and reduced cognitive ability in older individuals. Further, the higher frequency of anxiety among cognitively impaired individuals is now substantiated with prospective investigations showing anxiety as a risk factor for developing dementia. While anxiety

shares some cognitive characteristics with depression, the evidence base clearly shows that aspects of reduced cognitive performance and risk for cognitive impairment have unique associations with anxiety not otherwise explained by depression. Further delineation of these associations could lead to identification of different anxiety subphenotypes distinguished by distinct cognitive profiles, which could have implications for treatment as well as prevention of cognitive impairment.

Cross-References

- ▶ Anxiety Disorders in Later Life
- ▶ Aging and Attention
- ▶ Aging and Inhibition
- ▶ Cognitive Control and Self-Regulation
- ▶ Depression in Later Life
- ▶ Emotion–Cognition Interactions
- ▶ Executive Functions
- ▶ Mental Health and Aging

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Anxiety Disorders in Later Life

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Synonyms

Anxiety disorders in older adults; Late-life anxiety disorders

Definition

Anxiety disorders are generally characterized by both excessive fear and irrational, fearful thoughts that are difficult to control and negatively affect daily functioning. Additionally, avoidance behaviors are often used as a strategy to reduce those excessive feelings of fear and anxiety. Anxiety disorders are the most common mental disorders across the life span. With the introduction of DSM-5 in 2013 (American Psychiatric Association 2013), obsessive-compulsive disorder, posttraumatic stress disorder, and acute stress disorder moved from the anxiety disorder section into two separate sections: obsessive-compulsive and related disorders, and trauma- and stressor-related disorders. DSM-5 anxiety disorders seen in older adults include panic disorder, agoraphobia, social anxiety disorder, generalized anxiety disorder, and specific phobia.

Introduction

Several epidemiologic studies have revealed that anxiety disorders are the most prevalent mental disorders in later life. Most of these studies are limited to European and North American populations. As a result of conceptual and methodological differences between studies, prevalence rates differ widely. Most studies showed a prevalence of late-life anxiety disorders between 6% and 10% (Bryant et al. 2008). These disorders have a chronic life course that often begins early in life with a median age of onset of 11 years (Kessler et al. 2005). An onset of anxiety disorders in older adulthood is less common with only 1% appearing for the first time at age 65 years or older (Kessler et al. 2005). Although research into late-life anxiety disorders has grown in recent years, it is still in its infancy, and there still is a large gap to bridge compared to, for example, studies on late-life depression. Studies examining how anxiety presents differently in young versus older adults are limited, and well-conducted treatment studies in elderly patients are still scarce.

Despite the frequent appearance of anxiety disorders in later life, older adults suffering from anxiety tend to be underdiagnosed and undertreated. These disorders may go unnoticed due to the chronicity of their course, the overlap of anxiety symptoms with other common comorbid psychiatric and medication issues, and the misinterpretation of avoidance behaviors as age appropriate rather than a sign of a psychiatric disorder. First, anxiety into late adulthood may go undetected because of their chronic course that starts often early in life. This is in contrast to depression or dementia, which may be easier to detect due to a marked appearance at a later age. Specifically, depression has a median age at onset of 32 years, and 27% of individuals have their first depressive episode at 65 years or older, and most dementias appear for the first time after age 60. Second, with regard to comorbidity, other disorders (e.g., depression) may mask the existing anxiety symptoms, increasing the likelihood that the anxiety disorder goes unrecognized. This becomes especially difficult when chronic medical conditions like pulmonary or cardiovascular diseases are also present, might fully or partly explain the origin of anxiety. Third, "ageism," which in this context refers to the misinterpretation of abnormal behaviors as age appropriate, may hinder the diagnosis and thus proper treatment of late-life anxiety disorders. Avoidance behaviors after a heart attack are, for instance, often deemed understandable and an adequate, adaptive response, but could underlie a larger issue with anxiety. In addition, being retired and often receiving support in and around the home, elderly people may increasingly and successfully avoid anxiety-provoking situations, like traveling by car or visiting crowded shopping malls unattended, without raising suspicions of a more serious affliction. These aforementioned issues contribute to differences in late-life anxiety presentation in older adults compared to younger adults, which may hinder proper recognition and diagnosis. Underdiagnosis of anxiety disorders could lead to the assumption that they are a minor health problem in later life. The following sections challenge this presumption and provide an overview of the empirical research on late-life anxiety disorders.

Epidemiology

Recently a systematic review and meta-analysis provided data on the global prevalence of anxiety disorders (Baxter et al. 2013). These data showed substantial variation across different regions in the world. The mean current prevalence of anxiety disorders was 7.3% and ranged from 5.3% in African countries to 10.4% in Western countries. The global 12-month prevalence ranged from 7.6% to 17.7%. Prevalence rates on specific anxiety disorders were not provided. Overall anxiety disorders were twice as common among women compared to men. Compared to Western countries, the risk for experiencing anxiety disorders was 20–50% lower in non-Western countries. Older age (>55 years) was associated with a 20% lower prevalence of anxiety disorders compared with younger age groups. Additionally, a recent meta-analysis of late-life mental disorders in Western countries showed current and lifetime prevalence rates for specific late-life anxiety disorders: 0.88% and 2.63% for panic disorder, 0.53% and 1.00% for agoraphobia (with and without panic), 4.52% and 6.66% for specific phobia, 1.31% and 5.07% for social phobia, and 2.30% and 6.36% for generalized anxiety disorder (Volkert et al. 2013).

Studies of the global burden of disease reveal that mental and substance use disorders are the fifth leading disease category of global disability-adjusted life years (DALYs) accounting for 7.4% of total disease burden (Whiteford et al. 2013). Within this category anxiety disorders account for the second most common cause of DALYs (overall 14.6%), whereas depression is the first cause accounting for 40.6% of DALYs among almost all countries (except Eastern Europe where alcohol use disorders were the second cause) and among almost all age categories (except drug use disorders between 20 and 35 years). The burden for anxiety disorders rises rapidly in childhood, peaks between 15 and 25 years, and declines with increasing age afterward.

Clinical Features and Diagnostic Issues

Underdiagnosis and Undertreatment in Late-Life Anxiety

Underdiagnosis and undertreatment of late-life anxiety are reflected in the available epidemiological data. A longitudinal epidemiological study in the Netherlands showed that a mere 2.6% of elderly patients reporting anxiety symptoms consulted a psychiatrist, and only 3.8% were seen by health professionals at a mental health outpatient clinic. In this sample of older adults reporting anxiety symptoms, the use of antidepressants was also extremely low (3.8%), although 25% were prescribed benzodiazepines. Six years later the use of benzodiazepines had increased to 43%. The prescription of antidepressants had doubled to 7%, and referral to mental health facilities raised to 14% (Schuurmans et al. 2005). The findings are important because benzodiazepines are, relative to antidepressants, not the first-line agents for the management of anxiety disorders and are associated with serious drug-related hazards such as a possible aggravation of cognitive difficulties (e.g., memory problems), becoming dependant, and an increased risk of falls and fractures.

The National Comorbidity Survey – Revised (NCS-R), conducted in the United States, has also confirmed the increased overall risk of elderly people (aged over 60 years) going untreated for mental disorders in general relative to their younger counterparts: compared to younger adults between, respectively, 18–29 years, 30–44 years, and 45–59 years, older adults were, respectively, 4.8, 3.8, and 2.4 more times likely of being untreated for a mental health disorder (Wang et al. 2005).

Although Partially Overlapping, Later-Life Anxiety Disorders and Depression Need to Be Distinguished

The widespread assumption that depression almost always accompanies late-life anxiety could lead some clinicians to prefer a diagnosis of mixed anxiety-depression syndrome over a

diagnosis of an anxiety disorder in an older patient. Nevertheless, this concern may not be warranted given that mixed anxiety-depression syndrome has a prevalence of only 1.8% in older adults (Bryant et al. 2013). Although there is a clear evidence of a large overlap in anxiety and depression in older adults, studies have uncovered more differences than similarities between late-life anxiety and depression. Whereas a quarter of the elderly participants diagnosed with an anxiety disorder also met the DSM-IV criteria for a comorbid major depression; approximately half of those diagnosed with major depression satisfied the criteria for a comorbid anxiety disorder. Although anxiety and depressive symptoms partially overlapped, they could also be distinguished from each other. Whereas late-life depression was associated with an older age at onset and an external locus of control (i.e., attributing success or failure to outside influences or believing that events in one's life are caused by uncontrollable factors), the risk profile for late-life anxiety disorders was more complex, consisting of a combination of vulnerability factors, daily stressors (e.g., chronic medical comorbidity, functional limitations), life events (e.g., recent losses), and social problems (e.g., smaller social network, less emotional support). These differences in comorbidity patterns and risk factors suggest that late-life anxiety and depression are distinguishable diagnostic entities.

Age of Onset and Course of Late-Life Anxiety Disorders

The NCS-R data showed that when compared to mood disorders, anxiety disorders generally have the youngest age at onset (Kessler et al. 2005). As noted in the previous section, the median age of onset was 11 years, with 75% of all anxiety disorders starting before the age of 21 years and only 1% starting after the age of 65 years. These figures correspond with an observed global rapid increase in the burden of disease of anxiety disorders before the age of 15 and a peak between the age range 15–25 (Whiteford et al. 2013). Although prospective posttreatment follow-up studies in adult populations (18–65 years) gauging the clinical course of anxiety disorders for 10 or more years are scarce, existing evidence reveals the chronicity of symptoms and relative high relapse risk for anxiety disorders in general (Lenze and Wetherell 2011). The recovery rate for anxiety disorders following treatment varied from 40% to 60%, and relapse rates during a several-year follow-up period remained high. Given that the greater majority of adults suffering from anxiety disorders do not receive adequate treatment, it can safely be concluded that anxiety disorders tend to start at a young age and are highly likely to be chronic, with a fluctuating course into late adulthood and thus contributing to a relatively high prevalence in later life.

Late-Life Anxiety Disorders Should Not Be Regarded as a Minor Health Problem

Clinicians and researchers are often inclined to consider anxiety disorders in older adults a minor health problem that does not seriously impair their quality of life, but the opposite is true (Lenze and Wetherell 2011). Firstly, as mentioned earlier, empirical findings show that late-life anxiety disorders are frequently associated with psychiatric (e.g., with major depression and other anxiety disorders) and medical comorbidity (e.g., cardiovascular disease). Secondly, the quality of life is affected in older people with anxiety to levels that are comparable to what has been observed in older adults suffering from major depression; they experience significantly more decline in physical health, general well-being, and social and overall functioning and more health-care utilization compared to asymptomatic elderly. Finally, late-life anxiety is associated with an increased risk of mortality and for dementia.

The Diagnosis of Late-Life Anxiety Disorders May Be Complicated by Age-Related Variables

Medical and cognitive comorbidity can pose a challenge to accurate diagnosis and treatment of late-life anxiety disorders. Most elderly people with anxiety problems tend to attribute their symptoms to physical causes and existing medical

conditions (Wolitzky-Taylor et al. 2010). Moreover, the process of aging is often associated with more physical illness and other physical symptoms. Overall, more than 80% of the older adults are diagnosed with one of more chronic physical illnesses (Wolitzky-Taylor et al. 2010). Symptoms of anxiety and depression in older adults often coincide with serious somatic conditions, especially cardiovascular involvement, chronic obstructive pulmonary diseases (COPD), hyperthyroidism, and vestibular problems. Thus, separating anxiety disorders from "normal" anxiety induced by medical problems and procedures may be difficult. In addition, cognitive decline and dementia seem to be interrelated with anxiety in later life in a bidirectional way, which can also complicate or obscure the presence of an anxiety disorder in an older patient.

Further, receptiveness to sharing personal information with a provider can also pose a challenge to treating anxiety in older patients. The current generation of elderly may be less open in sharing psychological problems than the younger generations and may therefore have been struggling with anxiety symptoms for many years without ever receiving adequate treatment. A prospective cohort study showed that less than 5% of the elderly patients confronted with psychological problems consulted their general practitioners (Shah et al. 2001). The question whether they are reluctant in communicating their personal problems or whether they lack the necessary verbalizing skills to do so remains.

Finally, it is plausible that aging may lead to phenomenological differences with younger adults suffering from similar anxiety disorders and therefore possibly making an accurate diagnosis more difficult.

Phenomenological Age-Related Differences

The main arguments to differentiate between anxiety disorders in young and middle-aged individuals and older adults are the supposed differences in phenomenology and outcome in the two age bands. However, the criteria for the differentiation of early and late-onset anxiety seem fairly arbitrary, and the threshold age range in previous studies varied from 25 to 60 years. Some studies based their differentiation on analyzing epidemiological data calculating a best fitting cutoff age between 25 and 30 years (Tibi et al. 2013). Epidemiologically based studies showed that a later onset of anxiety disorders was associated with less severity and a better outcome. Other studies used a threshold age of 55–65 years (Ritchie et al. 2013) to differentiate between early and late onset. Also, in these studies an onset at older age was associated with less severity and better outcome. An unambiguous, proper, and valid definition of early- and late-onset anxiety disorders is as yet not available.

Differences in cognitive (i.e., worry), emotional (i.e., feeling keyed up), and physical symptoms (i.e., heart palpitations) between younger and older adults with anxiety problems have mainly been studied in undiagnosed or outpatient populations with elevated anxiety or mixed symptoms (Gould and Edelstein 2010). It is demonstrated in these populations that, relative to the values obtained in younger individuals, older age, and especially onset at an older age, is associated with fewer cognitive and emotional symptoms of anxiety, as well as a decrease in physiological arousal. Additionally, older adults may experience more tolerance of uncertainty. In general, the experience of negative feelings and the intensity of emotional responses appeared to decrease with progressing age. This may be attributable to a natural, age-related decrease in emotional responsiveness, i.e., a dampening of affective reactivity. Additionally, elderly people tend to be more in control of their emotional life and better able to cope with stressful life events. So far, however, these factors have never been systematically examined, and mentioned assumptions are hypotheses at the present time.

Most studies are conducted in older adults with generalized anxiety disorder. It was observed that older adults with generalized anxiety disorder showed fewer symptoms compared to younger adults (Miloyan et al. 2014b). Compared to the younger age categories trouble in concentrating, feeling dizzy/lightheaded and gastrointestinal symptoms like nausea and upset stomach are more prevalent in late-life generalized anxiety disorder. Also the worry content differs in later

life. Older GAD patients worry more about health and the well-being of loved ones, whereas their younger counterparts worry more about work, finances, and social relations.

Phenomenological age-related differences were also studied in elderly patients diagnosed suffering from panic disorder with/without agoraphobia. Furthermore, the phenomenology of panic attacks in younger and older adults has also been investigated in nonclinical populations and populations with mixed anxiety disorders. It was demonstrated that, relative to the values obtained in younger individuals, aging and onset at an older age are associated with a decrease in both cognitive and affective anxiety, as well as in physiological arousal. It is suggested that normal age-related psychophysiological changes and the latter symptom onset are responsible for these differences, which would explain why panic disorder with/without agoraphobia has been considered to be a less severe disorder later in life (Flint et al. 1998; Hendriks et al. 2010; Segui et al. 2000; Sheikh et al. 2004). These findings could explain a declining severity of physiological (e.g., lower increase in the heart rate frequency during panic attacks) and cognitive symptoms of anxiety (e.g., agoraphobic cognitions like the fear of going crazy or losing control) in late-life panic disorder. However, differences in age-related differences in agoraphobic avoidance, a core symptom in panic disorder with agoraphobia, were not found.

Also in social phobia, an age-related reduction in number of symptoms was observed. However, a core symptom profile accounting for the diagnosis of social phobia and consisting of both social phobic cognitions and social phobic avoidance behaviors remains the same across all age categories (Miloyan et al. 2014a).

It may also be important to differentiate between an early and a late onset of the complaints in older patients with social phobia, and other late-life anxiety disorders, because age of onset may likewise have a differential impact on the presence and severity of specific symptoms. Nonetheless, insufficient information about age of onset in older adults with social phobia symptoms are available at this time.

Assessment of Anxiety in Older Adults

The use of semi-structured clinical interviews, like the Anxiety Disorders Interview Schedule or the Structured Clinical Interview for DSM disorders, is the gold standard in diagnosing anxiety disorders in the general population. In general, self-report instruments are used to assess severity of symptoms of anxiety disorders and to evaluate treatment effects. A major limitation of the available instruments, especially instruments for the specific anxiety disorders, is both the absence of validation studies of these instruments in older adults and the lack of research on the assessment of late-life anxiety. Psychometric evidence is sufficient for the use of the Penn State Worry Questionnaire to assess severity of worry in older adults (Crittendon and Hopko 2006). Additionally, the Beck Anxiety Inventory, the Geriatric Mental Status Examination, and the Geriatric Anxiety Inventory are also valid instruments for assessing general anxiety symptoms in older adults (Therrien and Hunsley 2012). Finally, the short version of the Geriatric Anxiety Inventory, consisting of 5 items, may be a psychometrically sound instrument for use in large-scaled epidemiological studies or for screening purposes in older adults in primary care (Byrne and Pachana 2011).

Treatment

For young and middle-aged adults, powerful, evidence-based, and guideline-recommended treatments are available for all anxiety disorders. Numerous meta-analytic studies confirmed the efficacy of both cognitive behavioral therapy (CBT) and antidepressants (selective serotonin reuptake inhibitors (SSRIs) or tricyclic antidepressants (TCAs)) or the combination. Recent meta-analytic findings showed that both treatments improved also quality of life (Hofmann et al. 2014a, b). CBT and SSRIs/TCAs are also assumed to be effective in older adults diagnosed with anxiety disorders (Pinquart and Duberstein 2007). However, to date empirical evidence on the efficacy of these two treatments in adults aged 65-plus years is scarce since randomized controlled trials (RCTs) testing both CBT and

SSRIs/TCAs and direct comparisons of the two treatment arms in older and younger adults are lacking. In older adults reporting anxiety-related complaints, the symptoms may often not be recognized as serious, and the possibility of a psychological disorder is hence most often overlooked, leaving many patients undiagnosed and undertreated. The diagnostic focus often primarily concerns the patient's physical problems and the reassurance that no physical abnormalities have been found. Even if diagnosed adequately, the older patient is seldom offered a targeted and evidence-based treatment. Thus, rather than antidepressants, CBT, or both, the two treatments of choice for anxiety disorders, benzodiazepines are often prescribed.

The extensive research into the treatment of anxiety disorders in younger adults is in stark contrast to the small number of randomized controlled studies focusing on late-life anxiety disorders. The outcome of the relatively few findings from studies focusing exclusively on elderly patients is analyzed in several meta-analytic reviews. Both CBT and antidepressants (SSRIs or TCAs) may also be the optimal treatments for the management of anxiety disorders in older adults, although it is suggested that the efficacy of CBT in the treatment of anxiety disorders is lower in older adults compared to younger adults (Wetherell et al. 2013a). No differences were found between CBT and other psychological treatments in the treatment of late-life generalized anxiety disorder (Goncalves and Byrne 2012; Gould et al. 2012; Hendriks et al. 2008; Pinquart and Duberstein 2007). However, direct age comparisons of the efficacy of CBT within the same study are scarce. To date, only one study compared the outcome of CBT in younger and older adults suffering from panic disorder with agoraphobia and found no differences in outcome between the two age bands (Hendriks et al. 2014). Additionally, studies combining pharmacological and psychological treatment are also lacking. In the only study published so far, CBT augmented response on escitalopram in older adults suffering from generalized anxiety disorder and both interventions prevented relapse at the long term (Wetherell et al. 2013b).

It is suggested that CBT protocols originally developed for younger adults should be adapted to the specific needs and preferences of older adults. Proposed adaptations are focusing on education, frequently repeating treatment rationale, frequent use of reminders, offering help in practicing homework, and adherence enhancement. Although the very few studies have demonstrated that adaptations in CBT improved treatment outcomes for late-life anxiety, these studies were small, and findings are preliminary. Generalized anxiety disorder is by far the most studied anxiety disorder in older adults. Studies on the treatment of panic disorder with/without agoraphobia are scarce and absent in as well late-life social phobia, agoraphobia as specific phobias.

Cross-References

- ▶ Cognitive Behavioural Therapy
- ▶ Comorbidity
- ▶ Depression in Later Life
- ▶ Psychological and Personality Testing
- ▶ Worry in Later Life

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Aphasia in Later Life

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Synonyms

Aphemia; Dysphasia

Definition

"Aphasia is an acquired selective impairment of language modalities and functions resulting from a focal brain lesion in the language-dominant hemisphere that affects the person's communicative and social functioning, quality of life, and the quality of life of his or her relatives and caregivers" (Papathanasiou et al. 2013). This definition incorporates the main components of commonly accepted definitions of aphasia. Aphasia is an acquired disorder, not a developmental disorder. It is selective to the language pathways of the brain. Aphasia results when there is damage to the language-dominant hemisphere, usually the left hemisphere, and the most common cause of aphasia is stroke. Focal lesions that cause aphasia may also include brain tumor and head trauma, such as gunshot wounds. However, as Papathanasiou and colleagues (Papathanasiou et al. 2013) point out, the language difficulties sustained after a head injury may be intrinsically bound to cognitive difficulties. This is also the case in more generalized language deficits that occur in dementias. To distinguish aphasia from other language impairments, Code (1989) highlights that aphasia can be described as impacting on core linguistic components including lexical semantics, syntax, morphology, and phonology. Put simply, aphasia is a problem with talking, understanding, reading, and/or writing. The provided definition also extends beyond the person with aphasia to describe the impact of aphasia on those around them.

Introduction

The word aphasia originates from the Greek "a" (without) and "phásis" (speech), literally meaning "speechless." While the prefix "a" indicates a complete loss, the term aphasia is commonly used to describe both the total loss and partial impairment of language. Hallowell and Chapey (2008) describe four principles important to include in a definition of aphasia:

1. Aphasia is neurogenic in that there is some form of damage to the brain.
2. Aphasia is acquired in that there is a partial or complete loss of language function in a person who had previously developed some language ability.
3. Aphasia involves language problems in that the individual with aphasia may have a problem with formulation and interpretation of linguistic symbols, i.e., aphasia is multimodal.
4. Aphasia is not a problem of sensation, motor function, or intellect (p. 3).

The definition of aphasia has evolved in parallel with treatment philosophies and health frameworks, shifting from a sole focus on impaired language modalities to incorporate the broader impacts of the condition on the person and their significant others. The World Health Organizations' International Classification of Functioning, Disability, and Health (World Health Organization 2001) is a conceptual framework that is often used to describe the impact of aphasia. In reference to this framework, the *health condition* is the stroke or brain injury that has caused the aphasia. The *impairment* is the language impairment that results from the loss of functioning to the language pathways of the brain. This may have a broad effect on *activities* and *participation* in life roles. For example, when communication activities such as conversing, telephoning, writing letters, and reading books are limited, participation in education, work, and leisure roles may be restricted. Both *personal and environmental factors* may impact the person's ability to communicate, with the major environmental factor being the communicative ability and support of key conversational partners such as family and friends.

The majority of people living with aphasia are above the age of 65. This is due to the increased incidence and prevalence of stroke in the older population (Go et al. 2014), with stroke being the main cause of aphasia. Approximately 65% of all strokes occur in individuals 65 years or older (Go et al. 2014; Rothwell et al. 2005). Incidence refers to the new cases identified in a given period of time and prevalence to the number of people living with the condition in a given period of time. Relating this to aphasia, Engelter et al. (2006) studied the incidence of aphasia in first-ever ischemic strokes (i.e., strokes caused by a blockage of blood flow to the brain). The number of people diagnosed with aphasia in this study increased from 15% for people below the age of 65 to 43% in people above the age of 85 years. This is an increased risk of aphasia of 3% for each year of the stroke patient's age.

The impact of aphasia in older people has been described by Davidson and colleagues (2003) who compared the everyday communication activities in healthy older people and older people with aphasia. This study showed that there were both similarities and differences between these two groups. People with aphasia engaged in the same type of communication activities but had fewer communication partners and less engagement in social interactions than their healthy counterparts. Communication situations that were affected by aphasia were information sharing, maintaining and establishing relationships, and telling one's story. All of these situations are important to maintaining a person's feeling of belonging and having a chance to share one's wisdom and life experiences, feelings, and opportunities which are related to aging (Birren and Schroots 2000). In another study by Davidson et al. (2006), the same results were evident. People with aphasia were shown to have fewer friends than healthy older people, something that may lead to isolation and loneliness and more dependence on family and friends.

Classifying Aphasia

Aphasia impacts individuals differently, and various classifications have been devised to help categorize these differences. The most commonly used dichotomy for describing and grouping types of aphasia is between *nonfluent* and *fluent* aphasia. People with *nonfluent aphasia* have halting, effortful language, often producing few words with no connecting words or grammatical elements (e.g., "Dog. . .feed"). In contrast, people with *fluent aphasia* have a "flow of language" which sounds similar to a speaker without aphasia, but that often lacks meaning (e.g., "Well see he came and did that, but then the other happened so I left"). Another commonly used dichotomy is based on level of comprehension deficit. *Expressive aphasia* is a term used to describe impaired expressive abilities (i.e., difficulty speaking/writing) when the individual has relatively intact comprehension abilities (i.e., understands spoken/written language). In contrast, *receptive aphasia* is a term used to describe impaired

comprehension abilities, regardless of the individual's expressive abilities.

More detailed subclassifications of aphasia exist as a way of grouping the various presentations of this communication difficulty, helping to guide treatment. A commonly used classification system is the Bostonian or Connectionist classification system (Murray and Clark 2005). This classification system contrasts language characteristics, specifically language fluency (i.e., nonfluent versus fluent language), naming ability, comprehension ability, and repetition skills to form different aphasia subtypes, each associated with a specific brain location. Aphasia subtypes in this classification system are Wernicke's, Broca's, transcortical sensory, transcortical motor, transcortical mixed, anomic, conduction, and global aphasia (Murray and Clark 2005).

The language characteristics observed in an individual with *Wernicke's aphasia* include fluent language and poor comprehension skills, with the individual producing flowing but "empty" speech, sometimes producing jargon or nonsense words. These difficulties are proposed to occur as a result of damage to Wernicke's area of the brain (i.e., the posterior section of the superior temporal gyrus). *Transcortical sensory aphasia* presents similarly to Wernicke's aphasia, except that a strong ability to repeat words or phrases is retained, and a person may exhibit echolalia. In contrast, a classic presentation of *Broca's aphasia* would be halting speech consisting mainly of content words (nouns, verbs) but with few grammatical elements (agrammatism). Comprehension is Broca's aphasia is relatively intact. This type of aphasia is linked with damage to Broca's area of the brain (i.e., the anterior portion of left hemisphere). *Transcortical motor aphasia* is similar to Broca's aphasia, but again with preserved repetition and possible echolalia. *Mixed transcortical aphasia* is a combination of both sensory and motor transcortical aphasias, where both expressive and receptive language abilities are poor, but repetition remains intact. *Conduction aphasia* is associated with damage to the arcuate fasciculus (or parietal lobe in general) and is characterized by impairments in repetition of words or phrases which exceed any expressive or receptive difficulties. *Anomic aphasia* is an aphasia type characterized by word-finding difficulties, with minimal impairment in grammar or receptive language. *Global aphasia* refers to a severe impairment of both expressive and receptive language and is associated with extensive damage to the language-dominant hemisphere (usually the left). It should be noted that while formal classifications provide a common language for describing aphasia, not all cases will fit exactly into a single aphasia type. Furthermore, aphasic language impairments can change over time, for example, if people with global aphasia are able to recover a substantial amount of their language skills, their aphasia may resolve into a Broca's or transcortical motor type.

Types of aphasia also exist outside of the standard Bostonian/Connectionist classification system. For example, *primary progressive aphasia* is a type of aphasia which results from progressive neurological disease, rather than stroke or traumatic brain injury (Murray and Clark 2005). Thus, this type of aphasia is unique, as language deficits worsen over time, unlike other types of aphasia where the individual's language abilities remain stable or improve over time. In order for aphasia to be classified as "primary progressive aphasia," rather than dementia, the impact on language must be independent of impairments in cognitive functions.

There are also types of aphasia classified according to an alternate site of lesion in the brain. *Subcortical aphasia* occurs when language deficits result from injury to the subcortical areas of the brain (e.g., thalamus, internal capsule, basal ganglia), which are not typically associated with language processing (Murray and Clark 2005). This type of aphasia is considered to be rare. *Crossed aphasia* describes language impairments that are present following injury to the right hemisphere, which is considered to be uncommon as language is usually lateralized to the left side of the brain in both right- and left-handed people (Murray and Clark 2005). Crossed aphasia does not follow any particular pattern of impairment and can co-occur with the cognitive-communication deficits usually associated with right hemisphere damage.

Assessing Aphasia

Aphasia is a complex and multifaceted communication disorder. Assessment of aphasia involves evaluating several aspects of language functioning and potential social consequences. A thorough assessment should determine the following: *presence of aphasia*, *nature of aphasia*, and *social consequences of aphasia*:

1. ***Presence of aphasia***: The acquired nature of aphasia onset is one of the key clinical features instrumental in assisting the assessment and identification of the condition. As stroke is the predominant etiology for aphasia, the identification of aphasia is often intrinsically linked with the onset of stroke symptoms. Like other acquired neurological injuries, the site and extent of brain lesion influences the characteristics of the condition and the likelihood of aphasia diagnosis. The characterization of lesion site through medical imaging is therefore a key element in guiding the identification and providing preliminary diagnostic evidence in which to guide clinical decision-making.

   In addition to underlying etiology, an assessment must consider other explanations for language deficit. Aphasia is defined as a "*selective* impairment of language" (Papathanasiou et al. 2013) where deficits can be directly attributable to impaired expression or understanding of spoken or written language alone. In practice, however, poor language test performance does not automatically imply presence of aphasia. Other conditions such as hearing deficits, motor or sensorimotor limitations, visual impairment, cognitive deficits, and even vocalization difficulties may all result in poor language test scores (Spreen and Risser 2003). Accurate identification of aphasia and the process of differential diagnosis can be complex and multifaceted. The prevalence of neurological conditions such as dementia, neuromuscular conditions such as Parkinson's disease, and age-related cognitive decline in older populations adds increased complexity to accurate disease identification. Identification of and assessment of aphasia therefore require thorough knowledge not only of current language functioning but also the patient's medical, social, and communicative history to ensure the individual's presentation is correctly attributed to the right condition (Chapey 2008).
2. ***Nature of aphasia:*** After the presence of aphasia has been ascertained, the nature of the language deficits may be explored. This may involve a diagnosis of aphasia type, based on the classification systems described earlier. Aphasia varies widely in its clinical presentation, and individual patient performance across different language modalities can vary significantly. Comprehensive and multimodal assessment of language performance is required to identify areas of deficit as aspects of language may appear unimpaired unless specific attention is paid to investigate them (Spreen and Risser 2003).

   Six different areas of language functioning are typically examined in the assessment of aphasia. Spontaneous speech tasks examine expressive language functioning which often include picture description tasks or an evaluation of general conversational interaction. Repetition tasks can vary in complexity from single-phoneme repetition to repetition of multisyllabic words or phrases. Comprehension of spoken language assesses a patient's ability to follow simple commands or answer "yes" or "no" questions of varying levels of abstraction and difficulty. Assessment of word-finding ability can examine the ability to name pictures or different objects. Reading and writing abilities are also assessed which include evaluation of the comprehension of written words or phrases as well as writing abilities, such as a patient's ability write their own name (Spreen and Risser 2003; LaPointe 2011). Comprehensive aphasia assessments are useful to provide multimodal examinations of language functioning with tasks of varying length and complexity. Often other clinically relevant factors such as attention, orientation, and patient alertness are also noted during these examinations (Brookshire 2003). Such evaluations enable an estimation of overall severity as well as a sense of the patient's communicative

strengths and weaknesses (LaPointe 2011). In addition to assisting with diagnosis, such assessments assist with guiding the selection of treatment goals and planning intervention.

3. ***Social consequences of aphasia:*** Aphasia is a condition which can have detrimental impact upon a patient's functioning and quality of life, and it is important to assess these impacts in addition to traditional language assessment (Lam and Wodchis 2010). The social and psychosocial influence of aphasia extends across the continuum of recovery from hospital to the community. People with communication difficulties have been found to be six times more likely to experience an adverse event while they are in the hospital (Bartlett et al. 2008). Evaluation of the impact on a patient's communicative and social functioning in this acute phase is an important element in the assessment of aphasia. Further into the recovery, people with aphasia can experience significant depression and anxiety (Shehata et al. 2014). A study of over 66,000 hospital-based residents in Ontario found that aphasia diagnosis demonstrated the largest negative relationship to health-related quality of life when compared with 75 other diseases and conditions (Lam and Wodchis 2010). Assessment of aphasia should endeavor to provide a comprehensive evaluation of aphasia beyond the physical and behavioral features of the condition to include the social and psychosocial functioning of the individual and their social environment.

Aphasia from the Point of View of People with Aphasia

When defining a complex, chronic condition like aphasia, it is important to consider to perspective of the person with aphasia and their families. Parr et al. (1997) completed in-depth interviews with 50 adults with aphasia which explored their understanding of aphasia, based on the lived experience. The adults interviewed had been living with aphasia for approximately 5 years or more. Analysis of the interview information revealed five primary considerations when responding to the question: "What is aphasia?" Firstly, a*phasia can affect different aspects of language*: When the ability to put ideas into language is very impaired, people with aphasia may rely on using words such as "yes" and "no" and communicate through their facial expressions, gestures, and tone of voice. Nearly all people with aphasia have wording-finding difficulties, like the experience of having a word at the "tip of your tongue." Some people with aphasia speak in very short phrases, while others may speak in sentences. However, putting words into grammatical sentences may be problematic due to difficulty organizing the way words should go together. The ability to spell, write, and read can also be difficult. Less obvious may be the difficulty in understanding others, despite being able to hear. Many people with aphasia find it more difficult to follow what is being said when they are stressed, tired, or when there is background noise and distractions. Secondly, *aphasia is different for different people*: Some people with aphasia may be hesitant when talking and use only the "key words." Others may have an outpouring of words and find it challenging to be specific and to convey information precisely. Thirdly, the *severity of aphasia varies for different people*: Some people living with aphasia may have occasional difficulties with their language, for example, finding the right word to use or having problems reading complex information, while others may only be able to say a few phrases. As Parr and colleagues (1997) state, "Aphasia is not straightforward or simple" (p. 5). Fourthly, *aphasia changes with time*: The type of language difficulties can change and the severity and impact can also change. For example, in words of a gentleman with aphasia, "The stroke took my language. I was left with only two words… I knew I'd had a stroke but I couldn't tell anyone that I knew. I didn't have the words to say anything" (Green and Waks 2008). Eight years later the same gentleman stated, "I now have many thousands of words and I can write hundreds, though not always completely. I am happy phoning anyone…I still have some trouble with the subtlety of language, particularly with jokes. But my language allows me to be completely independent…" (Green and Waks 2008).

Some people may regain language skills soon after onset, but for many people aphasia is chronic in that their aphasia never completely disappears, and they and their family and friends need to adjust to living with a communication difficulty that affects many aspects of their daily lives. Lastly, *aphasia does not affect intelligence*: In the words of a lady living with aphasia, "My mind is one hundred per cent. . .speaking is bad" (Parr et al. 1997). When describing aphasia, Parr and colleagues (1997) emphasize that people with aphasia are "able to think, feel, remember and plan, even though their language is not working. Aphasia damages the lines of communication going in and out. . .not. . .intelligence" (p. 5).

Due to the many different types of aphasia and impacts, aphasia can be difficult to describe and define. This difficulty is evident in the definitions of aphasia provided by both people with aphasia and their family members. Some living with aphasia have a good understanding of aphasia, while others continue to lack a basic understanding many years after the aphasia started. For example, adults with aphasia have described their aphasia in terms of language breakdown (Parr et al. 1997): "I know the right word, but the wrong word comes out" (p. 106). "Aphasia is no speech or conversation" (p. 107). Yet when defining aphasia, another stated, "All I know is that I don't know what aphasia is" (p. 107).

Conclusion

In conclusion, a definition of aphasia has been provided that refers to the core elements that need to be present for a diagnosis of aphasia to be made. Aphasia after stroke is more prevalent in older people and the impact of aphasia in later life particularly affects important communicative activities of older age such as relationships and storytelling. Commonly used classification schemes are described. The link between the conceptualization of aphasia is demonstrated by how aphasia is assessed. Finally, the true experts, people with aphasia themselves, describe aphasia in their own words.

Cross-References

- ▶ Aging and Quality of Life
- ▶ Cognition
- ▶ Cognitive and Brain Plasticity in Old Age
- ▶ Cognitive Neuroscience of Aging
- ▶ Communication with Older Adults
- ▶ Dementia and Neurocognitive Disorders
- ▶ Disability and Ageing
- ▶ Language, Comprehension
- ▶ Language, Discourse Production and Communication
- ▶ Language, Naming
- ▶ Primary Progressive Aphasia
- ▶ Semantic Dementia
- ▶ Traumatic Brain Injury

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Apraxia

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Apraxia is a neurological disorder which affects the ability to perform skilled and purposeful movements. It is important to note that the disability in the apraxic patient is not explained by impairment in gait, tremor, weakness, intellectual or verbal comprehension, and motor and/or sensorial deficits. Among the core symptoms in apraxia are the incapacity to perform motor acts on verbal command, mimics, use of tools, and to organize the sequence of movements to conclude an action. Nonetheless, apraxia comprises several subtypes and its heterogeneous clinical manifestation affects the severity and specificity of the deficits.

The term apraxia derives from the greek *a* (absence of) + *prassein* (ability to perform). The disorder has been described previously by another neurologist. The German philosopher and philologue Heymann Steinthal (1871) was probably the first to use the term to refer to a clinical manifestation frequently observed in aphasic patients (e.g., impairment in use of tools previously used in everyday life, such as a fork or a pencil). An in-depth description of apraxia was provided some years later in the pivotal work of the German physician, Hugo Karl Liepmann. Liepmann described in 1900 the clinical case of the patient MT who presented impairment in performing gestures using the right hand and head (including face and tongue) in the absence of deficits in the left hand. But his key finding was reported in 1908, with the comparison between two groups of brain damaged patients classified according to the hemisphere affected. In this study, Liepmann described the independence between aphasia and apraxia, as some patients suffered from this disorder without the former. Furthermore, Liepmann argued that the left hemisphere was dominant both for language and motor control (Liepmann 1900, 1908).

Another important contribution derived from Liepmann's work was the idea that apraxia is not a unitary syndrome. Furthermore, Liepmann proposed a neuropsychological model describing how we plan movement including its form and spatiotemporal properties. According to this model, the sequence from plan to action involves several regions in the left brain hemisphere including the recovery of the movement and its meaning (related to the left parietal lobe), the

association of this information to sensorimotor (which contains the "innervatory pattern" of the movement) areas, and finally the transmission of the appropriate information to primary motor areas (responsible for the movement execution). These processes were related to the movement of the right limb. Considering the left limb, information had to be conducted from the left hemisphere to the right motor areas via corpus callosum.

According to Pearce (2009), Liepmann described three types of apraxia:

1. Ideational apraxia – incapacity to perform movements in their ideal form and spatiotemporal characteristics and consequent deficits in use (and simulation to use) of tools.
2. Ideomotor apraxia – even with preservation of retrieval process of the form and spatiotemporal characteristics of a movement, it is disconnected from the innervation pattern related to movement generation. In this case, the patient will present the understanding of what has to be performed but there will be an incapacity to perform or imitate meaningful movements on verbal command due to the lack of synergy between the knowledge and the sensorimotor pattern to generate the movement.
3. Motor, innervatory, or limb-kinetic apraxia – the sensorimotor representation of movement is not sufficient to activate the primary motor components of the movement. This disorder affects the speed, coordination, and performance of fine motor movements.

Some of contemporary models of apraxia were based on the work of Liepmann and his conception of gesture formulation in time and space (for a good review we suggest Petreska et al. 2007). Among these models, we will highlight two that have received more attention and have been more frequently used in later works.

In the 1990s, building on the cognitive processing model of language of the time, Rothi et al. (1991) described an updated version of the model initially proposed by Liepmann. They proposed the existence of different routes of processing: a route of lexical semantic nature to the familiar gestures (which stores the knowledge of the actions and motor learning program, processing the meaning and the known gestures, be it transitive or intransitive) and another non-lexical route for unfamiliar gestures (which allows playback of gestures perceived by a motor visual conversion mechanism, central to the processing of new or meaningless gestures). Despite its wide pragmatic value, the model of Rothi et al. had difficulty explaining the selection of a tactile route (The handling tool is not compromised, even when gestures started by verbal or visual stimuli are), as well as the imitation of meaningless gestures (Petreska et al. 2007).

Cubelli et al. (2000) reviewed the model of Roth et al. and reinforced the conception that the processing of gesture information occurs following a set of steps, ranging from the input (recognition) to the output (production) of gestures. They added the module of direct transcoding for visual stimulus (responsible for suitable motor programming) and the gesture buffer module (responsible for representing the short-term memory of gestures as a whole).

The model described by Cubelli et al. (2000) presents a hierarchical organization according to the following steps:

- **Step I:** there is the identification of the nature of the stimulus (auditory/verbal or visual).
- **Step II:** the information undergoes a stage of gesture of identification; there is a search for the appropriate motor action knowledge based on prior experiences of the individual in the use of the tool or object. The posterior parietal cortex seems to be responsible for the ability to properly position hands to use tools, based on motor representations already known about this tool.
- **Step III:** there is the implementation of knowledge, save in a kind of motor formula, that represents intended actions. The connection between the parietal and premotor areas are responsible for coding vision-for-action, and they are involved in abstract knowledge motor required for proper control of the gesture, depending on the context. The connection of the parietal lobe with the supplementary motor area is associated with the beginning of

the movement in the specific sequence of multiple combined movements. Subcortical structures, such as the basal ganglia, are involved in the initial learning of motor actions. If the gesture is already known, the parietal premotor circuitry is activated. In the case of use or imitation of a new tool, subcortical structures mediate the process.

- **Step IV:** Finally, the motor command would be executed by the motor cortex.

More recent theoretical models of cognition argue that our representational capacity is based on the brain's sensorimotor system, which also supports the semantic content of these representations in terms of the way we interact with our bodies in the environment (Gallese and Lakoff 2005). According to this "embodied cognition" model, motor plan actions would be a consequence of our prior experience with objects and its manipulation and also by employing compensatory strategies that change the motor act, especially in the use of tools according to sensory feedback (Osiurak et al. 2015).

Rounis and Humphreys (2015) argue that limb apraxia can be explained by the model of *affordance competition*. According to this model, objects elicit some prototypical and prepotent actions. For example, a pen affords to be held to write. A motor behavior is generated by parallel and competitive processes involving both available outcomes and demands for a specific gesture. In ideational apraxia, the affordance of some specific characteristic of an object could lead to the activation of a wrong pattern of gesture. In ideomotor apraxia the selection of movements to perform a gesture could be influenced by this competition. Some effectors (response to a stimulus), less important or effective to a specific action, can be selected instead of a more appropriate effector (e.g., utilization behavior, wherein the person automatically uses objects placed in his front by examiner, even when asked to do another action).

Brain Systems Related to Apraxias

As to regions or brain structures activated during the motor act, there is a vast literature highlighting specialized regions representing well-defined features of motor act. In a revision about limb apraxia in Alzheimer's disease, Lesourd and colleagues (2013) suggested that the superior parietal lobe is involved in the production phase of the movement, the inferior parietal lobe supports both the mechanical and sensorimotor knowledge involved in the action, and the anterior temporal lobe stores the semantic knowledge about tool use.

This hypothesis would account for the most traditional concept of apraxia as a disorder which involves a conceptual mechanism (to form a representation of the action) and an executive mechanism (which implements the motor commands). These mechanisms interact in a dynamic way: the environmental feedback in response to action changes the conceptual system and then the executive system. The constant communication between the three brain regions involved with the conceptual-executive system and their connection with the basal ganglia and thalamus seem essential for adequate gesture production.

Although initially conceptualized as lateralized system in the left hemisphere, more recent studies suggest involvement of both hemispheres, according to the task specificities and complexity involved in the gesture. The premotor cortex would be the main responsible area for transformation of a general gesture concept in a specific gesture conception that finally would be implemented by the motor cortex (Johnson-Frey 2004; Wheaton and Hallet 2007; Goldenberg 2009; Peeters et al. 2013). An incipient literature has suggested that different categories of action are distinctively coded in distributed and overlapping patterns of neural responses that subserve a higher-level and more abstract representation of distinct finalized motor action categories as transitive, intransitive, and tool-mediated (Handjaras et al. 2015).

Apraxias: Subtypes for Clinical Practice

In the clinical neuropsychological literature, there are many descriptions of apraxia subtypes

(Osiurak and Le Gall 2012). The classical differentiation between ideomotor and ideational apraxias remains useful even nowadays. *Ideomotor apraxia* is related to the capacity to regulate the motor programming of a gesture. This patient knows the meaning of a gesture and the tools involved and knows how to use them. Nonetheless, the motor gesture fails in terms of timing, coordination, and organization of the gesture in space. Patients suffering from *ideational apraxia* present impairment in the performance of a sequence of motor acts to execute a complex task. For example, the patient may fail to use objects in a correct sequence to conclude a task which demands multiple steps. According to Gross and Grossman (2008), *conceptual apraxia* is related to the deficit in knowledge of the meaning of the action and its relation to objects. For example, a patient might fail to know the meaning of a hammer or the action required to use this tool.

Other types of apraxias are frequently described in neuropsychology and can be defined in terms of selectively affected effectors or a specific motor ability impaired Petreska et al. (2007). One example of apraxia related to specific effectors is *buccofacial apraxia* in which a patient fails to produce movements involving the face, mouth, tongue, or even larynx and pharynx. The deficit can be evidenced in simple tasks like blowing a candle. Another example is the *limb kinetic apraxia*. In this disorder, patients cannot perform precisely acts using upper or lower limbs. According to Rounis and Humphreys (2015), limb apraxia is a very heterogeneous disorder and can affect the planning of a sequence of gestures, its conceptual representation, or even its implementation. Therefore, this disorder can also be classified in terms of the dichotomy ideational versus ideomotor. Considering apraxias related to specific abilities, the main example is the *dressing apraxia*. In this disorder, patients fail to dress in a correct way.

Finally, *constructional apraxia* is a disease which affects the capacity of coordinate sensorial and motor information to construct elements in two or three dimensions. Patients suffering from this disorder often fail to make a drawing (even by copying) or construct objects using small pieces like cubes or puzzles.

In some cases, apraxia can be the outcome of abnormal brain development. This disorder is frequently referred to as *dyspraxia or developmental apraxia*. It is important to note that this is different from adult apraxia, as in the case, the disorder leads to the loss of a previously skilled gesture. Dyspraxia involves impairment in learning or performing motor gestures during childhood (Vaivre-Douret 2014).

Apraxia in Pathological Aging and Its Clinical Assessment

In pathological aging, such as in Alzheimer's disease (AD) and other dementias, apraxia is a very frequent deficit, but it is often neglected in clinical assessment (Lesourd et al. 2013). Apraxia is relatively common in neurocognitive disorders, including AD, Lewy body dementia (DLB), vascular dementia (VD), frontotemporal dementia (FTD), Huntington's disease dementia (HD), and even mild cognitive impairment (MCI) (Smits et al. 2014; Johnen et al. 2014; Nagahama et al. 2015). Nagahama and colleagues (2015) analyzed the ability of patients with dementia to imitate a series of gestures and found impairment in different types of dementia, especially when performing bimanual gestures, with worse performance observed in patients with LBD, followed by subcortical VD and AD. Ozkan and colleagues (2013) reported a different pattern in which apraxia was more frequent in AD than subcortical VD, but in both conditions the syndrome was more common than in MCI patients.

Apraxia can also be used in the differential diagnosis of the behavioral variant of FTD from other types of dementia, even in mild stages of dementia, according to Johnen and colleagues (2014). More interestingly, their study suggests a specific pattern of impairment, in which pantomime of object-use is lower in AD when compared to FDT but pantomime of signs shows the opposite pattern. Imitation of finger postures more impaired in AD than in FDT, but this latter group showed pronounced difficulties in the imitation of

face postures, where AD patients do not. A study compared the ideomotor apraxia profile of AD and HD and found more prominent symptoms in the latter (Holl et al. 2011). Not only do the subtypes of apraxia or its specific symptoms vary according to each dementia subtype, but also the clinical progression may be different depending on the etiological mechanism of the dementia, as seen in Chandra et al. (2015). Signs of apraxia are also a strong predictor of impairment in activities of daily living in pathological aging (Farias et al. 2009).

Structured batteries for the assessment of apraxia in dementia and MCI are still scarce and often suffer from lack of psychometric validity and reliability. Although motor tests which can be used to assess apraxia may be found in different neuropsychological batteries for dementia (e.g., Mattis Dementia Rating Scale (Mattis 1988) and Mini-Mental State Examination (Folstein et al. 1975)), they are often too brief or designed for screening. In that sense, they do not allow the clinician a more detailed analysis, including the subtype/classification of apraxia. On the other hand, several independent tests for apraxia were developed in the last decades, yet most of them were designed for laboratory/experimental purposes and hardly fit the validation and standardization demands for clinical use (Lesourd et al. 2013).

Recent studies have proposed interesting tasks for the assessment of this syndrome. Smits and colleagues (2014) analyzed the validity and reliability of the Van Heugten Test for apraxia in older adults without cognitive disorders, MCI and mild AD patients. The test showed good psychometric properties, including inter-rater agreement, test-retest stability, correlations with cognitive measures, and significant group differences between the three groups. The Apraxia Screen of Tulia (AST) is a bedside test to quickly assess apraxia, based on a previously published battery (TULIA) (Vanbellingen et al. 2011). The test is composed of 12 gestures to be performed by the patient. It showed high reliability and validity for the detection of apraxia in a sample of stroke patients. In a more clinical perspective, Nagahama and colleagues (2015) used only six gestures in their study and achieved a high percentage of correct classifications between different types of dementia and normal aging. In a previous review (Leiguarda and Marsden 2000), the authors described a series of steps for the assessment of both cognitive systems involved in apraxia, conceptual and production, and suggested a useful classification of errors (temporal, spatial, content, and others) which can be clinically observed in patients' behavior.

Conclusion

Apraxia is a broad concept which encompasses several types of diseases that in turn have in common specific deficits in motor action. Although it is often neglected in neuropsychological assessment, it has a fundamental role in the differential diagnosis of some diseases and shed light on the organization and functioning of motor behavior in healthy individuals. Is apraxia a concept, a disease, a symptom of other diseases? Please clarify.

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Assessment of Functional Abilities in Older Adults (BADLs, IADLs)

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Synonyms

Independence; activities of daily living

Definition

The assessment of functional abilities in older adults refers to a comprehensive assessment to determine the level of independence that older adults have when performing activities of daily living. This assessment enables the planning of therapeutic interventions, social care and clinical support, and also supports clinical reasoning in detecting early signs of dementia.

The Importance of Being Active in Healthy Aging

Due to the ongoing growth of elderly populations in modern societies, the issue of how to maintain and improve the functional abilities of aging people has become a matter of urgency, in order to help to live independently in the community and, furthermore, to enhance the quality of their lives (Glass et al. 1999).

The traditional focus of research on aging has been on general health, but the idea of functional capacity has recently gained more attention. It was not until the 1950s that the significance of function in health and illness was given its proper recognition, as the numbers of older and disabled persons grew and the prevalence of chronic disease increased.

For people to lead fulfilling social lives, health and functional ability are crucially important: the level of functional ability determines the extent to which they can cope in the community independently, take part in events, visit other people, use the services and facilities provided by organizations and society, and generally enrich their own lives and those of the people closest to them. An active lifestyle is widely accepted as being closely linked with better health and longer life (Mendes de Leon 2003).

A growing body of evidence suggests that the extent to which older people are engaged in their social environment (visits to theaters, sporting events; shopping; gardening; meal preparation; card, game playing; day or overnight trips; paid community work; and unpaid community work) is associated with a clear survival benefit, irrespective of whether this engagement is defined by specific social or productive activities or by the nature and quality of their social relationships. Moreover, participation in leisure activities unconnected to fitness can also increase longevity and has other positive health effects for older adults (Glass et al. 1999), as recent studies have suggested (Mendes de Leon 2003; Strout and Howard 2012).

As such, lack of social engagement, as well as social isolation, and infrequent participation in social activities may be risk factors for cognitive impairment in aging. Taking part in stimulating social activities, having an extensive social network and a socially integrated lifestyle may also reduce the risk of dementia (Sørensen et al. 2008).

The Definition of Functional Abilities and Functional Status

The WHO has defined *functional status* as a person's ability to carry out the activities necessary to ensure well-being. The integration of three domains of function is at work here: biological, psychological (cognitive and affective), and social. Consequently, functional assessment is drawn from a model which looks at how the interrelationship of these domains contributes to overall behavior and function.

In 2001, the current International Classification of Functioning, Disability, and Health (ICF) (WHO 2001) was published. It shifted the relationship of health and functioning from the consequences of a disease or condition to the result of complex interactions among the individual, the environment, and the disease or condition. The new ICF was designed taking into consideration this biopsychosocial/integrative approach. This system is comprised of three main components: body functions and structures, activities and participation, and contextual factors (environmental and personal factors). Further theoretical research and instrument development examined key constructs of functional health: activities of daily living (ADLs), instrumental activities of daily living (IADLs), and psychological and social variables. The functional ability of elderly people is central to how well they cope with activities of daily living, which in turn affects their quality of life. In this chapter, focus will be given on basic and instrumental activities of daily living (BADLs and IADLs), one of the key aspects encompassed in functional abilities.

Functional Decline Associated with Aging

Impairment in ADLs, to a certain extent, is part of normal aging. There is a progressive slow decline

in functional abilities, which accompany the aging of the body, and is therefore considered normal. Healthy older adults will often undergo subtle declines in their independent management of instrumental activities of daily living (IADLs). While the rates of IADL dependence have fallen among older adults in recent years, the prevalence of these same declines and their negative impact on individuals, caregivers, and the healthcare system are still considerable and highlight how important it is to identify clinically useful predictors of everyday functioning that may play a part in psychological interventions. Among the recognized risk factors for IADL disability among healthy older adults are demographics (e.g., sex), depression, medical comorbidities, and certain psychosocial factors (Kiosses and Alexopoulos 2005). Neurocognitive impairment is another independent risk factor for concurrent IADL problems among older adults. Functional disability due to age-related chronic or debilitating conditions is therefore common among older adults, and its prevalence is expected to increase as the population ages, particularly among the oldest old (Gitlin et al. 2009).

Cognitive Factors Contributing to Functional Decline in Old Age

Among the strongest and most reliable cognitive predictor of IADL problems in older adults is deficit in episodic memory (EM). Episodic memory involves conscious gathering of information acquired in a particular place and at a particular time, and a deficit in EM was especially associated with problems in regard to older adults managing their own medication (Koehler et al. 2011).

Consequently, one might postulate that age-related declines in prospective memory (PM) would also increase the risk of IADL problems. PM is the complex cognitive process of successfully carrying out a delayed intention, or "remembering to remember." When compared to their younger counterparts, older adults can experience mild-to-moderate declines on laboratory tests of PM. Aging may have a significant effect on PM because of the latter's strong reliance on internal control mechanisms (i.e., self-initiated retrieval), which depend heavily on prefrontal systems, that are often affected in older adults (Woods et al. 2012).

Given the global nature of the decline in speed of processing and working memory that occurs with age, one might expect that older adults would have substantial difficulties in managing the affairs of everyday life or maintaining a good level of performance on the job. Decline in tests of executive function (e.g., complex attention, verbal fluency, and planning) is expected to a certain extent, and these, when present, have shown to be associated with a natural decline in ADL performance (Piguet et al. 2002). This is however not a consensus: there is considerable evidence that older adults function well and that cognitive declines documented in the lab might not have as negative an effect as one would expect on everyday domains of behavior. In a similar vein, it has been noted that a question that frequently arises when evidence for aging-related neurocognitive decline is presented is "why are the effects not more noticeable in everyday life?". Moreover, the DSM-IV-TR (American Psychiatric Association) directs that in order for a diagnosis of dementia to be warranted, cognitive deficits must result in a decline from previously higher levels of occupational or social functioning. This instruction to exclude from dementia diagnosis adults who exhibit cognitive deficits absent of decline in occupational or social functioning suggests a perspective that normal aging often leads to some cognitive decline without accompanying decline in everyday functions (Tucker-Drob 2011).

Another common problem in older adults is apathy, which is associated with cognitive and functional impairment in the elderly with preserved cognition. Apathy is a disorder of "will," i.e., "the human power, potency or faculty to initiate action." A reduction of this capacity sees affected individuals manifest diminished desire, goal formulation, and voluntary behavior – characteristics central to an operational definition of apathy proposed by Marin 25 years ago (Marin 1991). Apathy can lead to cognitive impairment and functional disability in

older adults. In the Cache County Study, elders without cognitive impairment and presenting with apathy scored lower in cognitive tests and reported a decrease in the level of their daily functioning (Onyike et al. 2007).

The Emergence of Standardized Functional Assessment in Older Adults

For the past 20 years, research has been dedicated to achieving an objective and comprehensive direct measure of the functional performance of the elderly.

The historical context of the increased life span prompted specialists to ask the following questions regarding the older adult's independence: "Can the person perform activities as previously?" "Does the person require direct assistance or specialist equipment to independently and safely carry out their daily activities?" For this reason, assessment of functional ability often includes an evaluation of the individual's ability to carry out various activities of daily living (ADLs).

ADLs can be further categorized as basic ADLs (BADLs) or instrumental ADLs (IADLs). BADL refers to various self-care activities such as eating, dressing, personal hygiene, and mobility in and outside the house, while IADL functions are related to more complex tasks such as household management, carrying out activities outside the home, use of public transport, cooking meals, etc. As such, functional rating scales aid in the identification of impairments, functional limitations, and participation and can serve as tools that monitor changes over time as well as in response to interventions (e.g., outcome measures).

Still, when selecting ADL tools, one needs to consider their measurement characteristics and psychometric properties (reliability, validity, sensitivity, and specificity) to avoid or reduce observer bias.

Functional Scales for Older Adults

There are many instruments for ADL assessment, including widely used scales for ratings of BADL and IADL, originally developed for general geriatric assessment. Several scales were later developed for Alzheimer's disease, and they are normally used in other dementias.

This section will address the most common ADL scales used in clinical and research settings involving healthy aging and dementia patients.

The ADL Index (Katz 1963)

The Katz Index of Independence in Activities of Daily Living (Katz ADL) assesses functional status as a measurement of the person's ability to perform activities of daily living independently (Katz et al. 1963). The Index identifies the quality of performance in the six functions: bathing, dressing, toileting, transferring, continence, and feeding. People are scored yes/no for independence in each of the six functions. A score of 6 indicates full function, 4 indicates moderate impairment, and 2 or less indicates severe functional impairment.

Score ratings should be based on the current state and not on the ability to carry them out; the scale is usually completed by a professional. It is considered that a patient who refuses to perform a function is considered incapable of carrying out that function with regard to the scoring on the item in question.

Validity and Reliability: No formal reliability and validity reports could be found in the literature.

The Lawton Instrumental Activities of Daily Living (Lawton and Brody 1969)

The Lawton Instrumental Activities of Daily Living (IADL) Scale is an instrument used to assess independent living skills among older adults and may be used in the community setting, clinic, or hospital (Lawton and Brody 1969). The type of tasks evaluated are more complex than the basic activities of daily living as measured by the Katz ADL Index or the Barthel Index. It takes 5–10 min for a trained interviewer to assess ability in eight complex daily living tasks such as using the

phone, grocery shopping, preparing meals, housekeeping, laundering, using transportation, taking medications, and managing finances. The assessment can be delivered with a written questionnaire or via an interview with the informant. The clinician can complete the scale using information about the patient, from an informant (person's family member or carer), the patient himself/herself, or recent notes.

The main purpose of the instrument is to identify how a person is functioning at the present time and to identify improvement or deterioration over time. Persons are rated according to their highest level of functioning in that category. A summary score ranges from 0 (low function, dependent) to 8 (high function, independent).

Validity and Reliability: Inter-rater reliability was established at 0.85. Of note, inter-rater reliability was determined with a small sample of 12 subjects (Lawton et al. 1982).

Advantages and Disadvantages: There are three fundamental issues: low sensitivity, does not address all IADLs, and is gender biased. Historically, women were scored on all eight areas of function; men were not scored in the domains of food preparation, housekeeping, and laundering. However, current recommendations are to assess all domains for both genders.

Functional Assessment in Dementia

Some assessments of function have been specifically designed to detect changes due to dementia. This section presents the most common functional tools used in dementia.

Alzheimer's Disease Cooperative Study Activities of Daily Living Inventory (ADCS-ADL) (Galasko 1997)

The ADCS-ADL scale is an informant-based inventory consisting of 23 items that assess both basic and instrumental activities of daily living, i.e., functional performance, of people with Alzheimer's disease (Galasko et al. 1997). It takes 15 min to administer, and it can be completed by someone who spends at least 2 days a week with the person.

The ADCS-ADL inventory offers a detailed outline of each activity and asks the carer to describe observed actions or behaviors. The necessary information is taken from the past 4 weeks. If a person did attempt to perform the ADL, the informant is asked to pick the single most accurate definition of the patient's level of performance from a list of descriptions of alternative methods of doing the ADL. For an ADL in which different methods of performance do not apply, the informant is asked if the subject usually carries out the ADL "independently" (the highest level), "with supervision" (needing verbal instructions during ADL performance, an intermediate level of ability), or "with physical help" (a lower level of performance).

Validity and Reliability: Good test-retest reliability (ranging from 0.41 to 0.70) over 1–2 months. Correlations between the ADCS items and the MMSE total score range from 0.28 to 0.70.

Disability Assessment for Dementia (DAD) (Gelinas and Gauthier 1999)

The Disability Assessment for Dementia (DAD) Scale is targeted at individuals living in the community who have cognitive deficits such as Alzheimer's disease and other dementias (Gelinas et al. 1999). Tasks include basic (dressing, hygiene, continence, and eating) and instrumental ADLs (meal preparation, telephoning, housework, taking care of finance and correspondence, going on an outing, taking medications, and ability to stay safely at home), as well as leisure activities (activities that are beyond self-maintenance and are for the purpose of recreation). The DAD helps delineating areas of cognitive deficits which may impair performance in ADL. Scores can be broken down in regard to initiation, planning, and execution.

The DAD is administered through an interview with the caregiver, taking 15 min, and is a measure of the actual performance in ADL of the individual as observed over a period of a fortnight prior to the time of the interview.

Each item is scored: 1 point = able to, 0 point = not able, or non-applicable = N/A.

Validity and Reliability: Internal consistency coefficient is reported at 0.96, the intraclass correlation reported at 0.96, and the test-retest reliability also has excellent ratings (Gelinas et al. 1999). The convergent validity for the DAD is supported through the instrument's correlation with the Global Deterioration Scale. The usefulness of this scale has been demonstrated in numerous clinical trials.

Functional Activities Questionnaire (FAQ) (Pfeffer 1982)

The Functional Activities Questionnaire (FAQ) measures instrumental activities of daily living (IADLs), such as preparing balanced meals and managing personal finances (Pfeffer et al. 1982). It is an informant-based questionnaire that can be given to either patient or carer, and it takes approximately 5–10 min to be completed. The individual answers 10 items relating to daily tasks which are needed to live independently. A scale ranging from independence (0) to dependence (3) is used for responses.

The total score ranges from 0, reflecting the fully preserved capacity, to 30, indicating maximum functional dependency. A cutoff point of 9 (dependent in 3 or more activities) is recommended to indicate impaired function and possible cognitive impairment.

Validity and Reliability: The FAQ is a consistently accurate instrument with good sensitivity (85%) to identify an individual's functional impairment. The FAQ demonstrates high reliability (exceeding 0.80). Tests of validity have been performed on the FAQ, establishing it as an instrument for the bedside and research being able to discriminate among different functional levels of individuals and being able to predict neurological exam ratings and mental status scores such as the Folstein Mini-Mental Status Examination (MMSE).

Advantages and Disadvantages: The FAQ is very sensitive in detecting individuals with dementia. A limitation of the FAQ is that informants may not be able to provide responses on certain items, either because the subject never performed them prior to developing cognitive impairment or because the informant had insufficient information to rate the subject's current performance.

Activities of Daily Living Questionnaire (ADLQ) (Johnson 2004)

The Activities of Daily Living Questionnaire (ADLQ) Scale is an informant-based instrument used to measure functional abilities in people with dementia. It takes 5–10 min to be completed (Johnson et al. 2004).

The scale is divided into six sections (self-care, household care, employment and recreation, shopping and money, travel, and communication) addressing different areas of activity, and each section has between three and six items. Each of the items is rated on a 4-point scale from 0 (no problem) to 3 (no longer capable of performing the activity). For each item, there is also a rating (9) provided for instances in which the patient may never have performed that activity in the past ("Never did this activity"), stopped the activity prior to the onset of dementia (e.g., stopped working before dementia symptoms were apparent), or for which the rater, for a variety of reasons, may not have information ("Don't know").

The total score, which has a range of 0–100, is calculated using the formula below:

Functional impairment: (Sum of all ratings/3 × total number of items rated) × 100

The denominator represents the score that would have been obtained if the most severe level of impairment had been indicated for all items rated (excluding those rated "9"). The numerator represents the total of the actual ratings for all items rated (excluding those rated "9"). The resultant score represents the level of severity of impairment in ADL. The amount of functional impairment is then rated as "none to mild" (0–33%), "moderate" (34–66%), or "severe" (66–100%).

Validity and Reliability: This scale has high test-retest and concurrent validity and has been

shown to accurately detect decline in individuals with probable Alzheimer's disease. Total ADLQ score is highly reproducible, with concordance coefficients of 0.86 or higher (Johnson et al. 2004).

Bristol Activities of Daily Living Scale (BADLS) (Bucks 1996)

The Bristol Activities of Daily Living Scale (BADLS) was designed specifically for use in patients with dementia and covers 20 daily living activities (Bucks et al. 1996). A professional or family can complete it in about 5–10 min. It is sensitive to change in dementia and short enough to use in clinical practice. It is regularly used as an outcome measure in clinical trials. This outcome is among those recommended by a consensus recommendation of outcome scales for nondrug interventional studies in dementia (Moniz-Cook et al. 2008).

Validity and Reliability: The BADLS has good test-retest reliability and good content validity (Bucks et al. 1996).

Advantages and Disadvantages: Patients can be evaluated over a full range of ADL and abilities despite communication difficulties, and it is sensitive to detect change over time. However, over half of the items (13 of 22) on the scale rate basic ADLs (e.g., selecting food, eating food, selecting drink, drinking), making the total score heavily determined by these tasks. Most individuals with dementia would not experience a decline in these areas until the later stages of illness, and this scale is unlikely to be sensitive to early decline in higher level cognitive activities.

Informant-Based Versus Performance-Based Functional Assessments

Informant-based tools can be as effective as cognitive tools for dementia screening and have many advantages: they can measure change longitudinally, they can be used for subjects unable to do cognitive testing for any reason, they are relevant to everyday cognitive activities, and they can be used cross-culturally (Lorentz et al. 2002).

Informant-based dementia screens provide an estimate of change over the long time periods typically seen in evolving dementias, evaluate cognitive abilities related to everyday function, and appear minimally affected by cultural, educational, and language biases.

Performance-based ADL instruments require the person to carry out real tasks in a structured setting using accessories. Scoring is standardized and can encompass elements of performance such as sequencing, initiation, and motivation. The main disadvantages of such assessments is the length of time taken to administer, need of specialist training, and also the potential requirement of an ecological setting in the clinical environment, which is not always available.

Direct Assessment of Functional Status (DAFS) (Loewenstein et al. 1989)

The DAFS is a performance-based (ADL) task that assesses seven specific functional areas: time orientation, communication, transportation, financial skills, shopping ability, grooming, and eating (Loewenstein et al. 1989). The "time orientation" subtask examines (a) the ability to tell time using a clock and (b) orientation as to person, place, and time. The "communication" subtask includes (a) ability to use a telephone and (b) send a letter, while (c) "transportation" task, (a) identification of driving signs and (b) driving rules. The financial subtask assesses participants' ability to (a) identify and (b) count currency, as well as (c) write a check and (d) balance a checkbook. The shopping subtask assesses participants' ability to learn a list of shopping items and then (a) freely and (b) with cueing select the items from a mock grocery store after a 10 min delay, (c) shop with a list, and (d) getting the correct change. Scores are obtained by computing individually completed correct responses in each domain.

Validity and Reliability: This instrument has high inter-rater and test-retest reliabilities. Convergent validity is evidenced by significant correlations between the scale and established measures of functional status (Loewenstein et al. 1989).

The Assessments of Motor and Process Skills (AMPS) (Fisher 2003)

The AMPS is a well-validated performance-based tool. It has been used extensively with a number of populations (Fisher 2003). The person has to perform two everyday tasks chosen from a set of over 100 standardized tasks. The assessment of the two tasks simultaneously measures 16 motor (e.g., coordination, grip, transportation, etc.) and 20 mental process skills (e.g., searching, choosing, organizing, sequencing, etc.) and their effect on the ability of the person to perform familiar ADL tasks. Both tasks' scores are used in conjunction with the AMPS score. Raw scores from each motor and process skill are converted into logits, using a Rasch model approach. A software program compares a patient score against age- and sex-matched controls; scores lower than cutoffs denote impairment.

One of the disadvantages of the AMPS is its cost for the training; however, this ensures greater reliability for the trained assessor. The AMPS is also limited to OTs, which may pose a challenge depending on staff availability. Finally, the AMPS does not measure initiation.

The Instrumental Activities of Daily Living (IADL) Profile (Bottari 2009)

The IADL Profile was originally developed for people post-brain traumatic injury (Bottari et al. 2009). However, it is currently being validated for aging populations and dementia patients. The assessment evaluates independence in complex everyday activities. This tool is administered in the person's home and community environment and aims to establish whether the subject's main difficulties in everyday life relates to executive function (EF) deficits. Participants are asked to simultaneously plan the full series of embedded tasks necessary to attain the ultimate goal of hosting a meal for unexpected guests. Two other tasks, obtaining the daily bus schedule for a long-distance trip between two large urban cities and making an annual budget, are also tested. Tasks are scored on the basis of four cognitive operations related to EF: ability to formulate the goal, plan the task, execute it, and verify the attainment of the goal. For each operation, the person's level of independence is scored on a five-level ordinal scale ranging from dependent (score of 0) to independent without difficulty (score of 4). In addition to the independence score, this test also allows clinicians to understand the types of errors committed by the individual, the type and amount of cues required to perform the task, and the time to complete the task.

Validity and Reliability: This revealed high to very high internal consistency for all factors ranging from 0.81 to 0.98; internal consistency of the total scale was very high (0.94). Hence, a total score can be calculated, providing a reliable global indicator of IADL independence and indicating where on a continuum from totally dependent (total score, 0) to totally independent (total score, 116) the ability of an individual is located (Bottari et al. 2009).

Limitations and Advantages of Functional Assessments

A key limitation of functional assessments relates to its high sensitivity to change. Changes in ADLs can be due to physical symptoms or frailty, cognitive deficits, neuropsychiatric symptoms, or a combination of these, which could confound the decline related to cognitive deficits.

However, for the same above reason, ADL scales are very useful in clinical care planning and psychosocial interventions and are also sensitive to detect improvement post pharmacological and non-pharmacological trials.

Of note, to date, most scales are unable to differentiate the exact factors underlying ADL change. This is a field with growing research interest, and it will not be long before a novel ADL can also address factors behind the measured disability.

Summary

The evaluation of functional performance in older adults is essential for planning support needed in older age. Changes related to normal aging, acute

illnesses, worsening chronic illnesses, and hospitalization can contribute to a decline in the ability to perform tasks necessary to live independently in the community. The information generated from a well-conducted functional assessment can provide objective data to assist with targeting individualized rehabilitation needs or to plan for specific in-home services (such as meal preparation, nursing and personal care, homemaker services, financial and medication management), or the need to involve other people for continuous supervision.

Functional assessment can also help clinicians to understand a person's baseline capabilities, facilitating early recognition of changes that may lead to an early diagnosis of dementia. Monitoring ADL function can also provide key information on the progression of the disease. For this reason, functional disability tools are commonly used as outcome measures in pharmacological and non-pharmacological trials and should be part of any set of assessments involving the elderly and people with dementia.

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Cross-References

- Active Aging
- Activity Theory, Disengagement Theory, and Successful Aging
- Age-Related Changes in Abilities
- Assessment of Older People in Primary Care
- Assisted Living
- Depression and Cognition
- Disability and Ageing
- Everyday Cognition

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Assessment of Older People in Primary Care

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Synonyms

Community care; Comprehensive geriatric assessment; Needs assessment

Definition

A structured approach to identifying the needs and problems of an older person from a holistic perspective, incorporating physical, mental, social, and functional components, with intervention and follow-up in primary care.

Overview

Assessment is fundamental to the work of specialists in the care of older people, defined as a structured approach to identifying the needs and problems of an older person from a holistic perspective, incorporating physical, mental, social, and functional components, with intervention and follow-up (Rubenstein and Rubenstein 2003). To respond to the challenge of aging populations, we need to translate the principles of specialist assessment to the primary care setting. Primary care is defined as a system of first response for addressing the health needs and concerns of the local population. Assessment systems in primary care need to be simple and holistic, able to identify people at risk, mobilize a response within primary care, and link to specialist practice. With a high prevalence of mental health problems among older people, assessment systems for primary care must include the assessment of mental health and well-being.

This entry has three aims, to describe the main methods and features of assessment of older people in primary care, drawing on examples from around the world; to describe in some detail the EASYCare assessment method, whose development over the last 25 years as an assessment tool for use in primary care for older people has been led by one of the authors; and to provide a number of recommendations for international development in this area.

Methods

An electronic search of all HDAS journals was carried out to prepare materials for this entry, we undertook an electronic search of all HDAS

journals (http://www.library.nhs.uk/hdas) carried out through the OpenAthens portal on 24 November 2015. We searched for the following words in the abstract and title fields, Primary Care AND Assessment AND Older People. The time frame was set from 01 January 2015 to 24 November 2015. This produced 1,063 results, which were reviewed. We selected 30 articles were selected for detailed review based on confirming that the tool was used in the assessment of older people in a primary care setting, was not a single disease-specific screening tool, and included mental health within a holistic assessment. Studies were selected case studies for this entry to cover the main purposes of assessment where there was the strongest evidence base for their use.

The literature study identified a small number of assessment methods that fulfill the criteria. These can be divide into three main groups: those that are used to screen for risk, those that form a single assessment in primary care, and those that can form part of a stepped approach toward more comprehensive assessment. These in turn will then be discussed, drawing on a number of case studies.

Risk Screening Assessment

Health risk appraisal (HRA) is an example of a risk screening assessment that can be used in primary care. HRA is an approach that has developed from the US-based insurance system. It involves a systematic approach, to collect information from individuals and to identify potentially modifiable risk factors (Eichler et al. 2007). Within the assessment of older people, the aim of HRA is to identify risk factors for decline in status that can then be used to modify management and improve quality of life (Eichler et al. 2007). Harari et al. (2008) used the health risk appraisal for older persons (HRA-O) as a self-completed questionnaire assessing medical conditions, function, social support, depressive conditions, memory impairment, and health measurements. A sample of people over 65 living in their own homes in London returned the questionnaire and received individualized written feedback on their risk factors. The feedback was also incorporated into the primary care IT system so that it could also be used by GPs for reinforcement of health behavior. This tool appears to be effective at identifying risk factors, has been validated in the USA and in a number of European countries, and has a high acceptability among patients and providers in primary care. However, this study found the HRA-O had a limited impact on health behaviors, excluding a small increase in physical activity and an increased uptake of the pneumococcal vaccine. Previous studies that included face-to-face encounters with participants have had more positive outcomes, suggesting direct contact may be important in the assessment of older people in primary care.

Eichler et al. (2007) also used risk assessment to assess older people ($\geq$70 years of age) in primary care in Austria; however, they used the Standardized Assessment Tool for Elderly People in Primary Care (STEP) tool. This tool was developed in a collaboration between 7 different European countries and involves 33 possible health problems and risk factors for health decline. Again, this took the form of a self-completed questionnaire but also included a memory and mobility assessment by the general practitioner. If there was a positive result, the general practitioner and the patient would make decisions together about further management. Eichler et al. (2007) found the assessment influenced further management in four domains: hearing impairment, mobility and falls, depression, and urinary continence. In contrast, GPs were unlikely to act on positive cognitive results, a finding repeated elsewhere in the literature. Again, this demonstrates that risk assessment may be an effective way of assessing older people to identify risk factors and may be used to affect management in primary care. However, the impact of these management changes on long-term outcomes is not clear.

Primary Care Assessment

Assessment of older people in primary care can also involve a more thorough assessment than that

of risk alone. Often this assessment will be an assessment of need and unmet need.

The Camberwell Needs Assessment for the Elderly (CANE) was developed in the UK, specifically for older people with mental disorders (Reynolds et al. 2000). It assesses four categories of need: environmental, physical, psychological, and social. Its validity, reliability, and acceptability have been assessed in the UK with good results. Stein et al. (2014) have also developed a German version which identified met and unmet need in older people in primary care, and results were consistent with other tools and scores. CANE has also been validated in a number of other countries. Although we found no evidence of association of the use of CANE and improved outcomes for older people, the use of CANE in both research and clinical setting and the validation in a number of countries suggests it may be a useful tool in the assessment of older people in primary care, particularly those with mental disorders such as dementia.

Another needs assessment tool that has been used in the assessment of older people in primary care is the Brief Assessment in General Practice Health Tool (BRIGHT). Wilkinson-Meyers et al. (2014) used this tool to identify met and unmet need in a sample of older people (>75) living in the community in New Zealand. They found 81% of people needed assistance with at least one instrument of daily living, and there was significant unmet need with regard to housework. However, this study was limited to personal assistance needs. Kerse et al. (2014) have published further work with the same sample where BRIGHT was used to perform a more comprehensive assessment through telephone interviews in primary care. They found that this method was effective at identifying older people in the community with increased disability. Those who undertook the BRIGHT assessment had a smaller decline in quality of life during the follow-up period. They also had an increased rate of placement in residential care, suggesting BRIGHT was able to identify need in the community that could not be met with older people remaining in their own homes, or the community support was not available to allow this. There was no difference in hospitalization and service use between the two groups.

The EASYCare Assessment

Over the last 25 years, one of the authors (IP) has led an international project, EASYCare Health, to develop and implement an assessment system for older people in primary care. The approach has been validated (Philp et al. 2001) in 44 poor, middle income, and rich countries around the world (Olde-Rikkert et al. 2013) and reported in 80 peer-reviewed publications. The key insight from this work is that all older people and their family circumstances are unique. Therefore, older people need to be assessed for their perceptions about their health and care needs and mobilize a response based of their priorities and that of their family carers. Local systems also need to be understood, both voluntary and statutory, from which support can be mobilized. The EASYCare experience has shown that older people and their families are most concerned about maintaining independence, being able to do what is important to them, not being a burden and not suffering at the end of their lives. We have identified the top 49 top concerns of older people have been identified relating to their health and care, which fall into seven domains: communication, daily living activities, mobility, safety, accommodation and finance, mental health, and staying healthy. In recent studies, the top concerns reported have been about pain, loneliness, accommodation, financial difficulties, memory, and sleep. This heavy weighting toward concerns about mental health and environmental factors suggests that policy and practice should give greater priority to these issues to promote better health in old age.

The EASYCare approach has strong evidence for validity for use in primary care, with a variety of methods of implementation, including incorporation into frontline assessments by professionals such as primary and community nurses (Philip et al. 2014), allied health professionals, social care staff, and care assistants. Voluntary sector staffs, such as those working for NGOs, have been particularly effective in using the EASYCare assessments to underpin their work with older people. Evidence also suggests that many older people can have a satisfactory and efficient telephone-based assessment by call center staff.

Assessors from statutory, voluntary, and independent sectors do however need to be trained in person-centered assessment, including understanding issues about mental capacity. Self-assessment is possible but older people derive more benefit from a guided conversation with a trained assessor. Prior to offering an assessment service, local resources which could address identified concerns need to be mapped, and agreement must be reached about how to share summary assessment information at both an individual and population level, with due consideration to issues of confidentiality, security, and consent. In countries with well-developed primary care systems, we have found that it is useful for contact with the older person to be initiated by their primary care physician and for the summary of the assessment and response to be held within the person's individual primary care record. Following an assessment and mobilization of support, a follow-up assessment is undertaken to document what happened as a result and the person's satisfaction with the outcome. In RCTs have shown that the process mobilizes an increase in support from community and voluntary sector services, balanced by a reduction in hospital admission. Levels of independence and well-being in the older person improve. One RCT evaluated the cost per quality-adjusted life year gained, with the intervention found to be highly cost-effective (Melis et al. 2008) at less than €2000 per QUALY.

An EASYCare assessment can be triggered by screening tools to identify at-risk older people and can also itself identify people who are likely to benefit from comprehensive geriatric assessment by specialist multidisciplinary teams. However, the unique feature of the approach is that its use can be contained for the most part within the primary care system and can help deliver appropriate care and support to older people in their own homes.

Stepped Approach

Another approach identified from the literature is a stepped approach, where assessments move toward more comprehensive assessment. The U-CARE method (Bleijenberg et al. 2013), developed in the Netherlands, is a prime example of this. The assessment begins with a frailty screening, using U-PRIM, of older people in the community that is applied to primary care records. This is then followed by U-CARE, a nurse-led, multidisciplinary assessment and intervention.

A further frailty assessment using the Groningen Frailty Indicator (GFI) questionnaire and further supplementary tools to ensure a holistic assessment is undertaken. Frail older people in the community then undergo a comprehensive geriatric assessment at home conducted by a practice nurse. The final step is then to create a tailor-made care plan in collaboration with the GP. Results suggest that this approach is acceptable to health-care professionals and may have positive outcomes (Metzelthin et al. 2014). There was better preservation of physical functioning in the U-CARE group; however, no effect was seen on quality of life. Furthermore, there is evidence to suggest the U-CARE method is likely to be cost-effective compared to usual care (Metzelthin et al. 2014).

Another example of stepped assessment was the use by Vass et al. (2005) of an educational program to enable health visitors and GPs to provide validated short geriatric assessments to older people. Older people were first assessed by a health visitor in their own homes, as part of a nationwide program in Denmark. However, this was modified to include an assessment to select older people who were showing early signs of disability. Depending on the results of the first assessment, older people were then asked to see their GP for a short geriatric assessment, focusing on the five Ds: delirium, depression, dementia, drugs, and drinks. Vass et al. (2005) observed that those receiving the modified home visit program and GP assessment had less of a decline in their functional ability over 3 years. This result was more notable in the 80-year olds compared to the 75-year olds. Improved outcomes were also associated with more regular home visits. No differences in mortality or rates of nursing home admission were seen.

Summary of Assessment Instrument

The key properties of the instruments we have described are summarized in the Table 1.

Assessment of Older People in Primary Care, Table 1 Properties of the assessment instruments

	HRA-O	STEP	CANE	BRIGHT	U-CARE	EASYCare
Holistic	✓	✓	✓	✓	✓	✓
Good coverage of mental health	✓	✓	✓	✓	✓	✓
Valid for use in primary care	✓	✓	✓	✓	✓	✓
Cross-cultural validity	✓	✓	✓			✓
Supports stepped care				✓	✓	
Cost-effective					✓	✓

Conclusion

Research of the literature for this entry demonstrated a relative paucity of recent published work about primary care-based assessment of older people, in contrast to the large amount of published work on identifying frail older people and meeting their needs through specialist services. However, the search terms were limited and we know that there is much published work and a long academic tradition focussed on developing better primary and community-based care for older people.

Nevertheless, there are some excellent, validated methods for primary care-based holistic assessment of older people's health and care needs. The methods fall into three main categories: assessment to screen for risk, single assessment for primary care management, and stepped assessment. Patterns of need appear to have strong commonalities across health systems and are well covered among the instruments we reviewed. Mental health needs feature strongly in them all.

It is no surprise that mental health is a key feature in assessment tools, which have been validated for use in primary health care. Poor mental health is a strong predictor of poor outcomes and will therefore feature in screening tools for risk. Mental health problems, including depression and anxiety, are common in older people, as are wider aspects of poor mental well-being such as loneliness, pain, and sleeping problems, and should therefore form a major component of any holistic assessment tool for primary care use. Identifying mental health problems in primary care for referral for specialist assessment using a stepped approach has always been required to support the principle of early intervention in mental health. This has been given added impetus in older people with recognition of the benefits of early intervention for including specialist assessment for people with dementia.

Health systems should be developed to harness the use of these assessment methods. How they are implemented will depend on local factors. It is important to mobilize all available resources, including those from the third sector. The responsibility for assessment and care navigation should ideally be independent of the provision of care to avert the risk of assessors skewing the mobilization of support toward their own services. There is a strong policy and professional rhetoric for person-centered care, but it is impossible to underestimate the capacity for providers to pursue professional and organizational objectives, rather than working across organizations for the benefit of recipients of services. To have sustainable and effective care for aging populations, commissioners and policy-makers need to promote a culture of empowerment and capability, rather than one based on passive receipt of welfare and care, with genuine attention to the concerns of older people and their families for their health and care. The adoption of any of the assessment approaches we have reviewed would be encouraged, to strengthen primary care for older people and help change culture and systems to improve older people's lives.

Cross-References

- ▶ Assessment of Functional Abilities in Older Adults (BADLs, IADLs)
- ▶ Assisted Living
- ▶ Health Promotion

- Home-based Primary Care
- Older Adults in the Emergency Health Care Setting
- Person-Centered Care and Dementia Care Mapping
- Psychosocial Well-Being
- Quality of Life in Older People
- Rural Health and Aging: Global Perspectives

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A

Assisted Living

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Synonyms

Assisted living facility; Long-term care; Residential living with assistance

Definition

Assisted living facilities (ALFs) are a long-term residential option for older adults that provide a mixture of independent living and available round-the-clock medical assistance. These facilities aim to create a homelike environment for older adults to allow them to live as independently as possible when they may no longer be able to be completely self-sufficient. It provides the opportunity for elderly individuals to maintain dignity and autonomy while getting the support that they need. The services provided are based on the specific needs of the individual and can change over time as those needs may increase. This environment is attractive to older adults considering that many prefer to receive care in a homelike

setting (Brodie and Blendon 2001; Grabowski et al. 2012).

Services Provided

Residents are provided with living amenities, daily meals, activities, and basic medical care. Living arrangements are offered as apartment style housing units, creating a community in which residents live nearby one another. Within the same facility, ALFs provide dining halls, shared facilities, and common spaces such as living rooms and patios. In addition to the provided space, many residencies offer activities and events to engage individuals and provide entertainment (Howe 2014). Encouraging residents to engage in social events is an effective way to help older adults in their transition to an ALF. These activities may also help them cope with difficult life events such as the bereavement of a spouse or loved one. Additionally, engagement in activities may reduce depressive symptoms that are commonly seen in older adults (Brody and Semel 2006).

The aspect that typically attracts older adults to move into ALFs is the on-site, 24 × 7 support and health services. Such assistance includes help with activities of daily living (ADL) such as bathing, eating, dressing, medication assistance and management, using the toilet, and walking. Specifically, residents can receive assistance with daily showers and morning routines with getting out of bed and getting dressed. Assistance can also be provided to those who need help in going from their rooms to the dining room for meals. Additionally, help is provided with chores such as cleaning, laundry, and transportation. This care is provided on an as-needed basis and can increase as health declines and need for support increases. Residents have access to a 24-h emergency call system typically near their bed, in the bathroom, and sometimes even around their neck on a necklace (Howe 2014). Overall, the philosophy of service within ALFs is to increase residents' independence and dignity while emphasizing flexible, individualized supportive services and health care (Allen 2004).

Residents

ALFs are able to serve residents with a wide range of physical and mental health ailments. Some residents are in relatively good health, require minimal assistance, and can function with little to no limitation. These residents typically choose to live in an ALF to have assistance with taxing chores such as cleaning and meal preparation. Others choose to move to an ALF with a spouse who has declining health to have extra assistance with taking care of them. Other residents have a variety of physical disabilities due to chronic pain or being wheelchair ridden that limit them from accomplishing ADLs. These residents require assistance with mobility within their private living space and transporting to the dining hall, common areas within the ALF, or to off-site locations. Furthermore, some residents are physically able but require assistance to compensate for their cognitive decline. Such residents may require assistance with remembering to take medication and other ADLs such as bathing and dressing. Additionally, residents with health problems such as hypertension, diabetes, heart problems, and joint pain also benefit from medication management and call systems to staff members in case of emergency. Many residents have a combination of limitations and health problems requiring individualized assistance to address their specific needs (Zimmerman et al. 2001).

Unique to Independent Living and Skilled Nursing

The services provided at an ALF are at a higher level than within an independent living facility but less intense than what is offered within a skilled nursing facility. An independent living facility offers fewer services and is considered the first step in the spectrum of care for elder adults. Independent living is sometimes referred to as a retirement community in which adults are generally in good health and require minimal supervision. Residents are responsible for taking their own medication and setting up doctors' appointments, as well as requesting extra assistance when

needed. These facilities offer smaller condominiums and apartments as housing options to reduce housekeeping tasks for residents when transitioning from their larger homes. Many older adults are drawn to independent living facilities for the sense of community and activities offered to maintain stimulation and enjoyment in life. Safety is always taken into account with well-lit walkways to reduce falling and emergency call systems to quickly alert the staff if assistance is needed. The staff typically keeps note of residents' health status in order to consider when health decline is significant enough to require increased assistance or a transition into assisted living (Howe 2014).

When health declines to the extent that a resident needs more support than is offered in an ALF, the resident is typically transitioned to a skilled nursing facility. While independent living provides less support than in an ALF, skilled nursing provides the highest level of intensive services for residents who need more individualized and advanced care. Within skilled nursing facilities, assistance is typically provided by registered nurses due to the increased care needed by residents. On the other hand, the staff members at ALFs are not required to be registered nurses and instead are commonly referred to as personal care assistants (PCAs). Staff members in ALF are mostly responsible for assistance with ADLs rather than trained to provide advanced medical care. A registered nurse typically acts as the medical director in ALFs to supervise the PCAs and the residents' medical needs. While PCAs assist residents in an ALF on an as-needed basis with ADLs, skilled nursing facilities provide services for individuals who have significant difficulty completing daily activities and require 24-h assistance (Howe 2014).

Assisted living can be an attractive and more affordable intermediate option between independent living and skilled nursing. ALFs are best designed for individuals who do not yet need a high level of intensive care but can benefit from assistance with ADLs and medication management. Many residents may transition from one level of care to another as they age, their health declines, and need for assistance becomes greater.

Safety

Since many residents have physical and/or mental disabilities that prevent them from living independently, safety is an increased concern within AFLs. Older adults are at a higher risk of falling due to increased fragility and decreased sensory perception (Chang et al. 2004). In order to create an adequately safe environment for disabled elders, many AFLs are designed to accommodate the specific needs of the residents. For instance, facilities have wide hallways to fit wheelchairs and well-lit sturdy handrails for assistance with walking. All bathrooms and walkways throughout the building are also handicap accessible. Bedrooms are typically equipped with a call cord or switch so that patients can have immediate contact with nurses in an emergency or if they need immediate assistance. Additionally, some AFLs provide a pendant or wristband for patients to wear for easier access to communicate with staff members (Howe 2014).

Facility Amenities

Assisted living facilities typically provide apartment style housing to residents in the form of a studio, 1-bedroom, or 2-bedroom. Units also typically include a kitchenette and a private bathroom. Residents tend to either live alone or with their spouse or partner. Some single residents may choose to live in a unit with another resident for companionship (Howe 2014). The ample space allows residents to create a homelike environment and incorporate their belongings to maintain their individuality within the facility.

In addition to the individual units, ALFs also provide many common spaces throughout the building to facilitate a community atmosphere for the residents. Such spaces include living rooms, meeting spaces/multipurpose rooms, dining halls, and patio areas for socializing and events. Many assisted living facilities also have amenities on-site that are shared by residents such as central laundry, hair and nail salons, movie theaters, convenient stores, and restaurant dining. These additional conveniences and luxuries create

a comfortable living environment for the older residents.

To further create a comfortable atmosphere within the assisted living facilities, many also provide a calendar of events and outings to engage residents and keep them active. For instance, transportation services are provided for off-site needs such as grocery shopping, pharmacy visits, shopping, and doctors' appointments. Additionally, transportation is also provided for off-site recreational activities such as museums visits, food tastings, and farmer markets. Such activities and entertainment are also planned at the facility to promote socialization among resident and to increase quality of life. Such events include guest speakers, musicians, performances, arts and crafts, and movie nights (Howe 2014). Some ALFs may also offer a "reminiscing group" in which residents are encouraged to discuss and recall pleasant memories from their pasts (Howe 2014). Not only does recalling pleasant memories increase mood but doing so can also have cognitive benefits for older adults by exercising their memory (Brody and Semel 2006). These activities promote engagement among residents to encourage them to get out of their rooms and socialize with others.

Importance of Dining Experience

A critical component of ALFs that contributes to the quality of life of the residents is the dining hall for communal meals. Many ALFs provide all meals for residents in buffet style or restaurant style dining areas. Therefore, the facilities must provide quality food to meet the nutritional needs of elder adults. This older population commonly has deficiencies in nutritional intake due to decreased appetite and thus a reduction in food consumption. Additionally, reduced food intake also commonly occurs due to limited food options in some ALFs. Eating meals in a designated dining area within the ALF encourages residents to be more active and social within an otherwise inactive lifestyle. Without a communal dining area, residents are more likely to eat alone, increasing their isolation, thus creating feelings of depression and further lowering food intake. Additionally, studies have shown that people tend to eat more when sharing a meal with others than when eating alone (Edwards and Hartwell 2004). Therefore, the psychological aspects of the eating environment have been suggested to play a large role in increasing residents' nutritional intake and thus increasing quality of life. Overall, the dining experience provided within AFLs is meant to create a comfortable "homelike" environment for residents to mimic distinctive patterns of family life. Creating an environment that encourages and enables residents to eat together induces feelings of togetherness, security, and happiness (Mahadevan et al. 2014).

Choosing the Right ALF

In order to choose a high quality fit between a resident and a facility, there are many components that must be taken into account. Finding a strong match is essential to ensure the resident feels comfortable and is satisfied with their environment to feel at home. There must be a balance between the residents' profiles, their needs, and preferences with the staff and services offered at an ALF. For instance, some residents may prefer a smaller-scale ALF with a quiet and calm living environment, while others seek a "hustle and bustle" environment that provides many activities to encourage engagement. When all of these components are taken into account, it becomes quickly apparent that a "one-size-fits-all" mentality is inadequate when choosing the right ALF for each individual (Morgan 2012).

There are a variety of ways in which residents determine the quality of an ALF. First, quality is not an abstract concept but comprised of specific components that are valued by the resident. Individuals move into ALFs coming from specific backgrounds, familial lifestyles, and cultures that drive their preferences for their new home. These preferences may or may not coincide with the specific "brand" advertised by the ALF and thus make the qualities of an ALF distinctly positive or negative to individuals. Second, the perceived quality of an ALF may also change over time for

an individual depending on their specific needs. For instance, the quality of an ALF may be more dependent on the quality of life or the quality of health care services depending on the needs of a resident. In a nursing home, the answer may be clearer that the quality of health care is more essential considering the increased need for assistance from the patients; however, in an ALF, this distinction is less clear and likely a combination of both quality of life and quality of health care due to the mixed needs of residents. Therefore, ALFs experience a challenge to ensure the highest quality considering that the needs and preferences of residents' are broad and ever changing (Morgan 2012).

The third way to determine the quality of an ALF extends beyond the building and staff members but to consider the additional characteristics of the facility that make it unique. For instance, the quality of an ALF should also encompass location, culture of the community, staff management, and provided activities. The combination of these additional qualities creates an idiosyncratic community that may feel like home to some but not others. Therefore, some residents may be particularly attracted to certain ALFs that best fit their needs and preferences. Lastly, the reference point of the individual judging the ALF can drastically affect how the quality of an ALF is determined. For instance, the resident compared to the resident's adult child may evaluate the quality differently. These perspectives can also change when touring the facility versus when residing in the facility. Therefore, when accounting for the priorities of the person evaluating the quality of an ALF, the ways in which quality is determined can drastically vary (Morgan 2012).

Autonomy in an ALF

Choosing to move to an ALF can be a difficult decision for both the individual and their family. Most facilities do its best to create an environment that is homey and comfortable with the core value to preserve as much autonomy as possible for residents. For some, merely moving into an ALF enhances older adults' independence, as they no longer feel like a "burden" to their family members. They may also have the opportunity to do more activities with the aid of transportation and staff members. However, some residents have concerns of limited autonomy due to the rules and regulations of ALFs. Therefore, many facilities must strike a balance between preserving the autonomy of residents while ensuring that they are safe.

With the added care of staff members within an ALF, some privacy must be compromised to preserve the safety of residents. For instance, staff members must have access to residents' rooms to enter freely in case of an emergency. Therefore, residents' need to adjust to this limited privacy that was not present in their personal homes before moving to an ALF. They may also have limited freedoms on how to decorate or furnish their rooms in order to minimize clutter and reduce the likelihood of falling. Minimal clutter also increases the staff's ability to easily move about the room to provide services within the private quarters.

Residents also must adjust to decreased autonomy in their ability to come and go from the facility. Many ALFs request that residents sign out and inform the staff when they leave the grounds. Due to the frequency of confused elders to wander, it is important that the staff keeps track of the residents' whereabouts. Additionally, declining memory might also cause older adults to get lost easily and not be able to find their way back to the facility. While this limitation can be frustrating for older adults who are accustomed to coming and going as they please, these rules and regulations are put in place to maintain the safety of residents. Some ALFs do attempt to curb limitations for individuals depending on the level of their required supervision based on their degree of cognitive impairment. However, this aspiration becomes an ongoing challenge as cognitive abilities are always changing and at different rates. Therefore, since such a large proportion of people in ALFs do have some degree of cognitive impairment, many residents must accept these limitations as default despite varying levels in ability (Morgan 2012).

Maintaining Well-Being

Overall, adjusting to life in an ALF can be difficult for some adults and affect their well-being during the transition. Research suggests that the best way to maintain well-being during this transition is to establish a sense of "home" at the ALF to increase feelings of belongingness and comfort (Cutchin et al. 2003). There are many ways in which this feeling can be achieved, such as through autonomy. Although some autonomy is limited as previously discussed, other types of autonomy should be purposefully persevered in order to increase the feeling that the ALF is home for residents. For example, the freedom to decorate one's room and bring personal belonging is an essential component during the transition to an ALF that help makes the new facility feel like home. Additionally, the freedom to maintain the same level of contact with family and friends also contributes to a smooth transition. Maintaining well-being during the transition can also be achieved through developing close social relationships with other residents within the ALF. This can be done through the shared dining spaces and variety of activities offered at the facility. When residents become involved in their new environment and participate in the events, they are able to meet others and form relationships. Creating these relationships is an essential component of feeling secure and can generate feelings of belonging to a new community. Other essential components to maintain well-being during the transition to an ALF is having mutual respect with the staff members and developing a sense of security within the facility. When residents can successfully adjust to life in an ALF, they are able to feel comforted with the amenities and services offered to improve their quality of life (Cutchin et al. 2003; Hammer 1999).

Summary

In summary, assisted living facilities (ALFs) are a desirable option for intermediate care during the aging process. Facilities offer individualized assistance for residents with a variety of ailments including physical, mental, and health limitations. Residents are provided with private rooms and assistance with activities of daily living (ADLs). Activities and shared common rooms promote socialization and engagement in the community to increase their quality of life. Additionally, shared dining areas encourage residents to leave their private rooms to meet other residents. Although limitations are put in place to prioritize safety, ALFs attempt to create a homelike environment that maintains the autonomy and dignity of residents.

Cross-References

- ▶ Comorbidity
- ▶ Small-Scale Homelike Care in Nursing Homes

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Attitudes and Self-Perceptions of Aging

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Synonyms

Ageism; Discrimination; Internalized ageism; Prejudice; Stereotypes

Definition

An attitude may be defined as an internal affective orientation explaining an individual's action (Reber 1995). They comprise four components: cognitive, affective, evaluative, and conative. The cognitive component refers to the opinions or schema held about an object. The affective component refers to the emotion or salience towards the attitude object. The evaluative component refers to the direction of the feeling, whether the object evokes a positive or negative emotion. Finally, the conative component of the attitude is the disposition for action (Maio et al. 2000). It is the combination of these components that determines the attitude held by an individual.

Attitudes: Explicit and Implicit

There are several characteristics that define an attitude within the 4-tier framework. First, an attitude is learned. Attitudes can be learned in many ways, the most prominent being personal experience, observation of salient others, and societal influence. Each method exposes the individual to attitudes and information about the attitude object, which they then appraise within their own belief systems (and those held within society and salient in-groups) to form and update their own opinions and attitudes.

Second, attitudes are predispositions. Attitudes are inclinations and tendencies for action; thus, an attitude and its direction contain motivational qualities. If the attitude is such that the salience towards the attitude object is high and the object is encountered, then be it negative or positive, as long as the conative response is satisfied, an individual will act upon his or her held beliefs. However, this is a predisposition and the association with behavior is not a causal one.

Third, attitudes are consistent. This does not mean that attitudes cannot be changed (as discussed later), just that they have a consistency in expression and measurement over time and across contexts. The way in which the attitudes are expressed may however change, depending on the social situation and on the pervasive attitudes of any salient others in the same social setting.

There are two subsets of the overarching "attitude": these are those of the implicit and explicit. Implicit attitudes are "introspectively unidentified (or inaccurately identified) traces of past experience that mediate favourable or unfavourable feeling, thought or action toward social objects." Conversely, explicit attitudes are defined as "consciously expressed actions, thoughts or feelings under the performer's control" (Greenwald and Banaji 1995). Research has further demonstrated that implicit attitudes are stable and enduring, allowing prediction of spontaneous behavior after exposure to unexpected stimuli. Research has also shown that explicit attitudes are less enduring and more malleable and predict only planned behavior (Perugini 2005). It is widely understood that because the two attitude types predict behavior at different times, they may in fact be manifestations of a single root attitude. Where explicit attitudes are consciously expressed by the performer, implicit attitudes reveal information which is not available to the individual through introspection however motivated or able a person. A prime example of this

is ageism. Where individuals genuinely believe they are not ageist and outwardly express accepting explicit attitudes, they may harbor negative implicit attitudes based on subtle reinforcement from their social interactions and environments.

Formation of Attitudes

There are several theories of attitude formation, but two have become prominent. These are the summation (Fishbein and Ajzen 1974) and averaged (Anderson 1971) models. The summation approach argues that an attitude is the sum of evaluations associated with salient outcomes of observed behaviors. Thus, the attitude (either positive or negative) is the result of the total exposure to an attitude object or target. Using this approach, an attitude can be equally strong if the salience and outcome are high but observed infrequently or if the salience and outcome are low but the frequency of observation is high.

In contrast, the averaged model proposes that attitudes are subject to a process of normalization. Thus, the attitude is formed from the average evaluations of the attributes associated with an attitude object. Rather than the summation theory that simply adds together all of the experiences, this theory posits that the direction of the attitude is a reasoned average based on evaluations from each exposure. This theory, unlike the summation approach, would incorporate outlier responses or opinions and "dilute" them into the previously held knowledge about a certain attitude object.

In a review, Betsch et al. (2004) argue that both models are only applicable in certain circumstances, and an integrated model is more appropriate. This is called the value-account model, which argues that implicit attitudes are formed by summation and explicit attitudes by the averaged procedure. The model also takes into consideration the four components of attitudes, explaining the salience and motivational aspects of attitudes while centering on the cognitive evaluations made by the individual and their awareness of the process.

Allport (1954) identified some key ways in which stereotypes were formed simply through the way in which we are raised within our culture and environment. Family socialization and exposure to images in books, television, and newspapers were highlighted as key contributing sources for potential prejudicial stereotypes. Obviously in today's world, the Internet and seemingly barrier-less technology all feed into the process of stereotype formation. Further to this, it has also been shown that stereotypes can be formed from a cognitive bias, resulting in a perception-based correlation between minority groups and infrequently occurring attributes. The reason for this being adopted as a stereotypical attribute of the minority group is due to both a categorical distinctiveness process, enhancing the similarities to the group an individual belongs while simultaneously maximizing the differences with the minority "other" (increasing the in-group/out-group difference), and the distinctiveness of the attribute occurring.

Unlike other prejudices, ageist attitudes are still openly prevalent in society. In television comedies, elderly people are depicted, defined by stereotyped negativities regarding physical decline and both physical and mental incompetency. When the age stereotypes have been acquired, they will be easily activated by the presence of an elderly person, resulting in the generalization of the stereotyped schema to elderly people. Once acquired, these attitudes are maintained and strengthened when encountering elderly people even if they do not exhibit characteristics associated with the stereotypes held.

Population Attitudes Towards Older Adults

Although attitudes are central to the formation of prejudicial thoughts and ultimately treatment, it is arguably the stereotypes derived from attitudes that are the key factor in shaping behavior. Research highlights role incongruity as the basis for prejudicial behavior. It is proposed that prejudice itself derives from the dissonance between

beliefs about the stereotyped attributes associated with a group and the beliefs about the attributes that allow success in valued social roles.

Aging prejudice, in a similar manner to that of an attitude, can be broken into component parts: cognitive, affective, and conative. Cognitive prejudice refers to the belief that an individual holds about an older person and that a certain opinion or attitude is correct and true. Affective prejudice describes what stereotyped characteristics of older people the individual likes or dislikes. Conative prejudice is similar to the conative component of attitude, in that it refers to the propensity of the individual to act on their ageist prejudice. It is the inclination or predisposition and direction of action that are aimed to measure when assessing the attitudes held by an individual.

It is fundamental for people to categorize and create stereotypes due to the size and complexity of the daily information processed. Stereotypes are the belief that members of the same group indeed also share a certain attribute, for example, all old people are frail or all old people are wise. This assumption arises directly from the categorization process through the assimilation of in-group differences and as such the promotion of out-group homogeneity. One outcome of this categorization process is the accentuation of intergroup differences and the reduction of intragroup differences, both of which affect evaluation of the out-group and intergroup perceptions, attitudes, and behavior. Within ageism, this is essentially maximizing the differences between younger people (the group to which you belong) and older people (the out-group), ascribing negative characteristics to the group you do not belong.

Levy and Banaji (2002) conducted a review on implicit ageism, illustrating a pervasive and wide-reaching proliferation of negative ageist attitudes. This is not something confined to one social or ethnic grouping but prevalent across the gamut of society, resulting in a range of consequences for both older people and society at large.

Impacts of Negative Aging Attitudes

Stereotypes are not applied indiscriminately but rather used to create a platform from which to seek out further information. It is in the absence of additional information that we apply these stereotypes; however hesitantly we may do this. It has been shown that the use of stereotypes (especially gender) affects people's judgments even when additional information is presented about the individual character of the person being judged. People tend to use (age) schemata as a platform on which to base their assumptions of an older person. However, rather than seeking information generally about the person, information is sought to confirm the stereotype, rather than to cast doubt on it. There is still the ability, however, for individuals to search for information to contradict the ageist preconceptions. Stereotypes, as with other heuristic techniques, allow for increased processing capacity of other information presented simultaneously. Linked to this, it has also to be considered that stereotype use will also increase if people are cognitively or emotionally preoccupied with other concerns. In fields such as medicine where workloads are high, hours are long, and stressors are ever present, questions should be posed regarding the underlying stereotypes activated. If not, there is potential for this to lead to misdiagnosis (Duerson et al. 1992) or refusal to treat (Filipp and Schmitt 1995).

When these negative attitudes have been internalized and become implicit, the attitude holder may indeed no longer be immediately aware that they hold these attitudes. It is with the lack of conscious awareness that the negative attitude now becomes the basis for unplanned responses to the attitude target. This phenomenon can be observed with ageism in that the explicit bias is not expressed; however, behavior and language used precipitate the negative stereotypes assimilated. This has been highlighted as a more dangerous form of prejudice as even those outwardly expressing the best of intentions have difficulty trying to avoid negative responses that are generated by implicit processes.

Despite prejudice often being largely irrational, with regard to older people, some of the prejudice can be based on biological and observable declines. There are both physical and psychological losses associated with aging, a fact that

is universally accepted. The problem with aging is that societally it is seen as being simultaneously a time of wisdom and a time of physical and cognitive decline. Looked at more closely, what is being said is that people believe older adults are wiser and more knowledgeable but that they are slower and less efficient in dealing with the new and/or when they have to think on their feet. Ageism appears to have a base in physiological and psychological fact; however, little or no account is taken of the compensation method adopted by older people to minimize the effects of age-related loss. Similarly little importance is placed on the positive aspects of aging which are equally integral to an older person but counter the existing accepted heuristics and as such are often overlooked or cast aside. From these disparate viewpoints, a legitimate question arises in whether the objective views of aging (which are generally negative) are therefore likely to cue negative attitudes in those who work directly or indirectly with older adults.

Common forms of modern ageism include devaluing the contributions made by older people and viewing the pathologic processes sometimes associated with later life as normal components of the aging process. Angus and Reeve (2006) have further identified that this socially ingrained ageism actively promotes stereotypes of social isolation, physical and cognitive decline, lack of physical activity, and economic burden. Gerontophobia is a narrower band of ageism that specifically refers to a phobia of older people. Lynch (2000) identified aging anxiety as a major component of gerontophobia and more widely ageism, explaining this as the "combination of people's concerns or fears about getting older." These fears are based on concerns over loss of social contact, reduction in cognitive ability, changes in physical appearance, declines in overall health, and financial hardships that are themselves stereotyped characteristics of the aging process. In addition to these somewhat irrational fears, it is the knowledge that simply by living life we will become a member of this out-group, a process and transition whose path cannot be altered or avoided. The inevitability of the transition itself is stressful and causes anxiety among those who hold these negative stereotypes.

When addressing the prevalence of all forms of ageism, it becomes clear that it now surpasses those of sexism and racism (Kite and Wagner 2002), although it is typically harder to measure due to the implicit ways it is conducted. Ageism is prominent in advertising, media, and comedy and in the way in which older people are generally viewed. It is due to this prominence that acceptance surrounding ageism has occurred. It is often seen as humorous, and based on some degree of fact, this negating any negative effects or outcomes. Due to the "humorous" nature of ageism, the negative effects on the older person (self-esteem, disablement, self-isolation) are generally ignored by the wider public. A problem arises, however, when trying to measure the "colloquially" clear prevalence. On explicit measures, people will present themselves in what they see as the most socially acceptable light. Because of this self-presentational bias, the explicit measure of ageism (unless very subtle) does not truly capture the full extent of ageism.

This negative approach is also ever present even within the healthcare settings where older adults are at their most vulnerable. Research indicates that the care of these older adults may indeed be less than that given to a younger person. Attitudes held by staff can affect the treatment received and the way in which elderly people are treated. This has been demonstrated where older people were not receiving the same diagnosis based on the same symptoms as younger people where the only differentiating feature was that of the patient's age (James and Haley 1995). Similarly, research has highlighted that in some instances, medical professionals were refraining from treating patients with mental impairments because due to their age the conditions were considered irreversible (Filipp and Schmitt 1995). This is not something as an artifact of previous generations as medical student scores on ageism measures were no better than those reported in the general population, and no real increase in acceptance was measured from pre- to post-educational training. It can be concluded that this was a reflection on the lack of specific geriatric training. It has

been suggested that in order to improve this knowledge and sensitize students in health professions to the growing needs of the older population, they require more specific gerontological training, not simply training that focuses on the losses associated with aging. It is further posited that this training should include direct contact with older people and patients as this would help student clinicians improve their perceptions.

Self-Perceptions of Aging

A racist will never change skin color, a misogynist will never change sex, but an ageist person will become that which they hate should they live long enough. As such, every person should be conscious of the fact that if discrimination against older people is tolerated, one day it could be directed towards them. This internalization of negative concepts and the experience of prejudicial behavior cause issues around self-esteem and well-being in older adults, as well as resulting in costs to both the individual and the wider society at large.

The practice of discrimination has been shown to cause lowered self-efficacy, decreased productivity, and cardiovascular stress (Levy et al. 2000). This is costly to individuals and, in workers, to the company they work for as these symptoms lead to decreased productivity and may lead to the perpetuation of ageist attitudes. Especially in the workplace, research has demonstrated a clear link between perceived credibility of older adults and ageist attitudes.

Despite there being apparently equal amounts of positive and negative stereotypes pertaining to older people, the pervasive attitudes present in research suggest higher negative attitudes than positive ones. These findings were not only in the young. Negative implicit ageist attitudes are held by older people themselves (Levy and Banaji 2002). The reasoning given for this is that elderly people have acquired the same implicit prejudices throughout their lives and have not had sufficient time or opportunity to develop the mechanisms to defend against this.

There are negative consequences for elderly people as a result of the ageist attitudes held as they are not only subjected to ageist prejudices from others but also internalize these implicit biases. As people progress through the life span, their age schema becomes more elaborate as more information both about others and themselves becomes incorporated. As they age, the number of traits, categories, and subcategories they have within the schema grows; however, core elements are still retained. Research supports this developmental approach, finding that despite having a more complex picture of aging, older people do not necessarily hold more positive views. Some research has suggested that older people judge their age category more favorably than younger people, but both groups have generally negative attitudes towards older age. Levy (1996) found that elderly people who exhibited higher negative implicit attitudes also performed significantly worse on memory tasks. Further, it was identified that the perceptions of older adults could also be affected by implicit self-stereotyping. It is now largely accepted that implicit age stereotypes can influence the views of older adults both towards others and upon themselves. In addition to memory tasks it is established that when older adults adopt these societal stereotypes, they see decline as inevitable and becoming a less active member of society as the only option. Similarly, when adopted, these stereotypes became a self-fulfilling prophecy, reinforcing stereotypes through the inaction and deficits resulting from their initial belief and internalization.

Challenging Negative Perceptions

Weakly held and less salient attitudes are easier to change than strongly held attitudes, and as such, stronger attitudes are developed in areas that an individual (or in-group to which they belong) considers to be of higher salience. These strongly held attitudes can be either positive or negative but are usually polar. In areas of limited or questionable importance, attitudes tend to be weakly held, ambivalent, or neutral which means that they are more susceptible to change. Challenging these

negative attitudes also proves harder for ageism than other forms of prejudice due to the underlying nature of the attitude and the duration of time over which they are formed and reinforced.

Stereotypes can be changed through the presentation of contradictory information, but how that information is presented (concentrated examples or sporadic) and the affective nature (positive or negative) of the stereotype undergoing change are integral factors to the extent and level of success of the modification. A growing body of research has shown that contact between groups can alter stereotypes and reduce prejudice, provided that it takes place under certain conditions.

Prestwich et al. (2008) demonstrated that in terms of racist attitudes, exposure to the target group did indeed alter the attitudes held. The quantity of the contact improved an individual's implicit attitude, and the quality of the said contact affected the explicitly expressed attitudes. This has also been shown to be the case more specifically in the field of aging. With an intergenerational study, Tam et al. (2006) illustrated the same pattern of implicit and explicit attitude change based on quality and quantity of contact.

In order to improve the implicit attitudes towards older people and the resulting behavior, it is important that there is a high quantity of planned quality exposure and contact time.

Research has demonstrated that even when encountering contradictory evidence, attitudes towards older people were resistant to change and in most cases did not alter. As with most negative associations, if younger people can avoid spending time with older people and encountering evidence that may either support or challenge their beliefs about them, they will do so. Observation research has illustrated that young people are actively seeking ways to refrain from engaging in social meetings with elderly people. This avoidance only reinforces the implicitly held beliefs as it prevents the individual from having "meaningful" encounters with elderly adults that may in fact cause inconsistencies in schemata to be noticed and reevaluations of attitudes to take place.

Each of the attitudinal modification strategies can be used in an educational setting to impart knowledge and cause disequilibrium in the current schema held to force a reassessment of existing attributes and evaluations to modify the existing ageist attitude. This has been shown to be effective to differing levels across the globe. It has been shown that these attitudes (implicit and explicit) can be altered in the favor of older people. Westmoreland et al. (2009) demonstrated that through a well-structured education based on the psychological principles above, attitudes towards older people can be changed. It is in the utilization of these strategies in the training of medical professionals and people involved in the care of older people that the pervasive negative attitudes can be challenged. In challenging these stereotypes and commonly held misconceptions, the inequalities in care can also be addressed, and on a societal level, we can look to challenge the internalization of the said implicit and explicit ageist attitudes.

Cross-References

- ▶ Age Discrimination
- ▶ Age Stereotyping and Discrimination
- ▶ Aging and Quality of Life
- ▶ Social Cognition and Aging
- ▶ Stereotype Threat and Aging in the Workplace

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Australian Longitudinal Study of Aging (ALSA)

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Synonyms

Cohort; Developmental dynamics; Panel studies

Definition

One of the central methods of studying aging and development over the life span concerns examination of how individuals change over time. Research of this type requires longitudinal data, multiple repeated assessments of individuals often conducted over a number of years. This section describes key characteristics of an internationally significant longitudinal cohort study of aging, the Australian Longitudinal Study of Aging (ALSA). As detailed below, the design of the ALSA was informed by a biopsychosocial perspective, and as a result the study covers a broad range of measurement domains from functional capacity, to cognitive ability, to activity engagement. After providing an overview of the ALSA, findings related to the specific domain of social relationships and the implications of social relations for health and well-being in older adulthood are discussed.

Background to the ALSA

The ALSA (Andrews et al. 1989; Luszcz et al. 2007, 2014) was established in Adelaide, South Australia, in the early 1990s as a means of providing sophisticated Australian data to inform research and policy related to population aging. The study has maintained a multidisciplinary biopsychosocial emphasis throughout, with a broad focus on how economic, environmental,

biomedical, behavioral, and social factors relate to aging. More specific aims of the ALSA were concerned with (i) assessing changes in health and functional status over time, (ii) identifying risk factors for chronic diseases and normative aging-related changes, (iii) assessing effects of disease processes and lifestyle on functioning and aged care service use, and (iv) examining predictors of mortality. Following an extensive pilot, the ALSA Wave 1 (baseline) assessment commenced in 1992.

Participants and Procedures

ALSA participants consist of a population-based cohort of adults aged 70 and older at baseline, who resided in the Adelaide Statistical Division in 1992. The South Australian Electoral Roll was used as a sampling frame (voting is compulsory for Australian citizens with some rare exceptions) with the sample stratified by age group (70–74, 75–79, 80–84, 85 and older), sex, and local government area. Older adults living in the community and in residential care were eligible to participate. Prospective participants were sent letters of introduction and invitations to participate. After exclusion of ineligible participants (e.g., those deceased, not contactable, out of geographical scope), a total of 1,477 of 2,703 eligible persons (a response fraction of 54.6%) consented to take part in the study.

In addition to the 1,477 primary respondents, spouses and other household members were also invited to participate, with the age inclusion criterion for spouses relaxed to 65 years. This resulted in recruitment of an additional 597 spouses and 13 household members, providing a total of 2,087 individuals in the baseline ALSA sample. The mean age of the baseline sample was 78.3 (SD = 6.7), and the sample included similar proportions of men (51%) and women (49%). Around two-thirds of the sample (65%) was partnered, and just over half of participants left school aged 14 years or younger (55%). Characteristics of the ALSA sample in terms of sociodemographic characteristics were similar to those of older adults residing in the community, with the ALSA sample showing some advantages in education, health, and cognition consistent with patterns of sample selectivity typically observed in cohort studies (Luszcz et al. 2014).

ALSA participants have provided data on up to 13 occasions across several modes of assessment, over a 20-year period. Much of the key ALSA content has been obtained through face-to-face structured household interviews with participants, conducted at the major waves in 1992 (Wave 1, $n = 2{,}087$), 1994 (Wave 3, $n = 1{,}679$), 2000 (Wave 6, $n = 791$), 2003 (Wave 7, $n = 487$), 2007 (Wave 9, $n = 213$), 2010 (Wave 11, $n = 168$), and 2013 (Wave 12, $n = 111$). Unequal time intervals between the major assessments reflect changes in the levels of funding available over the study interval. Shorter interviews focusing on major life events since the previous wave were conducted at additional waves (Waves 2, 4, 5, and 8 by telephone and Waves 10 and 13 face to face). At the major waves, participants also undertook clinical assessments and completed leave-behind questionnaires.

Measures

Details of the various measures included in the ALSA are available in Luszcz et al. (2014) and from the ALSA website www.flinders.edu.au/sabs/fcas/alsa/. Face-to-face interviews with participants were used to assess a range of characteristics including sociodemographic variables, self-reported health, depressive symptoms, hospitalization, carer role, activities of daily living, lifestyle activities, social network characteristics, exercise, driving, and income.

The clinical assessments conducted at the major waves included various cognitive tests, including measures of memory, processing speed, verbal fluency, and vocabulary. Also included were anthropometric assessments (e.g., height, weight, skinfold thickness), blood pressure, grip strength, and tests of sensory functioning (audiometry and visual acuity). Ancillary clinical studies conducted at Waves 1, 3, 9, and 12 tested bone density and obtained fasting blood

samples from which basic hematology measures and lipid profiles have been extracted and 20-channel biochemical analysis conducted.

Domains assessed in the leave-behind questionnaires included nutrition, oral health, sexual activity, and psychological variables (control beliefs, morale, self-esteem, and metamemory). Finally, supplementary qualitative interviews have been conducted with subsets of participants to obtain in-depth information related to sleep, widowhood, and characteristics that could promote late-life resilience.

Accessing the ALSA Data

The ALSA data are held at the Flinders Centre for Ageing Studies (FCAS) at the Flinders University of South Australia. The FCAS team welcomes inquiries regarding the use of the data for specific projects. Information on processes for requesting the data, current collaborations, and additional project details are available from the project website.

Social Relationships, Health, and Well-Being: Findings from the ALSA

To date, ALSA-based research has addressed numerous topics related to late-life health and well-being, ranging from characteristics of successful aging to predictors of cognitive decline, prevalence of late-life depression, and correlates of objective and subjective measures of health (see Luszcz et al. 2014 for an overview). Because a broad review of the ALSA findings is beyond the scope of this entry, the following section focuses on ALSA findings related to the specific domain of social relationships.

Supportive social relationships are recognized as an important resource for health and well-being over the life span. Social networks are believed to promote physical and mental health through a range of processes including positive social influence (e.g., encouraging health behaviors or medication adherence) and reducing negative appraisals of potentially stress-provoking events. Social network members can also alleviate stress through providing support and creating opportunities for the experience of positive emotions (Berkman et al. 2000; Cohen 2004; Thoits 2011). Remaining socially engaged has also been identified as a potential mechanism for delaying cognitive aging and dementia (Fratiglioni et al. 2004; Hertzog et al. 2009).

The particular relevance of social relationships to aging well is reflected in a number of ALSA studies that have examined associations of social network characteristics with health and well-being. Social network characteristics were assessed at baseline using a range of items related to both social network structure (i.e., objective network characteristics such as size and contact frequency) and network function (i.e., the extent to which network members provide support). Specific items asked about the number of children; proximity and frequency of personal and telephone contact with children, relatives, and friends; size of supportive networks; and the availability of confidants (Giles et al. 2002). A subset of the social network items concerned with contact with children and confidant availability has been retained across all waves. Researchers have also used items related to participation in socially oriented activities taken from the Adelaide Activities Profile (Clark and Bond 1995) and available across all major waves to create composite measures of social activity engagement (Isherwood et al. 2012; Kiely et al. 2013).

Several studies based on ALSA have used social network information obtained at baseline to predict healthy aging outcomes. Giles et al. (2004) used measures representing networks with children, relatives, friends, and confidants, along with a composite total network measure, to predict disability over the first six waves of ALSA (9 years). Results indicated that social networks with relatives (but not friends, children, or confidants) protected against the development of mobility disability after controlling for sociodemographic characteristics, self-rated health, chronic morbidities, depressive symptoms, global cognition, and lifestyle variables (smoking, alcohol, and exercise). The authors

speculated that the absence of protective effects from children and confidants could have arisen from a particular reliance on these networks during times of experienced or anticipated health declines negating beneficial effects of social support from these same sources. Giles and colleagues (Giles et al. 2007) used a similar approach to examine associations of social network characteristics with the use of residential aged care facilities. The most robust findings were evident in relation to availability of confidants. Specifically, participants who had more people to confide in were less likely to use nursing homes over 5 waves post-baseline relative to those without confidants, after adjustment for health, demographic, and lifestyle characteristics. In contrast, use of lower-level residential care facilities (e.g., respite care) was not reliably associated with different social network characteristics.

Additional findings from ALSA indicate that social network attributes could have implications for cognitive aging. Giles et al. (2012) modeled trajectories of memory performance over 15 years in a subset of 706 ALSA participants who provided memory data and were cognitively intact at baseline. Growth models revealed a linear decline in memory over time and a main effect of a composite social network variable, whereby participants classified into upper and middle tertiles (i.e., indicating larger and more supportive networks) showed better memory performance relative to those classified into a lower network tertile indicating smaller, less supportive networks. Rates of change in memory did not vary as a function of total network characteristics; however, an interaction of friend networks with time emerged. The interaction indicated steeper rates of decline in memory among those with smaller friend networks relative to those with larger friend networks. The findings are broadly consistent with recent perspectives suggesting that social activity could help to preserve brain functioning through cognitive stimulation (Hertzog et al. 2009); however, it is also possible that reverse causal mechanisms are at play whereby declining cognitive abilities result in withdrawal from wider social networks (Stoykova et al. 2011).

Research from ALSA has also revealed associations between social network characteristics and mortality. Giles et al. (2005) examined social networks with children, relatives, friends, and confidants as predictors of 10-year mortality in the ALSA primary sample. Cox proportional hazard models adjusted for a range of sociodemographic, health, and lifestyle variables revealed that total networks, friend networks, and confidant networks were associated with increased survival. This study added to previous mortality research using general indicators of social support by demonstrating that some network attributes (friends and confidants) may be of greater significance to longevity than others (children and relatives). In a separate analysis based on the total ALSA sample, Anstey et al. (2002) showed that membership of a social group was associated with delayed mortality among women (but not men) over 9 years after adjustment for age, self-rated health, functional capacity, and several psychological variables (perceived control, self-esteem, subjective life expectancy, and life satisfaction).

In addition to projects concerned with the role of social resources in predicting long-term health and well-being outcomes, studies using ALSA have also examined how different social network attributes are implicated in processes of late-life development. Chan et al. (2011) used baseline data to examine the extent to which received social support from formal sources (e.g., care organizations) and informal sources (e.g., friends and family) moderated the association of disability with depressive symptoms. The results indicated that the association between higher levels of disability and higher levels of depressive symptoms was weaker among participants receiving support from informal sources or support from both informal and formal sources. Importantly, formal support alone was not protective against depressive symptoms, highlighting the importance of informal social relationships for maintaining mental health in the context of aging-related declines. Using 16-year longitudinal ALSA data, a recent study by Kiely et al. (2013) examined the role of social engagement in mediating the relationship between losses

in vision and hearing and depressive symptoms. Findings showed that depressive symptoms were higher among participants with hearing loss and dual sensory loss (impaired hearing and vision) and that rates of increase in depression became steeper after onset of hearing or dual sensory loss. Importantly, associations between sensory loss and depressive symptoms became nonsignificant after adjustment for social engagement. These findings support the possibility of a specific causal process underlying increases in depressive symptoms in late life, whereby sensory losses result in decreasing social engagement which in turn results in increased experience of depressive symptoms.

Whereas Kiely et al. (2013) focused on the role of social engagement as a mediator, Isherwood et al. (2012) treated social engagement as an outcome variable, examining the extent to which becoming widowed was associated with longitudinal changes in social engagement over 16 years. Changes in levels of contact with children were also examined. Results showed a rise in social engagement over the transition to widowhood, indicating that the loss of a spouse could prompt broader compensatory network engagement. This finding was consistent with several previous studies that have examined changes in social contact following widowhood. The amount of face-to-face contact with children was similar for those who were widowed and those who were not; however, being widowed was associated with more frequent telephone contact with children.

One of the unique strengths of ALSA is the availability of data from a subset of 597 spousal couples. The spousal dyad represents a central social context for aging and development, with husbands and wives who remain together over an extended period of time developing a long shared history of joint experiences and often developing effective collaborative methods of coping with aging-related losses (Berg and Upchurch 2007; Hoppmann and Gerstorf 2009). Researchers have used data from the ALSA couples to examine spousal interrelationships in social activity, cognition, and well-being (morale) over time. Hoppmann et al. (2008) examined the extent to which there was correspondence between husbands' and wives' levels and rates of change in social activity over 11 years by treating the spousal couple as the unit of analysis and fitting growth curves to simultaneously model change in husbands and wives. Results indicated correlated levels of social activity between husbands and wives, indicating that husbands' activity levels were more similar to those of their wives' (and vice versa) than they were to those of unrelated spouses in the sample. More activities among wives were also associated with steeper decline in activities among husbands. Additional analyses including a measure of perceptual speed also revealed a positive association of levels of it for husbands and wives again suggesting interrelated development; however, the association was weaker than the corresponding association between husbands' and wives' social activity levels.

Additional studies have examined the interrelated development of spouses by using contemporary, dynamic longitudinal methods to examine gender asymmetries in the ways in which the characteristics of one spouse appear to affect the corresponding characteristics of the other over time. Gerstorf et al. (2009) used bivariate dual change score models to examine time-lagged spousal interrelations in older couples' cognitive test performance. The results indicated that husbands' perceptual speed reliably and positively predicted wives' perceptual speed at subsequent assessments. However, the models did not provide support for the opposite unidirectional effect of wives' perceptual speed predicting husbands' subsequent perceptual speed or for a bidirectional association between husbands' and wives' speed performance. A similar pattern was evident in models used to analyze memory performance, although the unidirectional effect was not as strong and was no longer statistically reliable after adjustment for functional limitations. The authors speculate that cognitively fit husbands may afford more opportunities for their wives to maintain broad engagement in intellectually enriching activities, whereas cognitively challenged husbands may require a lifestyle with wives restricted to less cognitively stimulating

home and caring duties as one possible explanation for the observed gender differences.

Walker et al. (2011) applied a similar analytical approach using dynamic models with 11-year ALSA data, to examine spousal interrelations in morale. The findings showed an opposite pattern of gender effects to the one reported by Gerstorf et al. (2009) in relation to cognitive changes, with wives' morale scores related to subsequent changes in husbands' morale. Specifically, husbands whose wives reported higher initial morale showed shallower decline in morale over time relative to husbands whose wives reported lower initial morale. Converse patterns of husbands predicting wives' morale were not evident.

Taken together, the various findings related to social networks and aging that have arisen from the ALSA support the importance of social context in influencing critical aspects of development in older adulthood. The existing studies indicate that specific aspects of social networks are differentially related to health, well-being, mortality, and cognition. Informal social networks may be a key resource for coping with disability, and it may be losses in social engagement that account for links between declines in sensory capacities and depressive symptoms. Finally, older couples develop in interrelated ways, with gender differences apparent in the extent to which husbands and wives influence different aspects of each other's psychosocial functioning.

Social Relations in the ALSA: Future Directions

A number of opportunities exist for further research using ALSA to examine social aspects of aging and development. Current projects are focusing on correlates of longitudinal changes in social activity engagement and resources that could moderate the association between functional disability and decline in social activity. Additional research is considering the extent to which social resources protect against associations of socioeconomic disadvantage with poor health outcomes. Scope also exists for taking novel analytical approaches to studying social relations using the ALSA data. One promising avenue concerns the use of profile-based methods to studying social networks. Approaches of this type use statistical methods to identify subtypes of participants characterized by different combinations of social network characteristics (e.g., Fiori et al. 2006). Previous studies have typically identified diverse (i.e., extensive networks), family-focused, friend-focused, or restricted (i.e., few social ties) networks. Extending this approach to ALSA could be used to identify similar network profiles, and to examine changes in profile membership over time, or the extent to which multidimensional network characteristics are related to trajectories of change in health, cognition, and well-being. The spousal dyad data might also be used with a reorientation to focus on differences, rather than similarities between spouses on key variables. Gerstorf et al. (2013) recently demonstrated that despite husbands and wives being more similar to each other in mental health than they are to unrelated others (as is typically demonstrated when taking a between-couple focus), considerable differences between husbands and wives (and sizeable heterogeneity in these differences) are evident when taking a within-couple perspective. Considering whether husbands and wives who are more or less similar to each other on key variables adapt more or less effectively to aging-related changes could represent a fruitful avenue for future examination of social relations and aging well using the ALSA.

Cross-References

- ▶ Aging and Mental Health in a Longitudinal Study of Elderly Costa Ricans
- ▶ Berlin Aging Studies (BASE and BASE-II)
- ▶ Canadian Longitudinal Study on Aging, A Platform for Psychogeriatric Research
- ▶ China Health and Retirement Longitudinal Study (CHARLS)
- ▶ Chinese Longitudinal Healthy Longevity Study
- ▶ Dynamic Analyses to Optimise Ageing (DYNOPTA)
- ▶ English Longitudinal Study of Aging (ELSA)

- ▶ Health and Retirement Study, A Longitudinal Data Resource for Psychologists
- ▶ Health, Work, and Retirement Longitudinal Study
- ▶ History of Longitudinal Studies of Psychological Aging
- ▶ IKARIA Study, Greece
- ▶ Irish Longitudinal Study on Ageing (TILDA)
- ▶ Korean Longitudinal Study of Ageing (KLoSA): Overview of Research Design and Contents
- ▶ Life and Living in Advanced Age, A Cohort Study in New Zealand, Te Puawaitanga o Ngā Tapuwae Kia Ora Tonu (LiLACS NZ)
- ▶ Older People and Their Psychological Well-Being in Japan, Evidence from the Japanese Study of Aging and Retirement (JSTAR)
- ▶ Longitudinal Aging Study Amsterdam
- ▶ SONIC Study, A Longitudinal Cohort Study of the Older People as Part of a Centenarian Study

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Australian Longitudinal Study of Women's Health (ALSWH)

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Synonyms

Women's Health Australia

Definition

The Australian Longitudinal Study of Women's Health (ALSWH; also known as Women's Health Australia, WHA) is a prospective longitudinal population-based survey of more than 40,000 Australian women across three generations. The project collects quantitative and qualitative data to investigate the epidemiology of Australian women's physical and mental health across the life-span; that is, how biopsychosocial and behavioral factors enhance or compromise women's health, and how these effects might vary at different life stages. A key feature of the ALSWH is its extensive record linkage with Australian Medicare, Census, and other databases, which allow researchers to incorporate novel variables, validate participant reports, and evaluate women's access to, and use of, various healthcare services.

Background to the ALSWH

In 1989, the Australian Department of Community Services and Health (ADCSH) released its landmark *National Women's Health Policy (*Australian Department of Community Services and Health 1989*)*, reviewing the body of knowledge on Australian women's health and outlining recommendations for the course of future research. Following a lengthy period of consultation with women's advocacy organizations and researchers, the ADCSH (now Australian Department of Health) agreed to fund a long-term longitudinal study of Australian women's health and well-being, and in 1995, the Australian Longitudinal Study on Women's Health (ALSWH) was founded (Dobson et al. 2015; Lee et al. 2005; Brown et al. 1996).

The ALSWH is a multidisciplinary joint project of the Universities of Queensland and Newcastle. The project has two overarching goals: first, to investigate the influences of biological, psychological, social, environmental, and lifestyle variables on women's physical and mental health (referred to here together as "health"), with a view to guiding future Australian health policy and practice; second, to assess the influence of any recent changes in Australian health policy and practice on women's health (Women's Health Australia 2016b).

To address these aims, ALSWH surveys were developed around five key themes: (1) how women spend their time – in terms of employment, unpaid caregiving, motherhood, socializing, and leisure – and what impact this has on health; (2) how self-rated health, specific diagnoses, weight, exercise, and diet affect health outcomes; (3) the prevalence and characteristics of violence and abuse against women across the lifespan; (4) how to best help women maintain health during and beyond significant life events (e.g., childbirth, menopause, and divorce) and throughout their older years; and (5) the availability,

usage, and appropriateness of healthcare options, implications for governmental costs, and women's experiences of accessing the healthcare system (Brown et al. 1996). Twenty years on, emerging technologies can now provide highly specific location data, enabling researchers to add a sixth theme: Examining the impact of geographical and climate factors – such as drought and pollution – on women's health (Dobson et al. 2015).

By mid-2014, the ALSWH project had produced almost 500 peer-reviewed journal articles involving at least 780 researchers. ALSWH findings formed the cornerstone of evidence used to develop the Australian Government's *2010 National Women's Health Policy* and several other governmental and organizational health-related policies (Dobson et al. 2015).

ALSWH data have also been used in a number of national and international studies and systematic reviews, most notably the *Dynamic Analyses to Optimise Ageing* (*DYNOPTA*) project. DYNOPTA pools participants from the ALSWH and other major Australian longitudinal work to study the health determinants and outcomes of over almost 80,000 Australian men and women (Dobson et al. 2015).

Participants and Procedures

At its 1995 inception, the ALSWH established three main cohorts, defined by age: young women, born in the period 1973–1978 (aged 18–23 years in 1996); the mid-aged, born 1946–1951 (aged 45–50 years); and older women, born 1921–1926 (aged 70–75 years). Recruitment and subsequent surveys were conducted via mail, with an online survey option now available.

A critical feature of the ALSWH is its population-sampling approach, intended to broadly represent all Australian women, as all previous Australian longitudinal studies centered on specific subpopulations (Brown et al. 1996). To establish the 1995 cohorts, the ALSWH researchers took a stratified random sample of the Medicare database, which contains the most complete and up-to-date record of Australian citizens and permanent residents. Women in rural and remote communities were intentionally oversampled to ensure that these subsamples were large enough for statistically valid comparisons with urban women (Brown et al. 1999). Comparison to 1996 Census data confirmed that all three cohorts approximated the underlying populations (Brown et al. 1996).

In longitudinal research, attrition (participant withdrawal, death, or nonresponse) is an inevitable challenge. If there is even slight bias in the manner in which participants are lost, the sample characteristics diverge from those of the population it represents. When differences are large, insights from the study might no longer apply to the population of interest. As ALSWH participants who missed one survey have often completed subsequent surveys, it is not possible to determine precise attrition rates, but approximations can be made (Dobson et al. 2015). From Surveys 1 (1996) to 6 (2011), there was a 43% drop in the number of surveys returned by the younger cohort, a 27% drop for mid-aged women, and a 67% drop for the older cohort. Record linkage with the National Death Index database showed that around 40% of the older cohort died over this period. Survey data and researcher contact reveal that a primary reason for withdrawal by older participants is their increasing frailty. Thus, to maximize the data acquired from older women while limiting their participation burden, researchers now send a shortened survey every 6 months.

Measures

Numerous measures are employed across the formal ALSWH surveys (S1: 1996; S2: 1999; S3: 2002; S4: 2005; S5: 2008; S6: 2011) and approved substudies (in which participants are invited to partake in related surveys in between the formal ALSWH surveys). All surveys are available on the ALSWH website (Women's Health Australia 2016a). The surveys include a

range of established psychometric scales and novel items to assess numerous variables (Lee et al. 2005) on demographics, physical and mental health, quality of life, day-to-day functioning, lifestyle, environmental factors, experiences with the healthcare system, and topics of relevance to specific cohorts (e.g., contraception, menopause, and age-related health problems). Most items are quantitative, but several open-text items have been included, allowing deeper qualitative analysis of complex topics. This entry describes the main types of quantitative measures used with the older cohort. Except where otherwise noted, information is sourced from two reports by ALSWH investigators, which summarize the project's main methods and findings (up to publication dates) for the older cohort (Byles et al. 2010) and the mental health of all cohorts (Holden et al. 2013).

Demographic items address age, area of residence, country of birth, language spoken at home, marital status, and education. Behavioral and lifestyle items assess body mass index, height, physical activity and restrictions, cigarette and alcohol consumption, transport options, and ability to perform activities of daily living. Health-related items ask women to report their overall physical and mental health, medical and psychological health diagnoses, common symptoms of later life (e.g., vision or hearing loss, back pain, and height loss), significant medical events (e.g., falls and surgeries), medication use, number of GP and specialist doctor appointments, number of hospitalizations, and whether they live in the community or in a residential aged care facility. Items exploring social engagement and support focus on the number, type, and supportiveness of social contacts (e.g., spouse, family, and friends); satisfaction with their social relationships; whether a loved one was experiencing health problems or had recently died; and financial constraints on social activities (e.g., whether they have difficulty managing on their income).

A number of established self-report psychometric measures are included to assess aspects of older women's health and experiences. Details of these are beyond the scope of this entry but can be sourced from the ALSWH website (Women's Health Australia 2016a).

The ALSWH also includes several objectively assessed variables, providing validation and expansion of participant reports. This is achieved primarily via electronic record linking, in which each participant's ALSWH dataset is matched with records kept by Medicare, Australian Department of Veterans' Affairs, and Pharmaceutical Benefits Scheme programs. Linkage allows researchers to corroborate self-reported health diagnoses and medications, track government healthcare costs, and identify patterns of access to healthcare services across the socioeconomic and geographical landscapes (Dobson et al. 2015; Lee et al. 2005). Importantly, linkage has recently been established with databases held by aged-care services and facilities. This will permit future ALSWH work to incorporate data from formal assessments of older women's physical and cognitive capabilities, such as those completed during application to support services and admission to residential aged-care facilities (Dobson et al. 2015).

The ALSWH team has recently expanded their record linkage capabilities in a new direction, now incorporating geocoded data to pinpoint each participant's location of residence. This allows researchers to assess how climate and weather events – such as drought, natural disasters, and air pollution – might affect women's physical and mental health (Women's Health Australia 2016a).

Accessing the ALSWH Data

Researchers wishing to work with ALSWH data, propose a substudy, or access its linked external databases must apply to the ALSWH Publications, Analyses, and Substudies Committee. Information on eligibility and the application process are available on the ALSWH website (Women's Health Australia 2016b).

ALSWH Findings on Older Australian Women

The core ALSWH team has, thus far, released three relevant reports of key findings: Byles and

colleagues' review of older women's physical and social health (Byles et al. 2010), Holden and colleagues' review of mental health across all cohorts (Holden et al. 2013), and Byles and colleagues' review of medication and healthcare costs (Byles et al. 2008). This entry summarizes these findings and refers the reader to the full reports for citations.

Physical Health in Older Australian Women

Aging brings inevitable declines in physical health, ability to perform activities of daily living, and health-related quality of life (*health QoL*). The ALSWH has explored numerous demographic, biological, medical, and social predictors of these outcomes.

Physical and Lifestyle Predictors of Health Outcomes

A similar pattern of risk factors was observed when investigating health outcomes beyond quality of life: height loss, body mass index (BMI), falls, smoking, and alcohol use were all identified as predicting broadly aversive health outcomes. Both underweight and overweight/obese women had higher risk of hospitalization than those with healthy BMI, especially if they smoked; however, slightly overweight women (25–27 kg/m^2) had the lowest mortality risk, with current smokers at greatest risk across all BMIs. Overweight and obese women were at lower risk of osteoporosis, but higher risk of hypertension, heart disease, diabetes, and heart disease, with the latter effect again amplified in smokers.

Smoking was inversely related to longevity, with a clear dose–response relationship. At Survey 1, women reported their smoking status and their responses later cross-referenced with 2006 national mortality data. Results were striking: 81% of those who had never smoked and 75% of ex-smokers had survived, but smokers' mortality rate rose steeply with the more cigarettes consumed per day. Just 43% of women who smoked at least 25 cigarettes per day survived to at least 2006.

Results were less clear-cut for alcohol use. At Survey 1, 35% of women were nondrinkers and 29% drank less than weekly; for many, these were long-term behavioral patterns. Alcohol consumption was inversely related to mortality: non- and rare-drinkers were up to twice as likely to die over a 6-year period as moderate drinkers and also tended to report poorer mental health and social functioning, even after accounting for smoking, health diagnoses, BMI, and demographics. No survival benefits were observed for women who drank more than the moderate rate. ALSWH investigators note that there is insufficient evidence to suggest that non- or rare-drinkers should increase their intake to reap health benefits.

Falls are a common concern for older women, and for good reason. In a subsample of the older cohort, around 20% had fallen in the past 6 months and over half feared falling in the next year. On average, women's homes had 9 of 25 listed fall hazards, though hazard incidence differed little between women who and had not fallen. Across the full older cohort, women with moderate to very high levels of physical activity were less likely to fall than those with no or very low levels, and much of this benefit persisted for at least 6 years. Women with very high levels of physical activity reduced their risk of sustaining a fracture by half. It is interesting to note, however, that greater physical activity was not significantly related to another indicator of bone health: height loss. Women lost an average of 0.19 cm height per year, with more severe losses associated with reduced self-rated health. Women were at greatest risk for height loss when underweight, born in a European country, diagnosed with osteoporosis, and taking both sleep and anxiety medications.

Medical Diagnoses as Risk Factors for Poor Health Outcomes

Among the strongest predictors of older women's health outcomes were the number and types of chronic health conditions and experience. Cancer and Alzheimer's disease were most predictive of disablement and death, while cancer, heart disease, and stroke were predictive of high health system usage. More than any other disease, Alzheimer's was associated with diminished social functioning and general health. The prevalence of chronic illness increased over time, and the more conditions a woman experienced, the

greater her likelihood of experiencing poor health QoL, physical disablement, and death.

Predictors of Health-Related Quality of Life

On average, health-related quality of life (*health QoL)* declined at each survey (Surveys 1–5). This trend encompassed four patterns: (a) 50% of women held relatively stable scores of high health QoL; (b) 27% had high health QoL at Survey 1 that declined over subsequent surveys; (c) 20% began with low health QoL that further deteriorated over time; and (d) 3% reported low health QoL at Survey 1 but showed improvement at each survey and reported high health QoL by Survey 5.

Compared with women with consistently high health QoL, those with poor or declining scores tended to be poorly educated, widowed, a smoker, overweight or obese, and physically inactive. These women were more likely to have a range of chronic health conditions (e.g., heart disease, stroke), general physical symptoms (e.g., back pain, vision problems), and a history of falls. They were also more likely to have had specific surgeries, take several medications, and frequently access GP and specialist care.

Patterns of Healthcare System Usage

Australians on a low income – such as age-pensioners, war widows, and low-income self-funded retirees – qualify to receive a Medicare subsidy that covers either the full cost of a GP visit (bulk-billing GPs) or the great majority of the cost (non-bulk-billing GPs). Likewise, they receive a government subsidy on most prescribed medications, via the national Pharmaceutical Benefits Scheme (PBS). With record linkage established for around half of older ALSWH women, it is possible to get independent snapshots their healthcare system usage and out-of-pocket costs. To date, there has been limited review of older women's usage of healthcare services.

An early ALSWH substudy of New South Wales women (Young et al. 2000) found that 98.8% of older women (6,464 of 6,542) had seen a GP in the 1995–1996 calendar period. Older women claimed the Medicare subsidy for a total of 110,482 GP consultations over this time: an average of 8 appointments per woman per year, compared with around 5 per year for younger and mid-aged women. The most commonly used PBS medications among older women were those used to treat conditions of the cardiovascular system (75%), nervous system (61%), alimentary (gastrointestinal) tract (57%), musculoskeletal system (43%), and respiratory system (20%). Women taking at least one of these medications were more likely than their peers to visit their GP and specialist doctors often, as were overweight/obese women and diabetics (Byles et al. 2008).

For many older women, poor availability and affordability of doctor visits limit their access to medical care. From 1995 (Young et al. 2000) to 2005 (Walkom et al. 2013), a significant minority of older women reported that needing to visit a non-bulk-billing GP caused financial strain, with some unable to seek medical care at times. Women in rural and remote areas experienced the greatest financial burden: with specialist doctors, major hospitals, and sometimes GPs unavailable outside of main cities, these women face travel and accommodation costs on top of consultation fees. For some of these women, becoming unable to drive themselves to distant appointments has made seeking medical care impossible.

Many older women have also identified medication costs as a significant financial burden (Walkom et al. 2013), and this was particularly true of those requiring multiple medications. In an evaluation of women's 2003–2005 PBS subsidy claims (Byles et al. 2008), older women made more PBS claims and took a greater number of medications than did younger and mid-aged women. Thus, despite receiving a higher PBS subsidy per medication than many young and mid-aged women, older women incurred the greatest cumulative out-of-pocket medication expenses. This took a serious financial toll, with many feeling a substantial impact on their ability to live on their income, and some even forced at times to choose between buying food or essential medication.

Dental work, too, is unaffordable for many older women. Dentistry receives little governmental funding compared with medical services, leaving considerable patient costs, as well as

limited access for those in rural and remote areas. Across Surveys 2–4 (Sibbritt et al. 2010), around 36% of older women visited a dentist; however, it was not necessarily the same women accessing care at each time point. Of women who had visited a dentist, just 21% reported a consultation on all three surveys, 15% on two surveys, and 19% on just one survey. In Survey 4, 5% of women reported not consulting a dentist despite needing to. Reasons typically cited were a shortage of local dentists, lack of transport, high costs, and/or a long waiting period for an appointment. Compared with those reporting no dentist visits, women who accessed dental care at least once tended to live in urban regions, be married or in a de facto relationship, be non-smokers, have better physical functioning, live easily on their income, and have attained higher education.

In recent years, Australia has experienced substantial growth in the *complementary and alternative medicine* (*CAM*) industry, which includes non-evidence-based fields such as naturopathy, homeopathy, acupuncture, and chiropractics. The Medicare/PBS systems cover neither consultations with CAM practitioners nor the purchase of CAM products, such as herbal preparations and "detox" pills. Roughly 40% of women reported visiting a CAM practitioner at least once over Surveys 1–4, with most reporting usage on just one survey and none reporting CAM use at all four surveys. Despite the overall rise in CAM popularity, older women's usage declined at each survey, dropping from around 15% at Survey 1 to just 10% at Survey 4. Those most likely to visit a CAM practitioner lived in rural/remote regions, had poorer physical health, and more frequently visited their GP, specialist doctors, and hospital. Importantly, this suggests that older women were not using CAM practitioners as an *alternative* to modern medicine but as a transient *complement* to their usual medical practitioners and treatments (Adams et al. 2009).

Mental Health of Older Australian Women

Mental health is not merely the absence of a psychiatric diagnosis. Rather, the World Health Organization (World Health Organization 2014) refers to mental health as "a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community. [It is] fundamental to our collective and individual ability as humans to think, emote, interact with each other, earn a living and enjoy life." *Mental illness*, then, is most completely viewed as encompassing both psychiatric diagnoses and subclinical psychological distress that interferes with a realistic view of the self or the ability to cope with day-to-day life, employment or study, or community participation.

The Prevalence of Psychological Distress

Although psychological distress was less common in older women than in younger and mid-aged women, a significant portion of older women reported high distress in at least one survey. At Survey 1, roughly 6% of older women reported significant psychological distress and this gradually increased over time, hitting 8% at Survey 6. It is important to note, however, that this was a dynamic effect, with around half of older women distressed at Survey 1 becoming mentally well by Survey 2 and a portion of previously well women reporting distress in Survey 2. This trend was mirrored across Surveys 3–6, with the greatest contribution to prevalence at each survey coming from women who had not previously reported distress. A subset of older women did, however, experience chronic or recurrent psychological distress. Women were at a ninefold greater risk of reporting significant distress at any given survey when they had reported distress at the previous survey and a fourfold greater risk when they had reported distress at the survey before that.

In the younger and mid-aged cohorts, the prevalence of psychological distress fell consistently across the measured 5-year period, but in a concerning trend, distress began climbing again in the older cohort, from 4% at age 75 years to around 7% at age 87. Likewise, the prevalence of diagnosed clinical depression or anxiety increased as older women aged: from age 75 to 87 years, depression rose from 4% to 7% and anxiety disorders from 3% to 5%. It appears, then, that the rate of mental illness in older women is increasing

but so is its detection and treatment. Yet these mental illnesses were not entirely remediated by treatment, with depressed women of all ages continuing to experience greater psychological distress than those without the diagnosis (36–48% vs. 5–16%, averaged across all cohorts).

Much ALSWH work has focused on identifying and understanding the individual and social factors that influence, and are influenced by, mental health in women.

Individual Factors: Demographic, Lifestyle, and Medical Predictors of Distress

Several demographic, lifestyle, and medical factors have been associated with psychological distress in older women. It remains unclear to what degree (a) these individual factors might impact mental health, (b) mental health might influence these individual factors, or (c) the individual factors and mental health are reciprocally related.

Most notable in demographics, women were more likely to report distress if they had lower education levels, experienced difficulty managing on available income, had been born in a non-English-speaking country, or spoke a non-English language at home. In terms of lifestyle/health factors, older women were more likely to report distress if they were underweight, a current or ex-smoker, or a nondrinker. Interestingly, overweight and obese older women were less likely than those of healthy or low weight to report psychological distress. There was no significant association between distress and any relationship status for older women, which the ALSWH team suggests might be due to widowhood becoming common in women's social networks by this stage.

A number of chronic medical conditions were also related to mental health. Older women who reported high stress at Survey 1 were more likely than their peers to report coronary heart disease or stroke for the first time at Survey 2, while women with poor mental health at Survey 1 were at increased risk of reporting diabetes for the first time at Survey 2 (Strodl and Kenardy 2006). Similarly, older women with arthritis were more likely than peers to be experiencing depression and/or anxiety (Byles et al. 2010).

Social Factors: The Importance of Social Support for Mental Health

The ALSWH project has also explored how numerous social factors are linked with mental health outcomes. Important social factors fall roughly into six categories: (1) building and receiving social support, (2) accessing the community, (3) contributing to the community, (4) caregiving, (5) navigating widowhood, and (6) experiencing elder abuse.

Building and Receiving Social Support Older persons are at high risk for shrinking social support, particularly via the death of friends and family members, retirement from the workplace, and declines in their physical mobility. This can result in a "vicious cycle" in which reduced social support worsens mental health, and poor mental health impedes women in engaging with their community and making new friends.

Unsurprisingly, women with a broader social network at Survey 1 tended to be those with good physical and mental health, those born in Australia or another English-speaking country, and those undergoing a social hardship, such as serious health decline in a loved one or being a widow. Over Surveys 2–4, women's networks typically decreased slightly. Smaller networks were more associated with having been born in another country, having impaired vision or physical functioning, and having moved house (often away from a long-time home to a retirement village or closer to family). Women with small social networks tended to report poorer mental health than those with more larger networks, which the ALSWH authors tentatively suggest might reflect a poorer ability of distressed and depressed individuals to connect with, maintain, and benefit from their social network.

Women reporting greater satisfaction with the quality of their social contacts were more likely to not be impaired in mobility, hearing, sight, or continence; not have experienced a recent major illness; have been born in Australia or another English-speaking country; not have recently moved house or suffered a drop in income; and either have a partner or be a widow, rather than be separated, divorced, or never married. More

socially satisfied women also reported better overall mental health, though, again, the direction of causality (if any) is undetermined.

Accessing the Community Physical and cognitive signs of aging can reduce older persons' access to their community, particularly when they are no longer able to drive. Often, substantial barriers in accessing public transport, such as high cost, limited availability, inconvenience, or poor disability access, compound the reduced community access of persons who have ceased driving.

At Survey 3, roughly half of all older women living in urban areas reported driving themselves as their primary mode of transport, compared with around 70% of rural/remote women. Public transport was rarely used in rural and remote areas, likely due to poor availability. Of women driving at Survey 3, 86% were still driving at Survey 4, while 10% relied on someone else to drive them; only a minority reported using public transport.

Ceased drivers tended to have limited mobility, vision, or hearing; have impairments due to chronic medical conditions such as stroke or arthritis; or take at least five medications. Compared with continuing drivers, ceased drivers were more likely to later report poorer self-rated health, greater physical disability, and decreased access to leisure and social activities outside of their home. One in five older women reported being unable to venture beyond their own neighborhood, which can have a particularly heavy impact on their ability to access critical facilities such as shops and healthcare service providers.

Contributing to the Community Volunteering with a community organization is one common way to stay physically, mentally, and socially active. Over Surveys 1–4, between 8% and 25% of women reported undertaking volunteer work in at least one survey, whereas 35% reported never volunteering. Across Surveys 2–4, volunteers were more likely than their non-volunteer peers to be well-educated, speak English, live in rural areas, live alone, driving their own car as primary transport, and having greater social support. They appeared better positioned to access the healthcare system as needed, tending to have private health insurance, visiting healthcare professionals more often, and reporting better physical and mental health-related quality of life.

Compared with women who had never volunteered (*non-volunteers*), those reporting volunteer work at all four time points (*continuing volunteers*) and those volunteering at Surveys 3 and 4 (*new volunteers*) were more likely to report superior physical and mental health at all surveys. Those who reported volunteer work in at least one survey (*intermittent volunteers*) also displayed better physical/mental health at Survey 2, but showed decline in all measures over time, and by Survey 4 had become indistinguishable from non-volunteers. Across Surveys 2–4, continuing volunteers had the greatest social support, non-volunteers the poorest, and intermittent and new volunteers moderate support.

Becoming a Caregiver Across Surveys 2–5, around 40% of older women reported for at least one time point that they were acting as informal caregivers through their husband's later years or for other family members. However, the great majority (95%) of these women did not act as caregivers permanently, instead transitioning into or out of the role over the 12-year period sampled. Compared with older women who had never provided care, caregivers reported lower perceived quality of life, and poorer physical and mental health. Those with more intense duties and those who lived with their care-recipient were particularly vulnerable to these challenges. At all levels of caregiving intensity, both short- and long-term carers reported adequate social support.

Navigating Widowhood With Australian women typically living longer than men, widowhood is a common experience for older women. At Survey 1, 35% of older women were widowed, with an additional 2,494 women widowed by Survey 3.

Compared with that of their married peers, the mental health of widows typically showed a slow decline in the 4 years preceding spousal death, possibly indicating anticipatory grief or the growing burden of caregiving. The greatest decline was

observed at the point of spousal death and over the subsequent 12 months before beginning to recover. By women's fourth year post-loss, their mental health had returned to the level prior to the initial years of decline. Qualitative analysis has shown that, despite the grief of spousal death, older women's quality of life often rapidly improves as the physical and emotional strain of caring for a seriously ill husband is relieved.

Many widows reported that maintaining or increasing social contact and participation in activities smoothed adjustment to widowhood. Most belonged to a local organization such as a church or RSL club, and more than one-half engaged in enjoyed hobbies (e.g., gardening, handiwork, and eating out) most or every day of the week. Widowhood was, in fact, associated with greater social connectedness, despite the loss of the woman's primary source of practical and emotional support. Analyses suggest that in the bereavement period and beyond, friends, grown children, and other family members step up to fill the gap in support.

The Experience of Elder Abuse The term *elder abuse* encompasses physical, verbal, psychological, sexual, and financial abuse directed toward older people, typically perpetrated by family member(s). Survey 1 revealed an alarming prevalence of abusive behaviors against older women. Roughly 8% of older women were categorized as *vulnerable to elder abuse*; these women reported fearing their family member(s) or experiencing at least one episode of verbal or emotional abuse. Over 6% of women reported at least one incident of *coercion*, while 18% rated highly on *dependence*, receiving inadequate privacy, feeling distrustful of family, or being reliant upon family members for critical aspects of life. Around 15% were classed as *dejected*, feeling often sad, lonely, unwanted, or uncomfortable around at least one family member.

Compared with women who felt safe, abused women were more likely to be current or ex-smokers, be single or widowed, have lower education and social support, and have greater difficulty managing on their income. They also tended to report poorer mental health and a greater number of chronic medical conditions such as diabetes and stroke, though it remains unclear whether there is any causal effect.

Mental Healthcare Usage by Older Australian Women

In 2006, the Australian government introduced the *Better Access Scheme (BAS)*, allowing GPs to refer patients for up to 10 subsidized sessions per year with a mental health professional. The scheme is greatly underused by older women: 4 years on from its introduction, just 3% of older women had used the BAS in treating their diagnosed anxiety or depression. Compared with diagnosed women who did not use the BAS, the BAS users were less likely to have private health insurance or a pensioner concession card. At each of Surveys 1–5, BAS users reported better mental health than non-BAS anxious or depressed women, though both groups reported consistently poorer mental health than those diagnosed with neither anxiety nor depression.

Future Directions for ALSWH

To date, ALSWH investigations with older women have centered on those living in the community. With record linkage now expanded to databases held by these aged-care facilities, future work might compare the health and quality of life of women in residential aged care those living in the community. Extending demographic measures to explore the community living arrangements of women (e.g., living independently vs. living with grown children) may yield further insights into factors related to health and well-being, particularly regarding elder abuse.

A second direction of interest is to include in upcoming surveys an updated measure of social support, as those used to date have not assessed the impact of what has become a major source of social support for individuals of all ages: the world of Internet forums, Facebook, and social media. In particular, it would be interesting to compare the level of support received from networks online versus "in real life," and whether online support might be more accessible and life enhancing for older women with limited mobility.

Finally, it would be useful to compare ALSWH data with that currently being acquired in a separate longitudinal study of Aboriginal and Torres Strait Islander (ATSI) Australians' health. While a small number of ALSWH participants were of ATSI background, they cannot represent the immense diversity of ATSI peoples. ATSIs have a substantially shorter life-span than non-ATSI Australians, as well as poorer physical and mental health, and numerous demographic differences. Comparing ATSI and ALSWH study findings might shed more light on factors contributing to poorer ATSI health outcomes and, assisting with improvement of healthcare services and public health programs for ATSI Australians.

Conclusion

Australian women are living longer than ever before, yet there has been a paucity in long-term prospective research to examine the biopsychosocial factors underpinning physical and mental health. The ALSWH has shed some light on this problem. Both physical and mental health was shown to decline throughout old age, with attendant declines in physical capabilities and quality of life, and rises in public health costs. Medicare services are heavily burdened yet are underused by older women living in rural or remote areas, and those requiring assistance for mental health concerns. Greater efforts must be made to ensure that older women – particularly those in rural and remote communities – can access quality bulk-billing GPs, specialist doctors, hospitals, and dentists. Elder abuse is also a critical issue for older women and must be better addressed in terms of prevention, reporting, and elder protection.

Current and future burden on the Australian healthcare system might be somewhat relieved – and older women's health and quality of life enhanced – with extended public programs to assist elders to lose weight, quit smoking, increase physical activity, remain connected with their community, and cultivate supportive social networks. Future research with the ALSWH older cohort will be useful in continuing to assess the impact of such measures, as well as further exploring factors contributing to older women's health and quality of life.

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Autism Spectrum Disorder

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Synonyms

Adulthood; Ageing; ASD; Asperger's syndrome; Autism; Autism spectrum disorder; Autistic disorder; Intellectual disability; Neurodevelopmental disability; Pervasive developmental disorders

Definition

Autism spectrum disorder is a neurodevelopmental disorder that is both high in prevalence and most commonly lifelong in nature. Despite this, there is a dearth of available information regarding the disorder in later life. Existing evidence indicates poor outcomes in adult life in a range of areas of health and wellbeing, though more information is needed to create a more comprehensive understanding of the circumstances and needs of autistic adults as they age.

Introduction

The lifelong nature of autism spectrum disorders (ASD) attests to the need for a thorough understanding of the condition throughout the lifespan. This entry will summarize the extant knowledge regarding ASD in later life. It will begin with a brief discussion of the conceptual and diagnostic background of ASD and evidence of its persistence into adulthood. Overviews of several key areas of health and wellbeing in later life for this population follow. These areas include physical health, mental health and cognition, participation and lifestyle and supports. In particular, these sections highlight the knowledge gaps regarding ASD in later life and make suggestions for future work in the area. Finally, challenges and future directions for work on this topic are presented.

Background

Autism spectrum disorders (ASD) are a heterogeneous group of neurodevelopmental disorders characterized by persistent deficits in social communication and interaction, as well as restricted, repetitive, or stereotyped behaviors or interests (American Psychiatric Association 2013). The Diagnostic and Statistical Manual of Mental Disorders (DSM-V) specifies that these symptoms must be present during the child's early developmental period and should not be better explained by global developmental or intellectual delay (American Psychiatric Association 2013).

Symptoms must also cause clinically significant impairments in key functional domains such as social or occupational functioning.

ASD has undergone several significant conceptual revisions over time, and these are reflected in the evolution of terminology and diagnostic criteria. The first diagnosis of ASD, termed "early infantile autism," was made by the Austrian-American psychiatrist and physician Leo Kanner in 1943 (Kanner 1943). In Kanner's view, autistic children were socially cut off from the world and experienced particular trouble dealing with change. In some cases, the diagnosis was confused with schizophrenia. In addition to this, poor parenting practices and poor parent–child relationships were considered as key precipitators of ASD. This resulted in parents, especially mothers, being blamed for their child's ASD. By the 1960s, advancements in scientific research methods shifted the focus away from environmental influences to neurological and genetic explanations. By the following decade, the rise of the cognitive movement saw language and communication difficulties become the defining feature of autism. During this time, Wing and Gould (1979) framed autism as a triad of social behavioral impairments that originate in specific areas of the child's brain. "Infantile autism" was first officially recognized in the DSM-III in 1980 within the class of pervasive developmental disorders, alongside Asperger's disorder, Rett syndrome, childhood disintegrative disorder, and pervasive developmental disorder not otherwise specified (PDD-NOS) (3rd ed., DSM-III, American Psychiatric Association 1980). Its key criteria included pervasive lack of social responsiveness, deficits, and peculiarities in language and bizarre responses to certain environmental cues, but it was distinguished from schizophrenia based on schizophrenia-specific symptoms such as hallucinations. After a major revision in the DSM-III-R, infantile autism was renamed "autistic disorder," acknowledging the developmental nature of the condition and its persistence beyond early childhood (Volkmar and McPartland 2014). A polythetic approach was implemented in this revision, allowing for greater diagnostic flexibility. In the most recent revision of diagnostic criteria (DSM V), autistic disorder, Asperger's disorder, and PDD-NOS were merged under the umbrella term of "Autism Spectrum Disorder" (American Psychiatric Association 2013).

The reported prevalence of ASD has varied widely among studies, though a general increase in prevalence has been observed over time. Estimates from the mid to late twentieth century lay between 4 and 12 per 10,000 persons, whereas more recent estimates report the prevalence of ASD to be between 30 and 90 per 10,000 persons (Baird et al. 2006). This increase may reflect the broadening of diagnostic criteria, increased availability of diagnostic services and funded supports, increased public and clinical awareness, differences in study methodology or a true increase in prevalence of ASD. The best available data on prevalence of ASD in adults is from a 2011 study from the United Kingdom, which found a prevalence of 9.8 per 1000 persons (Brugha et al. 2011), a figure similar to that observed in children. This finding suggests substantial retention of the diagnosis into later life.

The widening of diagnostic criteria and the observed increase in prevalence suggests the possibility that a large number of autistic adults live without a formal diagnosis of ASD. The complexity of first diagnosing a developmental disorder in adulthood also raises the possibility that some autistic adults may be misdiagnosed with other mental disorders (Stuart Hamilton and Morgan 2011). The "hidden nature" of this population also presents challenges for research, especially when determining inclusion criteria for adults without an official diagnosis. Lack of clarity of diagnosis in adults also creates clinical challenges, as assessment and management of additional mental or physical health conditions may not be appropriately tailored to the person's needs.

The most appropriate terminology for referring to those with a diagnosis of ASD has been subject to much debate, with different groups expressing their preference for different terms. Person-first language (e.g., adult with autism) has been found to be preferred by health professionals and parents of individuals (Kenny et al. 2016). On the other hand, adults with a diagnosis of autism themselves have been found to prefer

identity-first language (e.g., autistic adult), a common reason for this preference being the idea that autism is a positive and inseparable part of their identity (Kenny et al. 2016). We acknowledge and respect the range of opinions present in this debate and have been mindful of this in using the terms "with ASD," "autism," and "autistic adult" interchangeably throughout this entry.

ASD in Later Life

Research which follows children with ASD into younger adulthood and beyond finds evidence of both improvement and stability in the core social and behavioral phenotype of ASD. In a review of 25 prospective, retrospective, and cross-sectional studies, Seltzer and colleagues (Seltzer et al. 2004) concluded that despite the small volume of work and some methodological limitations, modest improvements in ASD symptoms are apparent from childhood through to adulthood. These improvements are significantly less for those who also have intellectual disability. Importantly, these improvements are seldom large enough to place the individual within the normal range of functioning, indicating that in most cases, ASD is a lifelong condition. The progressive increase in the prevalence of ASD, coupled with global population ageing including increased longevity for those with developmental disorders, highlights the need to ensure the development of age-specific supports for older adults with ASD. Although there has been a notable increase in research focusing on autistic adults, more information is needed regarding the health and wellbeing circumstances and lifespan trajectories of this population.

Physical Health

Physical health is an area of critical importance for both the general population and for autistic adults as they age. The ageing population of autistic adults and their need for appropriate health services presents a significant challenge to health care systems, health professionals, and to society. Autistic children have high rates of co-occurring medical conditions, and this co-occurrence has also been observed in adulthood (Croen et al. 2015). In particular, markers of differential health status are evident for autistic adults relative to the general population, both in terms of the presence of common medical conditions and medical conditions associated with genetic disorders (Croen et al. 2015).

Perhaps the most obvious indicator of differential health status for autistic adults is the observed mortality rate. Compared to the general population, autistic adults experience 2–5.6 times higher mortality rates (Mouridsen et al. 2008). This rate appears slightly higher in females, individuals with more severe intellectual disability, and those who also have epilepsy. There is also some indication that the causes of death for this population in childhood and adolescence differ to those in adulthood, with the most common causes of death in adults reported to be epileptic events (e.g., seizures), respiratory events (e.g., respiratory arrest), and cardiovascular events (e.g., arrhythmia) (Bilder et al. 2013). Unnatural events, such as accidents and suicide, are also notable causes of death in autistic adults (Hirvikoski et al. 2015). Specific unnatural causes of death may have an association with intellectual ability, such that people with ASD and intellectual disability are more at risk of accidental death whereas suicides are associated with people with ASD and normal intelligence (Mouridsen et al. 2008; Hirvikoski et al., 2015). Taken together, mortality data suggests that the heightened mortality risk in ASD is associated with the presence of additional medical conditions, specific genetic syndromes, and intellectual disability, rather than the ASD itself (Bilder et al. 2013). In light of such evidence, the authors have argued for the need for more in-depth examinations of the potential mediating role of comorbid conditions in the increased mortality risk for autistic adults using larger, population-based samples (Schendel et al. 2016).

Studies investigating medical conditions in autistic adults report high rates of bowel disorders, sleep disturbance, seizures, diabetes, neurologic disorders, and auto-immune diseases (Croen et al. 2015; Jones et al. 2015). Reports of obesity

rates have been less consistent. The medical morbidity patterns share some similarities to those found in autistic children. However, age-related disorders such as hypertension and diabetes mellitus type I (Jones et al. 2015) are also observed. More cross-sectional studies of the physical health of autistic adults are needed to elucidate the extent of physical health issues facing this population and how these compare to control populations. Further, longitudinal studies are needed in order to examine the trajectories of health as people with ASD age and the factors that determine health outcomes. A particular focus on how preexisting conditions interact with the ageing process to produce secondary conditions or disabilities is also required.

Mental and Psychological Health

The mental health of autistic adults presents another area which requires further study. High rates of psychopathology are well documented in autistic children (Simonoff et al. 2008). The evidence base for the association in adulthood is smaller and it is unclear whether the comorbidity patterns in children are mirrored in older populations. There is also limited knowledge concerning age-related changes in prevalence of mental disorders in autistic adults and the prevalence of age-specific mental health conditions. One study tracing 135 autistic children who had previously been referred to a British outpatient clinic before the age of 16 found about 16% of the sample developed a definite new psychiatric condition within the follow-up period (ranging from 23 to 58 years). In this work, the authors emphasize the large variation in individual outcomes and in the disabling effects of the psychiatric condition (Hutton et al. 2008). Such findings point to the complexity of the relationship between ASD symptoms and the subsequent development of psychiatric disorders.

The prevalence of psychiatric disorders in autistic adults has been examined in a limited number of studies (Croen et al. 2015; Hofvander et al. 2009; Totsika et al. 2010). These suggest that autistic adults are at higher risk than the general population of developing a mental health condition. Robust estimates regarding the rate of psychiatric disorders from population-based studies of adults with ASD are lacking, though clinic-based studies of children suggest that between 50% and 70% suffer psychiatric disorders. A recent examination of a sample of insured autistic adults in the United States reported that 54% of their 1507 participants had a clinical diagnosis of a psychiatric disorder according to records from outpatient and inpatient clinical databases for the period of 2008–2012 (Croen et al. 2015). Available evidence from a clinical study indicates anxiety and mood disorders to be the most common psychiatric disorders in autistic adults with lifetime rates reported at 50% and 53%, respectively (Hofvander et al. 2009). Also considerable are the reported lifetime rates of attention-deficit/hyperactivity disorder (43%) and obsessive compulsive disorder (24%) (Croen et al. 2015; Hofvander et al. 2009). As with the general population, there is some evidence from cross-sectional investigations to suggest that prevalence of mental disorders (other than the dementias) may decline as autistic adults get older (Totsika et al. 2010). However, the extent of this decline is unclear and an over-representation of mental disorders compared to age-matched non-autistic populations is likely to persist.

The presence of multiple comorbidities as well as the substantial overlap between the symptom profile of ASD and other mental health disorders can make it difficult to identify the precise nature of psychiatric conditions in autistic adults (Ghaziuddin and Zafar 2008). Similarly, psychiatric disorders may manifest in atypical ways in those adults with low IQ and/or intellectual disability, including self-injurious behavior and irritability (Ghaziuddin and Zafar 2008). Therefore, misdiagnosis and diagnostic overshadowing, where clinicians fail to diagnose comorbid psychopathology in individuals as a result of attributing their symptoms to their ASD, are key issues for this population.

Studies have found the majority of autistic adults to be taking one or more psychotropic medications, with some longitudinal evidence suggesting a significant increase in the

proportion of medicated autistic adults over time (Esbensen et al. 2009). There has been longstanding concern regarding inappropriate prescribing of psychotropic drugs in people with intellectual disability, including those with ASD in association with intellectual disability. Studies suggest that rates of psychotropic drug prescription exceed recorded rates of psychiatric diagnoses with a recent population-based cohort study in the United Kingdom reporting that 26% of their sample who had been prescribed antipsychotic drugs to have no record of severe mental illness or challenging behavior (Sheehan et al. 2015). The issue of inappropriate drug prescription is one with implications both at the individual and system levels. It is a particularly pertinent issue for those individuals with intellectual disability who are also older and autistic, for whom new prescriptions of antipsychotics are shown to be significantly more common (Sheehan et al. 2015).

The role of psychological factors in the health and wellbeing of autistic adults is another area that is poorly understood. Psychological factors including coping, resilience, self-esteem, and emotion regulation have been increasingly recognized in gerontology as key adaptive mechanisms for all adults as they age (Bowling and Iliffe 2011). However, there is little extant information examining such psychological factors specifically in autistic adults.

Overall, as with physical health, the mental and psychological health of autistic adults is a field that would benefit from further detailed studies. Robust descriptive and longitudinal examinations of the presentation, correlates, and trajectory of different conditions in autistic adults across the full spectrum would be valuable. In particular, specific studies of age-specific and ageing-related mental health conditions and related interventions are needed. Additional investigations are also needed into the extent and reasons for different drug-prescription practices. Finally, more concentrated efforts are needed to investigate the function and predictive value of adaptive psychological mechanisms in health and wellbeing outcomes for this adult population.

Cognition and Perception

The cognitive functioning of adults in late life is a matter of substantial research interest in the general population. In the case of autistic adults, there is very little information available regarding their cognitive strengths and weaknesses relative to the general population. Studies examining cognitive deficits in autistic individuals have particularly focused on executive functioning. Executive functioning has a key role in ageing, since the deterioration of executive functioning is largely accepted to be the underlying factor in declines in cognitive ability as adults get older. Executive functioning also has a particular relationship with ASD, with cross-sectional investigations consistently finding evidence of deficits of executive functioning in autistic individuals across the lifespan and both for those with and without intellectual disability (Hill 2004). Related to this, a popular idea in the literature has been that deficits in executive functioning may underlie a range of social and behavioral characteristics evident in ASD (Hill 2004). As with other areas of functioning, the vast majority of the available literature in this area is restricted to childhood and early adolescence.

There is limited evidence available regarding the developmental trajectory of executive functioning in autistic individuals. Cross-sectional studies have provided some insight into the development of executive functioning across the lifespan. One study examining performance on executive functioning tasks of autistic boys with no intellectual disability found them to display deficits in inhibition, flexibility, and planning compared to their non-autistic peers, but also that the older group (mean age = 13.2) outperformed the younger group (mean age = 9.2) on these tasks (Geurts and Vissers 2012). Similarly, a 3-year longitudinal study suggested improvement in the planning domain of executive functioning in autistic children (Pellicano 2010). These findings are consistent with longitudinal reports showing the lessening of ASD symptoms over time (Shattuck et al. 2007). However, executive functioning deficits are still found in adults. One study of older

(mean age, 64 years) autistic adults without intellectual disability found impairments in sustained attention, working memory, and fluency (Geurts and Vissers 2012). Taken together, these cross-sectional and longitudinal studies suggest that deficits in executive functioning are apparent across the lifespan. However, the precise developmental trajectory of executive function across the lifespan and the interaction with age, intellectual ability, lifestyle, and health related variables require detailed and very long-term study.

Considering the prevalence of dementia in older adults throughout Western countries, we may assume that a substantial number of autistic adults also develop dementia. However, there is very little research examining the prevalence, presentation, and trajectory of dementia in this population. There are two conflicting possibilities regarding the representation of dementia in autistic populations. The first is that there may be an underrepresentation of dementia in autistic adults. Some researchers believe "hyperplasticity" (Oberman and Pascual-Leone 2014) of the ASD brain may be protective against age-related cognitive decline and dementia. Another possibility is that developmental effects interact with environmental and medical risk factors to result in an overrepresentation of dementia in autistic adults. Recent reports of thinning in the tempo-parietal cortex in young autistic adults raise questions about whether such effects may give rise to premature ageing, cognitive decline, and dementia (Mukaetova-Ladinska et al. 2012). The exact nature of the relationship between dementia and ASD awaits discovery. Nevertheless, dementia has a significant impact on the individual, family, and society, including in people with ASD.

A key feature which is now listed in the DSM-V criteria for ASD is hyper- or hypo-reactivity to sensory input or unusual interests in sensory aspects of the environment (American Psychiatric Association 2013). Unusual sensory processing has been found to occur in 30–100% of autistic individuals, with one study reporting 95% of autistic adults self-reporting extreme levels of sensory processing on at least one quadrant of the Adult/Adolescents Sensory Profile (Dawson and Watling 2000; Crane et al. 2009). Research has reported that sensory experiences can be both problematic and enjoyable for autistic adults and span visual, auditory, tactile, olfactory, and vestibular stimuli (Robertson and Simmons 2015). A defining feature as to whether the sensory experience is positive or negative depends on whether the autistic adult has control, or perceived control, over the sensory stimuli. Different sensory stimuli and environments can have extremely debilitating effects on autistic adults and can evoke nausea, physical pain, cause the adult to become immobile, and negatively affect the adult's ability to concentrate or attend to a task. This has significant implications for an adult's participation in employment and leisure activities, functioning appropriately in social situations, and attending health care appointment/services and other age-specific activities. Further exploration of the prevalence and changes in sensory processing in autistic adults as they age is required, as well as further investigations of specific triggers and potential coping strategies.

Participation and Lifestyle

For autistic adults who are ageing, little is known about participation (e.g., employment, ongoing education, leisure, volunteering, etc.) and lifestyle factors (e.g., exercise, diet, smoking, alcohol, drug use, etc.) and how they affect health and quality of life. Achieving and maintaining social participation and other lifestyle activities present unique challenges for autistic adults due to their social, communication, and behavioral challenges. Exploration of social factors in autistic adults indicates that this population tends to do poorly on objective indicators of social functioning (Howlin et al. 2013) and many report feelings of loneliness and isolation (Tobin et al. 2014). In terms of broader lifestyle factors, autistic adults are reported to attain low levels of employment, education, and independence, which have led to most extant outcome studies concluding that autistic individuals attain poor overall outcomes in adulthood (Henninger and Taylor 2013). There has been discussion regarding the role of IQ in determining such outcomes, though studies

conducted with a range of samples have indicated that autistic adults experience poor social integration regardless of their IQ (Henninger and Taylor 2013).

In regards to life style factors, autistic adults have been reported as using alcohol and drugs less than the general population (Croen et al. 2015). Participation of adults in physical activities is relatively unknown, though studies in children with ASD indicate that they appear to be less active than their non-autistic counterparts (Pan 2008). In addition, studies indicate that health problems resulting from sedentary or minimal-activity lifestyles such as obesity and cardiovascular disease are more common in adults with intellectual and developmental disabilities such as ASD (Yamaki 2005). This has significant implications during ageing as maintenance of physical activity is largely accepted to have a protective effect on overall health and cognitive function. Investigation of participation and lifestyle factors which autistic adults are engaged with as they age is required. This investigation needs to firstly gain an understanding of ageing effects on such activities, and then to identify the best ways to improve participation which may then influence overall health and quality of life of ageing autistic adults.

Some research has focused on quality of life (QoL) as an overall indicator of wellbeing for this population. These studies have relied on a select range of measures that assess QoL as a multidimensional construct including a range of dimensions: physical and mental functioning, relationships and social inclusion, personal development, family and wider environments, recreation and leisure, safety and security, and subjective wellbeing (Burgess and Gutstein 2007). A meta-analysis of 10 QoL studies across the lifespan demonstrated QoL to be lower in autistic populations compared to their non-autistic counterparts, and no associations between the individual's QoL and their age, IQ, or autism symptom severity (van Heijst and Geurts 2014). Notably, only one of these studies examined QoL in an adult sample over the age of 50. QoL has been argued to be a suitable and advantageous construct for examining outcomes and developing treatments for autistic individuals by allowing a holistic profile of their health and wellbeing to be constructed (Burgess and Gutstein 2007). Further investigation of QoL for ageing autistic adults and identification of factors which positively or adversely influence QoL is needed, given the lack of a solid evidence base.

Informal and Formal Supports

Supports and services are central aspects of the lives of autistic individuals throughout their lifespan, regardless of their level of functioning and symptom severity. These supports include informal supports such as supportive social relationships and more formal supports for participation in society and everyday activities. The positive relationship between social support and quality of life (QoL) is well established for the general population. A substantial number of studies have investigated social support and its effects for autistic adolescents and younger adults, but there is a paucity of evidence for adults beyond the post-secondary school transition period. Informal social support has been identified as an important predictor of QoL in a systematic review of fourteen studies investigating the relationships between social participation, social support, and QoL in autistic adults (Tobin et al. 2014). Evidence suggests that perceived, rather than actual, informal support is a strong predictor of QoL but also that unmet formal support needs contribute to poorer QoL in autistic adults (Renty and Roeyers 2006). The importance of person-centered approaches to support intervention was also identified in this review as important in increasing complex skill sets (Tobin et al. 2014). It would be particularly useful to investigate how the relationship between social support and QoL may be different for adults with different levels of functioning and how this relationship may change with age. This would inform the development of targeted interventions and support solutions across the lifespan.

Reviews of the availability, quality, and accessibility of services for autistic adults within each region or country are needed to provide important

insight to the service needs and circumstances of autistic adults. Existing reviews and reports from the United States, the United Kingdom, and Australia report a general lack of supports available for autistic adults (Freedman 2014; Shattuck et al. 2012; Roth 2013). This is unsurprising given the overall lack of available information regarding the needs and circumstances of autistic adults. In order to ensure the effectiveness of services, the evidence base on which existing services have been developed should be surveyed. Accessibility of services is another key issue to be addressed, especially for those for whom ASD symptoms may affect access, those living in rural areas, those who are time and resource-poor, and those from culturally and linguistically diverse backgrounds. Furthermore, some qualitative evidence from the United Kingdom suggests that autistic adults, particularly those considered "higher functioning" due to their higher IQ and/or less severe symptoms, are prone to "falling through the gaps" of services and supports (Griffith et al. 2012). Being a spectrum disorder, service and support needs will range widely between individuals and this must be considered when developing and reviewing services for this population. In addition, reviews of existing health and disability services in terms of their coverage of autistic adults would be useful.

Challenges and Future Directions

There are unique challenges in studying ASD in later life. The first is the heterogeneity of the spectrum itself. Being a spectrum disorder, individuals with ASD vary widely in their level of intellectual and communicative functioning, severity of symptomatology, and presence of additional conditions. This makes it difficult to generalize findings beyond each study sample and its unique characteristics. It may be useful to investigate suitable ways of grouping autistic individuals based on certain factors such as IQ or gender to make more generalizable and useful interpretations of research findings.

A second issue is the hidden nature of adult autistic populations. It is likely that a potentially large number of autistic adults are ageing either unaware of their condition, without a formal diagnosis or with a misdiagnosis of a different condition. The "hidden nature" of this population presents some difficulties for research, which include identifying recruitment pathways and determining inclusion criteria for adults who do not have an official diagnosis. Such issues must be carefully considered when conducting research, especially during stages of recruitment and in the interpretation of findings.

Overall, several key recommendations may be made for future research regarding ASD in later life. A common thread throughout this discussion has been the lack of robust research evidence for the years beyond the post-school transition phase in virtually all areas of health and wellbeing. Research focusing on this period of life is urgently needed, considering the substantial prevalence of ASD, global trends in population ageing, and that the first cohorts of diagnosed adults are now entering middle age and older adulthood.

Considerable research efforts are required to improve the understanding of the circumstances, needs, and challenges of autistic adults in later life. Such efforts should include both cross-sectional and longitudinal examinations of health and wellbeing. Importantly, our understanding of autism in later life should be informed not only by quantitative interrogations but also by qualitative research that examines the lived experience and subjective perspectives of autistic adults and other relevant parties such as their families and health care providers. Such mixed-methods interrogations allow for the creation of a more complete picture of autism in later life.

Findings from the detailed investigations of ASD in adulthood should be interpreted in the context of the wealth of information available regarding ASD in childhood, in order to develop a whole lifespan understanding of ASD. Also, the well-documented presentation of ageing-specific health conditions in the general population can be a useful source for developing specific research questions and for assessing the relative state of autistic adults compared to the general population. It should also be noted that our present understanding of ASD in later life and consequently

also the discussion throughout this entry relies heavily on studies from the United States and the United Kingdom. Keeping in mind the influence of wider contextual factors on the health and wellbeing of populations in general, efforts are needed to develop a deeper understanding of the specific circumstances facing autistic adults across different geographical and cultural contexts including lower- and middle-income countries.

Without a thorough understanding of the unique circumstances and challenges of ASD in later life, it is difficult to develop adequate and effective services for this population. Such issues have been illustrated in studies that find a clear lack of knowledge and training on the part of health professionals in providing care for autistic adults (Warfield et al. 2015). Related to this, there is the need for future researchers to consider the translational components that may arise from their findings and to maximize the utility of their research in this sense.

In addition to more applied research, there is also the opportunity and need for the development of theories specific to ageing and ageing on the autism spectrum. For example, "successful ageing" (Rowe and Kahn 1987) is an emerging theory in the social gerontology literature being developed to understand desirable ageing standards for older adults. However, the present theoretical and empirical literature on the concept is largely exclusive of disabled individuals. Given the high rates of disability in old age, it would be useful from both personal and societal level to develop theories of ageing that consider those ageing with a lifelong disability such as ASD.

Summary

A vast majority of the research on ASD has focused on childhood and adolescence. Recent investigations that suggest ASD to be lifelong, as well as increasing prevalence rates of the disorder and wider social trends of population ageing, call for more focused investigations into ASD in later life. The small existing body of available research suggests poor physical and mental health outcomes exist for this population in adulthood. While other areas such as cognitive functioning, participation, lifestyle, and supports have not been entirely unexamined, the quality and quantity of this evidence is limited. This topic area would benefit from more robust investigations that examine not only the presentation and correlates of ASD in later life but examine the lifespan trajectory of such indicators as individuals get older.

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Cross-References

- ▶ Advocacy with Older Adults
- ▶ Aging, Inequalities, and Health
- ▶ Aging and Psychological Well-Being
- ▶ Aging and Quality of Life
- ▶ Age-Related Changes in Abilities
- ▶ Comorbidity
- ▶ Clinical Issues in Working with Older Adults
- ▶ Disability and Ageing
- ▶ Healthy aging
- ▶ Life Span Developmental Psychology
- ▶ Mental Health and Aging
- ▶ Medication-Related Issues in Later Life
- ▶ Psychological Theories on Health and Aging
- ▶ Quality of life in older people
- ▶ Social Policies for Aging Societies
- ▶ Social Support and Aging, Theories of

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Automaticity and Skill in Late Adulthood

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Synonyms

Expert; Habitual; Involuntary; Practiced

Definition

Automaticity refers to cognitive processing that requires few mental resources and describes both processes that are innately or spontaneously effortless as well as those that engage fewer resources following practice or training. ***Skill*** refers to cognitive processing that has reached a high level of competence and mastery as a result of experience and investment.

Automaticity and Skill in Late Adulthood

This entry will review theoretical perspectives, historical findings, and recent developments in the study of automaticity and skill in older adulthood. This topic is of particular interest for the present volume because automaticity and skill represent a critical dissociation in the study of cognition and cognitive aging. Whereas older adults often show reduced competency in novel and unfamiliar tasks, performance is typically spared for the performance of well-practiced tasks, or tasks that are inherently automatic. This distinction accounts in part for one of the most notable paradoxes in the study of cognitive aging – that healthy older adults generally function quite successfully in their everyday lives, despite the marked declines that are seen in laboratory assessments of cognitive ability. Indeed, the empirical study of cognition depends in large part on tasks that are novel, controlled, and reductionist, whereas older adults' daily lives involve complex encapsulated domains and opportunities for compensation. This dissociation in the outcomes of cognitive aging highlights the distinction between effortful and automatic processing that occurs in persons of all ages, with unfamiliar tasks often requiring substantial cognitive resources and well-practiced tasks proceeding in a more fluent manner.

Automaticity

Automaticity is often defined in contrast to cognition that involves effort or the involvement of attentional resources. From a descriptive standpoint, task performance might be considered automatic when it is fast, effortless, obligatory, autonomous, and occurs without conscious awareness (Logan 1988). Automaticity is an inherent property of some tasks but develops with practice for other tasks, as distinguished by seminal theories of automatic processing advanced by Hasher and Zacks (1979) and Schnieder and Shiffrin (1977).

Perspectives on Automaticity

Cognitive processes may be conceptualized as falling on a continuum, from those that are relatively effortful and require substantial processing resources, such as performing complex mental arithmetic, to those that are relatively automatic and require fewer or minimal processing resources, such as navigating the familiar route from one's work to home (e.g., Cohen et al. 1990). Some tasks appear to be innately automatic, often requiring few resources from very early in development and universally across life experiences (Hasher and Zacks 1979). From the perspective of cognitive aging, the standard finding is that such tasks rarely show age-related declines, as is the case for attentional orienting (Hartley et al. 1990; Jennings et al. 2007), implicit memory (Hasher and Zacks 1984; Amer and Hasher 2014; but also see Howard and Howard 2013), familiarity-based recognition (Jacoby 1992; Yonelinas 2002), and the processing of emotional cues (e.g., Johnson and Whiting 2013). Other tasks are not inherently automatic and instead involve a shift from effortful to automatic processing but are also largely unaffected by aging because the learning underlying the automaticity was acquired in early life, as with the lexical proficiency that underlies performance in the Stroop task (e.g., Verhaeghen and De Meersman 1998).

In terms of the mechanisms that underlie automaticity development, several possibilities have been advanced, including strength-based (Cohen et al. 1990), memory-based (Logan 1988; Rickard 1997), and process-based (Fitts 1964; Ackerman 1988; Anderson 1987; EPIC Meyer and Kieras 1999) perspectives. These different perspectives shed light on diverse but overlapping classes of automatic processing and development

(Fisk et al. 1996). For the most part, these models have been developed and refined by examining performance on laboratory tasks of automaticity development.

Strength-based models of automaticity conceptualize learning as occurring as a result of attention training, describing a transition from controlled search for information to automatic detection by contrasting associated responses to target stimuli versus distractors in visual search domains following considerable exposure (Schneider and Shiffrin 1977).

In contrast, memory-based theories of automaticity propose that skill development is driven by a shift from responding based on an algorithmic strategy to responding based on retrieval from memory. In Logan's instance theory account (1988), exposures during practice lead to the accumulation of instances in memory. Strategy is determined by a race between the algorithmic and memory alternatives with an increasing distribution of completion times for each. After sufficient exposures, instance retrieval is expected to occur more rapidly than the algorithm can be executed.

Process-based theories also involve increasing reliance on memory systems but also increasingly incorporate reliance on sensory-motor (e.g., Ackerman 1988) and procedural (e.g., Anderson 1987) skills. These models are able to account for a wide swath of both elemental and complex human cognition (e.g., see the modeling of simple digit data entry and the complex radar "fighter pilot" task; Fornberg et al. 2012).

Age Differences in Automaticity

Research examining age differences in automaticity from the perspective of attentional strength has primarily demonstrated age differences by examining performance in visual and memory search paradigms, with older adults showing reduced activation of associated responses to target stimuli even following extensive training (Fisk et al. 1996). However, some aspects of automaticity in visual search performance do show stability with aging. For example, older adults do not show impairments in the top-down guidance of visual search (Madden et al. 2004, 2005).

When considering memory-based automaticity, older adults transition more slowly compared to younger adults, in part due to slower learning (Jenkins and Hoyer 2000). Indeed, for some tasks, older adults' learning is not simply slower but fails to reach automatic levels even following extensive training (e.g., Maquestiaux et al. 2010, 2013). In contrast, memory-based automaticity has been found to develop rapidly for older adults in the well-practiced domain of reading (Rawson and Touron 2009, 2015).

Beyond the cognitive changes that can slow learning in older adulthood, age differences in automaticity development have also impacted an aversion by older adults to utilize memory strategies after learning has occurred (Touron 2015). Memory avoidance by older adults appears to be driven by a number of different factors, including low confidence in memory ability (Touron and Hertzog, 2004a,b; Frank et al. 2013; Hertzog and Touron 2011) and a failure to understand the costs and benefits of memory use relative to the algorithmic strategy (Hertzog et al. 2007; Touron and Hertzog 2014). Older adults' strategy use during learning is also influenced by age-related decreases in task-switching preferences (Hines et al. 2012) that are likely linked to reduced task-switching ability (Kray and Lindenberger 2000; Reimers and Maylor 2005), particularly in situations where the optimal task strategy is not apparent (Kray et al. 2002). Older adults are able to use external cues as an aid to strategy decisions but also might overutilize these cues beyond their practical applicability (Spieler et al. 2006; Lindenberger and Mayr 2014). Older adults' avoidance of the less demanding memory strategy can be seen as volitional, given that instructions and modest incentives increase memory use to levels consistent with older adults' memory abilities and similar to memory use by younger adults (Touron et al. 2007; Touron and Hertzog 2009). These findings are consistent with the perspective that older adults tend to be more conservative in decisional elements of cognitive tasks (Ratcliff et al. 2000, 2006) and indicate that memory-based models of automaticity should allow for strategy choice processes (Rickard 1997).

Research taking a process-based approach to automaticity demonstrates that older adults can develop automaticity in some but not all components of cognitive tasks. For example, when searching a set of information held in memory, older adults are able to develop automaticity in memory-based components but not attentional components of the task (Fisk et al. 1995). Expanded process models are also able to account for older adults' slower transitions to automatic task approaches by incorporating age-related declines in the cognitive abilities that underlie the task, as well as age differences in strategic choices (e.g., Meyer et al. 2001). When considering the changing roles of knowledge, perceptual-motor ability, and memory capacities over the course of training on a task, older adults have been shown to have qualitatively similar patterns to those of young adults (Hertzog et al. 1996; Rogers et al. 2000).

Although older adults are slower to acquire automaticity in new skills, they frequently utilize already acquired knowledge and automatized skills in everyday life and in this manner may compensate for declines in cognitive abilities. Indeed, interventions that capitalize on automatic processes can improve older adults' everyday functioning. For example, medical self-care adherence can be improved by requiring participants to form implementation intentions of the critical health behavior, so that these detailed plans can later be automatically available when the behavior is required (Liu and Park 2004). In a similar manner, age-related increases in established knowledge in relevant domains can benefit automaticity development for complex task skills, such as financial planning, in the laboratory (Ackerman and Beier 2006; Beier and Ackerman 2005), particularly in the early stages of learning.

Skill

In comparison to many of the automatic processes and tasks discussed above, domains of cognitive skill are often quite complex. Given this, the study of skill often breaks studied tasks down in order to examine their component operations and abilities. As with the study of automaticity, age differences in skill development and skilled performance vary depending on the particular focus of study.

Research on the establishment of skill, components of skill, and outcomes of skill have taken various approaches, from the study of skill development using novel tasks in a laboratory environment (ranging from simple reaction time tasks to complex video game tasks) to the examination of more complex skills in real-life domains (such as technology use), to the study of skills with extended training and exceptional populations within expert domains (such as chess or bridge). For a few tasks, older adults' performance appears to be similar to younger adults in terms of both the development and execution of skills (as for simple perceptual motor tasks, Salthouse and Somberg 1982). For other tasks, older adults are slower to acquire skills but then perform at levels comparable to younger adults (as in the mental arithmetic training by Charness and Campbell (1988)). For a third class of tasks, older adults differ in both the development and asymptotic performance of skilled activities, even when the task approach is qualitatively similar (as in a video game interface that aggregates several simple tasks described by Salthouse and Somberg (1982) and the vigilance learning studied by Parasuraman and Giambra (1991)).

Elements of Skilled Performance

Skill domains rely on the coordination of and support from relevant component cognitive operations. Typically, skilled performance integrates fluid and crystallized intellectual abilities (e.g., Ackerman 1992). Declines in fluid abilities, such as processing speed, can present obstacles to skill development and performance, whereas crystallized abilities such as vocabulary knowledge are typically retained or augmented with aging and can therefore support new skills (Salthouse 2004; Schaie 1996). Memory involvement is often key to expert performance (Ericsson and Chase 1982), as in the chunking of complex representations to more streamlined semantic concepts (Chase and

Simon 1973). This chunking is particularly critical given age-related declines in working memory capacity (Bopp and Verhaeghen 2005) and the substantial requirements for coordinating information in complex skill performance. Skills also rely heavily on speeded information processing, and declines in processing speed contribute substantially to age-related differences in many different areas of cognitive performance (Salthouse 1996).

Several large-scale studies of cognitive training and interventions have examined whether older adults' skilled performance may be optimized with extensive exposure to related task components. Due in part to the recent widespread availability and popularity of computerized cognitive training programs, such as Brain Age and Lumosity, there is considerable interest in evaluating the efficacy of cognitive training, as well as the breadth of any benefits that arise from training. Available research typically shows fairly narrow ability-specific benefits from training for older adults (e.g., Stine-Morrow et al. 2014; Willis and Nesselroade 1990), with improved performance on the trained tasks but not for intelligence or cognition more broadly. These findings are consistent with the broader literature on cognitive training (e.g., Redick et al. 2013). This pattern has been obtained across a variety of basic cognitive abilities, such as memory, reasoning, and processing speed (e.g., mnemonic training by Verhaeghen et al. (1992) and Willis et al. (2006)). However, some promising evidence for transfer has been obtained, such as benefits for general health and well-being (i.e., Wolinsky et al. 2006, 2009, 2015). With a broader invention approach, research by Park and colleagues has demonstrated that an engaged cognitive and perhaps social lifestyle can also benefit older adults' performance in memory and fluid intelligence (Park et al. 2014; Stine-Morrow et al. 2008; also see Hultsch et al. 1999).

Other Influences on Skilled Performance

Noncognitive characteristics also play a role in skilled performance, including those related to personal interests, motivation, and personality. Older adulthood sees a shift towards less openness to experience, which might discourage investment in developing new skills (Kanfer and Ackerman 2004). Older adults also commonly have a lesser interest in pursuing new knowledge and skills due to an increased motivation towards interpersonal and emotional goals (Carstensen 1995). Metacognitive beliefs are likely to also play a role, including general and task-specific self-efficacy and performance monitoring that might encourage continued performance or shifts in task approach or strategy (see Hertzog and Hultsch (2000) for a review). Positive beliefs regarding memory control and ability, and monitoring that highlights the performance success, can lead to more optimal strategies and outcomes for performance.

Compensatory and strategic factors often influence older adults' performance within skilled domains, both in everyday skills and expert performance. Healthy older adults typically retain high levels of functioning in everyday tasks, in part due to a tendency to perform familiar tasks in highly routinized domains. These pockets of ability represent encapsulated regions that do not typically show the age-related cognitive decrements present in more novel and unpracticed task domains. This encapsulation can be an incidental outcome of pursuing personal interests and vocations or can also be more purposeful; the selective optimization with compensation model (Baltes and Baltes 1990) describes the tendency of older adults to select activities more narrowly and alter task approaches in order to optimize their performance in skilled domains. For example, in later life an expert auto mechanic might choose to selectively repair those car models or systems that they have the most prior experience, in order to rely on established knowledge and minimize the cognitive resources needed for the diagnosis and solving of unfamiliar problems. From the perspective of metacognitive training benefits, research has demonstrated that cognitive training can be enhanced with concurrent interventions aimed at boosting cognitive self-efficacy (West et al. 2008). Specific interventions that enhance metacognitive monitoring and strategy updating also allow older adults to improve cognitive performance (Bottiroli et al. 2013).

Everyday Skills

Other research has examined older adults' development and retention of skills in everyday domains such as driving, technology adoption, and the work context. For many older adults, the preservation of driving skill is particularly critical, given the implications for continued maintenance of an active and autonomous lifestyle. Although cognitive, sensory, and physical declines can impair driving ability, older adults tend to revise driving patterns in order to compensate for these changes. Older adults often have considerable experience and familiarity with driving, but normative declines in sensory, physical, and attentional abilities can make driving more hazardous for older adults (e.g., Emerson et al. 2012). For example, older drivers often avoid periods of busy traffic, night driving, and routes that require left-hand turns. Due to these patterns, rates of accidents are not higher for the older adult population, although injury from traffic incidents is more frequent (NHTSA 2014).

Although adoption and reliance on technology is lower among older adults, use of electronic devices can also be beneficial to older adults' functioning and independence. Computers and smartphones enable older adults to engage in cognitively and socially stimulating activities, and electronic medical devices can enable the tracking of health conditions, communications, and outcomes. Older adults are slower to adopt new technologies, although historical trends show increases in use and competence. In particular, those older adults who have minority status, lower education, and lesser financial resources are less likely to use new technologies, with additional predictive factors such as cognitive abilities, concerns, comfort, and personal confidence (Czaja et al. 2006).

Everyday skill has also been examined within the context of changes in work for older adults. Most people can work productively until fairly late life, although this varies by domain and can be affected by institutional pressures. For individuals who continue to work within a particular occupation throughout adulthood, the work context can become an encapsulated domain that shows preserved abilities despite general cognitive declines (for a review, see Bowen et al. 2011). From the perspective of both self- and supervisor ratings, older workers are generally shown to fare quite well in terms of performance as well as indices such as attendance and other personal contributions. In addition, the work environment can provide older adults with mental challenge and social support that can facilitate more positive aging outcomes, particularly when the job requires the processing of novel information and completion of varied and stimulating tasks (Andel et al. 2007). Research examining exceptional achievements and productivity in the work domain has demonstrated that quality work can occur throughout the lifespan, although there is substantial variability depending on the particular occupation (Simonton 1991).

Expertise

The findings for work domains exemplify the broader literature on expertise and aging. Older adults who are experts in a particular skill often typify patterns of encapsulation. Substantial literatures on expert performance by master typists, chess players, crossword puzzle solvers (e.g., Hambrick et al. 1999), and bridge players demonstrate that age differences are often eliminated with substantial expertise in a domain. Despite these findings, age differences are typically obtained when the component abilities are examined outside of the familiar domain of expertise. For example, those with expertise that relies upon mental imagery (professional graphic designers) are no better when implementing a new mental imagery task, the method of loci mnemonic (Lindenberger et al. 1992). Similarly, chess experts retain the ability to recall complex spatial configurations in late life, but only when these configurations represent meaningful gameplay for chess pieces, and can therefore rely on established memories. Research focusing on the role of deliberate practice notes that considerable investment is required to reach expert levels of performance (e.g., the 10,000 hour rule, Ericsson, 2006). Other researchers point out that additional factors must also influence the establishment of expertise, including intelligence and cognitive

capacities, inherent talent in the domain, and dispositional influences (Hambrick et al. 2014).

Conclusions and Future Directions

This entry has reviewed evidence for both age-related declines and preservation in automaticity and skill. In general, older adults are most able to maintain functional levels of performance when tasks rely on abilities that are inherently automatic, have been automatized early in life, or involve familiar and well-practiced routines. In addition to the underlying cognitive capacities, tasks often also involve strategic choices, as with the reliance on acquired information for memory-based automaticity, or the willingness to persist in the learning of new technologies. Based on these findings, we might support skill acquisition and functioning in older adulthood by structuring tasks in such a way that reliance on established knowledge is facilitated and encouraged.

Cross-References

- ▶ Cognition
- ▶ Everyday Cognition
- ▶ Expertise and Ageing
- ▶ Plasticity of Aging
- ▶ Psychology of Wisdom

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