# Using Technology to Enhance Resiliency Among Older Adults


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**Abstract** Older adults are far less likely to adopt and successfully use technologies compared to younger groups. This is unfortunate given that older adults can benefit from technology use in a variety of ways. This chapter illustrates the ways in which technologies may benefit older adults in the US through the enhancement of resiliency. We begin by providing an overview of the aging population in the US and by discussing information and communication technology (ICT) use among older Americans. We discuss how ICTs can enhance resiliency among older Americans and, more specifically, among older adults living in continuing care retirement communities (CCRCs). We conclude by providing an overview of other technologies which may benefit older adults with regards to resiliency. Through this discussion, those working with older adults can understand the potential benefits and importance of technologies in the lives of older adults.

**Keywords** Aging · Older adults · Resilience · Quality of life · Technology ICT · CCRC · Well-being

The number of and diversity in new and emerging technologies is increasing rapidly. More and more devices, gadgets, and applications are being introduced to the market with the potential to radically change an individual's life for the better by giving unprecedented access to information sources, allowing individuals to

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communicate in new and exciting ways, and providing the means to completing everyday tasks with increased ease and confidence. Yet, despite the increase in the number and types of technologies available to consumers, older adults (defined in this chapter as those aged 65 years of age or older) are far less likely to adopt and successfully use technologies compared to younger groups (e.g., Anderson & Perrin, 2017; Choi & DiNitto, 2013; Friemel, 2016). This is unfortunate given the current literature suggesting that older adults, despite experiencing significant barriers to successful use of technology (e.g., lack of adequate instruction—see Cotten, Yost, Berkowsky, Winstead, & Anderson, 2017; Czaja & Sharit, 2013), can benefit from technology use in a variety of ways. One way in which technology may improve the lives of older adults is through enhancing resiliency.

This chapter illustrates the ways in which technology may enhance resiliency among older adults in the U.S. population. We begin by providing an overview of the aging population in the U.S. and by discussing information and communication technology (ICT) use among older Americans. We discuss how ICTs can enhance resiliency among older Americans and then, more specifically, we discuss the ways in which ICTs may particularly benefit older adults living in continuing care retirement communities (CCRCs), a population that is often overlooked in the literature. We conclude this chapter by providing an overview of other technologies, beyond ICTs, which may benefit older adults with regards to resiliency. It is our intent that, through this discussion, individuals working with older adults will understand the potential benefits and importance of technologies in the lives of older adults.

## Aging in America

### *Numbers and Trends*

The U.S. population, like that of the rest of the world, is aging rapidly (Bongaarts, 2009). This demographic shift is predicted to be one of the most significant in the history of the U.S. with more than a doubling of the 65+ population by 2050 (Mather, Jacobson, & Pollard, 2015). Though the U.S. remains one of the world's youngest developed countries, it has the greatest number of adults aged 65 and over and the greatest number of adults aged 85 and over when compared to other developed countries (United Nations, 2013). More resources across various domains (e.g., social, economic, heath) will be needed to accommodate this demographic transition. As of now, the infrastructure of our society is simply not ready for this major population shift, putting the health and well-being of aging adults at risk for more negative outcomes whether they be social, financial, or health-based.

The aging of the "Baby Boomer" generation is the primary contributor to the dramatic increase in the number of older adults in the U.S. The "Baby Boomers" are individuals born between 1946 and 1964 who are currently entering the typical age of retirement (approximately 65 and over). While the Baby Boomer generation enjoys higher levels of education and has more work experience compared to older generations, Baby Boomers are also more likely to be divorced and have fewer children (Mather et al., 2015). In addition, Baby Boomers tend to live longer compared to older generations, but those additional years may also be sicker years (Mather et al., 2015). These characteristics, taken together, paint a picture of a generation that will require a fair amount of diverse services to accommodate their health and well-being; Baby Boomers may be living longer, but these additional years may also include increased morbidity and disability and Baby Boomers may also lack the same social support that previous generations enjoyed (Mather et al., 2015; Ortman, Velkoff, & Hogan, 2014).

The well-being and quality of life of this continuously aging population is of particular concern. As individuals live longer, they often reduce the number of working hours or retire, thus limiting their income. Chronic illnesses and disabilities may place older adults at an increased risk of functional and cognitive limitations, making the performance of everyday activities difficult or impossible. Older adults also often have to relocate based on their changing needs (e.g., moving closer to the family due to a need for caregivers, but distancing the older adult from friends), thus potentially negatively impacting their physical, mental, and social health and well-being. These changes have significant implications both at the individual and familial level (e.g., retirement planning and caregiving) as well as the societal level (e.g., determining the distribution of resources across programs which benefit aging populations like social security, workforce training, and long-term care). Working to ensure the well-being and quality of life of older Americans is important for keeping them healthier and more productive and thus reducing the potential higher costs of future care.

## *Resilience in the Older Adult Population*

One component of well-being offering new insights to the aging process is that of *resilience*. Resilience, in general terms, is the ability for someone to "bounce back" from difficult times or challenges in their lives—it is the ability of an individual to positively adapt to adversity (Lamond et al., 2008). Examining links between resilience and health, well-being, and quality of life has become popular in recent research (see Windle, Bennett, & Noyes, 2011). While previous research on resilience has often focused on younger and/or disadvantaged groups (see Luthar, 2006), there is increasing interest in considering resilience as an important attribute to successful aging.

The definition of what constitutes successful aging and theories that explain the process have changed as life expectancy has increased in the U.S. and world population. Gone are the days where the goal of aging was simply to "live longer." While longevity continues to be an important component to the definition of successful aging, today successful aging is viewed as a composite that includes physical, mental, emotional, and social well-being (Rowe & Kahn, 1997, 1998, 2015). As the aging population continues to live longer, become more diverse, and experience new and varying complications, the definition of successful aging has and continues to evolve. Harris (2008) argued that rather than focus on the concept of successful aging, perhaps theorists and researchers should instead focus on the concept of resilience. While successful aging is dependent to an extent on an individual's physical and mental health status as well as social and cultural background, Harris contended that older adults with higher levels of resilience may lead long and happy lives regardless of impairments and background. In changing the definition or expectations of aging, society can appreciate a broad range of aging frameworks, not simply deficit models.

Resilience theory focuses on strengths within individuals and how we age despite risk (Fergus & Zimmerman, 2005). In other words, resilience theory addresses the question: how do people overcome challenging situations and make the most out of their lives when faced with adversity? Resilience is often examined across the life course, but it can also be evaluated in terms of specific instances or events. Examples of this may include evaluating how an individual responds over time to a chronic illness that may impede and lower functioning or examining how one responds to the loss of a spouse, or evaluating a person's response to being relocated and transitioned into a new home. Research finds that higher levels of resilience are beneficial to older adults through these situations (Bonanno, 2005; Staudinger, Marsiske, & Baltes, 1995).

## *Factors Affecting Resilience*

Early understanding of resilience postulated the concept as a stable personality characteristic that one had or did not have throughout the life course. However, current research suggests it is a more dynamic and changing process (Windle, 2011). Resilience theory identifies three basic components of resilience: (1) protective factors, (2) vulnerability factors, and (3) adversities. Protective factors are factors that support individuals in times of adversity, thus lessening the potential negative impacts of stressful circumstances and events—examples of protective factors include personality characteristics and ecological factors like social support (Windle, 2011). Resilience can change over the life course due to protective factors (Bolton, Praetorius, & Smith-Osborne, 2016). Typically, a greater number of

protective factors leads to greater resiliency. Vulnerability factors increase the risk for hardship or stress and thus may contribute to lower levels of resilience; they may include socioeconomic and psychosocial factors like poverty, being diagnosed with mental illness, having a history of abuse, experiences with chronic illness, disability, and experiences in bereavement and loss. Adversities, in contrast to vulnerability factors, are the actual stressors that cause the need for resilience to overcome—as an example, a new diagnosis of a chronic illness (e.g., cancer) may be viewed as an adversity to overcome. Taking all three of these components into account, resilience can be viewed as an evolving process that can be improved through the expansion and building of protective factors. This view of resilience—as one that changes and can be improved—allows for older adults to take measures to enhance their coping of adversity in older age or at times of significant adversity.

## ICT Use and Resilience in Older Adults

Older adults experience higher levels of loneliness, social isolation, depression, bereavement, health declines, and incidence of disability when compared to younger age groups. While most older adults will experience one or more of these issues, recent research suggests that use of information and communication technologies (ICTs) can help to mitigate and/or negate the negative effects of these issues. When we use the term ICT, we refer to any Internet-connected device or application used primarily for the purposes of sharing and retrieving information (e.g., using a search engine to look up information on a health topic) or for communication purposes (e.g., sending an email to a family member or friend). In everyday discourse, the most common types of ICTs are Internet-connected computers and smartphones. An area of interest that emerged over the past few decades as the Internet has become more widely accessible and prevalent is its effects on personal well-being. Among older adults, researchers have found associations between ICT use and decreased depression (Cotten, Ford, Ford, & Hale, 2012, 2014), decreased sense of loneliness and a better sense of community (Chopik, 2016; Cotten, Anderson, & McCullough, 2013; Czaja, Boot, Charness, Rogers, & Sharit, 2017; Sum, Mathews, Pourghasem, & Hughes, 2009), and greater overall satisfaction with life and an increased sense of well-being (Chen & Persson, 2002; Heo, Chun, Lee, Lee, & Kim, 2015; Czaja et al., 2017).

Despite the increasing literature to suggest that older adults may significantly benefit from ICT use, it is important to remember that as a group, older adults have the lowest adoption and usage rates in the American population. While technology use has increased among older cohorts since 2000, from 12% reporting using the Internet that year to 67% by 2017, they still lag behind younger cohorts (Anderson & Perrin, 2017). The difference in usage rates is most pronounced among the "oldest old", in that only 44% of older adults aged 80+ report going online (Anderson & Perrin, 2017). Given the measured benefits of ICT use among older adults, it is a unfortunate that adoption and usage rates are so low and implies that

special attention be given to this age group with regards to ICT education and training, as well the development of ICTs that cater to their needs.

## *ICTs as a Tool to Overcome Aging Issues*

As individuals age, there are often social and spatial barriers that inhibit normal communication patterns (Winstead et al., 2013). Social barriers refer to obstacles that hinder contact with social networks and minimize social interactions. Spatial barriers refer to issues in mobility—either in leaving the home or in navigating around the community—that can inhibit performance of normal daily activities. The number of social and spatial barriers older adults face typically increases with age. As an example, older adults who are forced to relocate (living closer to family caregivers, moving into a continuing care retirement community, etc.) may experience a disruption in normal social routines and have trouble staying in contact with neighborhood friends. As another example, older adults experiencing physical and cognitive decline may have trouble traveling to see friends and family or keeping up with regular activities such as doctor's appointments. ICTs have been shown to be a vital tool for older adults to overcome these barriers (Winstead et al. 2013). Research suggests that ICT usage can contribute to: increased efficacy in management of health (Campbell & Wabby, 2003), increased social support and enhanced cognitive and physical well-being (Blaschke, Freddolino, & Mullen, 2009), and increased connections to family and friends, which can decrease feelings of isolation or depression (Davidson & Santorelli, 2008).

Not only can ICTs help older adults circumvent social and spatial barriers (Winstead et al., 2013), they can extend and perhaps help form new avenues for social contacts. Smith and Hollinger-Smith (2015) found that older adults who engaged in activities that enhanced positive emotions experienced boosts in resilience outcomes. Positive emotions can be garnered through many avenues, but some are strongly connected to ICT use including communication and building social relationships. When using ICTs, older adults experience higher levels of social support and well-being (Cotten, Anderson, & McCullough, 2013); thus, ICTs activities can be designed such that communication and building social relationships is emphasized, which can ultimately lead to enhanced resilience.

There, are, however, gaps in the literature that future researchers should address. At present, there are no studies that specifically examine ICT use as a direct builder of resilience and no longitudinal interventions designed to build resilience among older adults (MacLeod, Musich, Hawkins, Alsgaard, & Wicker, 2016). However, because ICT interventions have been tangentially shown to build social contacts and support, improve quality of life, and promote more positive well-being, it reasons that future ICT studies should examine impacts on resilience directly and design interventions to build protective factors for older adults.

## How ICTs Can Benefit Older Adults in CCRCs

While there is an increasing literature focused on older adults and the benefits of ICT use, less attention has been given to ICT use of older adults within the context of continuing care retirement communities (CCRCs). These communities are uniquely designed facilities that provide various levels of care (e.g., independent living, assisted living, skilled nursing care) to residents and provide various types of assistance to help accomplish activities of daily living. The assistance provided is dependent on the facility, the level of care of the resident, and the specific needs of the resident, examples of which include assistance with bathing and dressing, assistance with medication management, and assistance with the preparation of meals. Because CCRCs cater to older adults who require some sort of assistance, the CCRC population is markedly different from the general population—older adults in these settings tend to be older and experience more physical and cognitive impairments that necessitate increased help with activities of daily living (Harris-Kojetin, Sengupta, Park-Lee, Valverde, Caffrey, Rome, & Lendon, 2016). While less work has been done examining the benefits of ICT use among residents in these types of facilities, work by our group suggests older adults in CCRCs can greatly benefit from ICT use.

### *Benefits and Drawbacks of Moving into a CCRC*

Older adults relocate to a CCRC for a variety of reasons, including concerns with health and healthcare and having adequate social support (Sergeant & Ekerdt, 2008). As an example, older adults who experience a significant medical event and lack the resources to care for themselves (e.g., they cannot independently maintain their quality of life and have no friends or family members available or willing to provide adequate care) may opt to relocate to a CCRC where trained staff is available to cater to their health needs. CCRCs typically emphasize meeting various diverse needs of their residents—not just medical, but also emotional and social. This is done in a variety of ways such as promoting participation in social activities among residents, which can promote greater life satisfaction and lower levels of social isolation among residents (Winstead, Yost, Cotten, Berkowsky, & Anderson, 2014).

While moving into a CCRC may, in theory, make life "easier" for the older resident through the services provided as well as the social community generated among residents, relocation is a significant life event that may have negative impacts on an older adult. Most prominently, older adults transitioning into a CCRC may experience a series of new social and spatial barriers (Winstead et al., 2013), which may reduce the overall quality of life. In summary, moving into a CCRC may separate older adults from family members, friends, and other community members with which they frequently visit (e.g., members of their church).

This separation can be exacerbated if the older adults lack personal transportation or experience mobility issues that prevents them from leaving the CCRC (Chen et al., 2008; Cornwell & Waite, 2009). In this way, social life begins to revolve around life at the CCRC, which can promote a feeling of isolation and loneliness. This, combined with the stress of moving into the CCRC, can lead to negative health outcomes (Ball et al., 2000).

## *How ICTs Can Impact CCRC Residents*

Given the potential negative impacts of relocating into a CCRC, the transition itself can be viewed as an event of adversity; that is, older adults transitioning into a CCRC must overcome the challenges associated with the compression of their social networks and loss of autonomy and environmental control (Winstead et al., 2013). Older adults with more positive responses to the transition or those with more stable coping styles may experience more satisfactory outcomes or, at least, less pronounced negative outcomes—those with higher levels of resilience may respond better to the transition.

What role, then, can ICTs play in enhancing resilience among older adults moving into and living in a CCRC? In what ways can ICTs ease the transition into a CCRC and minimize the negative impacts older adults may experience? Research from our group has shown that specially designed ICT training interventions can help mitigate the negative effects of living in a CCRC.

The ICTs and Quality of Life (QoL) Study was a randomized controlled trial intervention study, conducted between 2009 and 2014 in a medium-sized metropolitan area in the Deep South area of the U.S. (Cotten et al., 2017). It examined the impacts of ICT use on the health and social capital of older adults living in CCRCs, specifically assisted and independent living communities. The study involved our group going into CCRCs and conducting an 8-week ICT training intervention (1.5 h classes conducted twice per week with an additional 1.5 h office hour session). The intervention was specifically designed to teach older adults with little-to-no computer and Internet experience and was designed to accommodate the specific learning needs of CCRC residents. This included implementing specific teaching styles for older populations and utilizing equipment designed for older learners with physical impairments (screens with high resolution, larger keyboards, trackball mice, etc.). Classes started with the basics of using a computer and navigating the Internet and progressively increased in difficulty over time. Activities taught included sending and reading email, searching for information, social networking, and using entertainment websites (e.g., YouTube, Hulu). More detail regarding the study can be found in our book *Designing Technology Training for Older Adults in Continuing Care Retirement Communities* (Cotten et al., 2017).

Residents who participated in the ICT training reported a myriad of quality of life benefits derived from the training and the use of ICTs (Berkowsky, Cotten,

Yost, & Winstead, 2013; Cotten et al., 2013; Winstead et al., 2013). A majority of the benefit was derived from how the residents used ICTs to transcend the spatial and social barriers of CCRC life (Winstead et al., 2013). Participants noted how email provided the means of staying in contact with friends and family and how the Internet served as a useful tool in searching for information on long-lost social contacts. In one particular example, a participant in an assisted living community detailed how during the intervention she was able to use the Internet to search for information on a friend from her childhood she had lost contact with decades prior and reconnect through email (Cotten et al., 2017: pp. 98–99). Participants also described how they used the Internet to stay up-to-date and in contact with community networks (e.g., visiting a church website) as well as visit locations dear to them (e.g., using Google Street View to see old neighborhoods and homes). The use of ICTs in this way helped the residents feel less isolated from their social contacts and their communities, thus inhibiting more negative outcomes like depression.

In addition, participants in the study exhibited increased self-efficacy, a concept which describes how individuals self-evaluates their abilities to accomplish tasks and achieve goals (Cotten et al., 2017). They reported more positive attitudes in their abilities to use computers and the Internet, fewer perceived limitations in using ICTs, and a greater sense that they had felt more "modern" and "contemporary." Self-efficacy is related to resilience in that those with a stronger sense of self are typically more resilient in the face of adversity (Rowe & Kahn, 1997); thus, self-efficacy acts as a protective factor. Participants in our study remarked how they felt that they had "joined the human race" and were more confident in their abilities to use ICTs to their advantage. Our findings suggest that despite the potential negative impacts of relocation, CCRC residents can use ICTs to enhance their resilience to the transition and promote a better quality of life. However, our study does emphasize the importance of specially designed interventions for groups like individuals in CCRCs, as this population is markedly different from the general aging population and thus requires specific accommodations.

## Beyond Computers: Other Technologies that Can Enhance Resiliency

Throughout, this chapter has focused primarily on the effects of Internet-connected computer use as a means of enhancing resiliency among older adults (computers being the most commonly used ICT), both in the community as well as within a CCRC. We now turn our attention to other technologies that can potentially enhance resiliency. It should be noted that this is by no means an exhaustive list, as there are numerous technologies on the market which benefit older adults in a variety of ways and there are more and more technologies being introduced every day. The following section details just a sample of technologies currently available that may enhance resilience in diverse ways.

## *Mobile Technologies*

Smartphones (e.g., Internet-connected mobile phones) have dramatically increased both in popularity as well as prevalence in everyday life since their introduction to the market a decade ago. With this increase there has also been increased attention turned toward the concept of mHealth, or "mobile health." mHealth refers to health information, education, and care supported or delivered via mobile communication technologies such as smartphones. The obvious advantage of mobile technologies in managing health is their potential use to communicate with a healthcare provider (e.g., doctor) or a caregiver, which can be vital for older adults experiencing physical and mental health issues and who may have difficulty traveling. However, smartphones and other mHealth devices can also run specific health-based applications or "apps" that older adults can use to manage their health. The number and diversity of health apps available to download and use on mobile devices is increasing everyday, each with unique functions and advantages. Examples include (but are not limited to)

- *Meal preparation* apps which allow for users to track the foods they consume to better manage their diet and weight, thus assisting them with adhering to specific diet recommendations from doctors
- *Exercise* apps which tailor exercise routines to the sex, weight, and ability of the user to help keep the user in shape and active
- *Medication* apps which remind the user when to take specific medications, thus increasing the success rate of medication adherence
- *Community health* apps which may provide information on the health services available in the user's surrounding area, locations and directions to doctor's offices, and provide notice to health events such as health fairs
- *Health information* apps which provide both cursory and detailed information on specific diseases and illnesses as well as recommendations on how to proceed should symptoms of certain ailments arise
- *Emergency response system* apps which allow users to signal to individuals outside the home at the touch of a button to come to assist the user through a health crisis (e.g., a user who has sustains a fall-related injury may use these emergency response apps to call for an emergency medical team).

The literature on mHealth applications for enhancing the health and health care of older adults is growing as the technology expands and develops. While there is evidence to suggest these apps have the potential to significantly improve outcomes in users (e.g., Donker et al., 2013), more research is needed to evaluate the efficacy of these apps.

Mobile devices also have potential benefits beyond these health apps, giving older adults the tools they need to lead more resilient lives. An obvious example is that smartphones, like telephones and email, provide older adults with the means to easily communicate with friends and family; thus, maintaining social contacts. Smartphones, however, also have numerous apps that may promote independent

living. An example is that of ride-sharing apps—apps wherein users can call for a driver on short notice and the driver uses GPS to find, pick up, and drop off users for a fee (e.g., Uber, Lyft). Apps like these may be vital for older adults who lack the transportation means to go to a doctor's office, attend community events (e.g., church services), or visit family and friends. Use of such apps may allow older adults to live more functional lives despite any limitations they experience. They, in effect, provide a new tool to overcome adversity—such as the spatial barriers alluded to earlier in this chapter.

## *Telepresence*

An emerging trend in health technology is that of telepresence and robotics. Telepresence refers to the ability individuals to appear to be in a location they are not and to interact with others in that location despite not being there. An example of telepresence is that of video conferencing wherein an individual may use specific software (e.g., Skype, Face Time) to make a video phone call with another. In doing so, the person may have a face-to-face conversation with another person at a separate location through the use of audio and video equipment. Robotics may be combined with telepresence technologies such that the video conferencing technology can be attached to a moving robot that can be controlled from a remote location. For example, a person in California can interact with someone in New York by controlling a robot that can move around and follow the person in New York, all the while transmitting video and audio to motivate conversation.

Telepresence technologies and robotics can be especially beneficial for older adults with regards to healthcare, as it provides the means through which an older adult can communicate with members of a care team without leaving the home (e.g., Czaja, Loewenstein, Schulz, Nair, & Perdomo, 2013). This can be especially useful for older adults who lack transportation means or experience mobility issues and thus cannot travel to see a doctor. It can be useful to older adults in rural areas as well where travel to a doctor's office or hospital may be challenging. Telepresence has also been shown to help alleviate loneliness and depression due to the social connections it can foster (Tsai, Tsai, Wang, Chang, & Chu, 2010). Telepresence technologies allow older adults to stay in touch with friends and family with the added benefit of video.

## *The Internet of Things*

The Internet of Things (IoT) is a concept that refers to how devices and applications can connect and communicate with one another via the Internet. The concept has grown in popularity in the health sphere as researchers and companies across various domains (healthcare, engineering, etc.) have teamed up to develop and

deliver technology systems wherein individual components may communicate and share information with one another which can, in turn, provide a new means for older adults to function independently. An example may be that of a system wherein household controls (e.g., lights, temperature, humidity) are all connected via a wireless Internet connection to a smartphone or a tablet computer. Older adults who may have mobility difficulties may use the smartphone or tablet computer to manipulate their environment without having to move around the home. These systems may also be outfitted with sensors to help monitor a particular space within the home as well as older individuals themselves. For example, the home can be outfitted with sensors that detect if an older adult has fallen and, if sensed, sends an emergency signal to the appropriate authorities. The literature on the ability for these types of technologies to promote independent living among older adults is growing. Findings suggest that while there may be benefits for older adults, there are many barriers to successful use (concerns with privacy, cost, usability, etc.) which need to be addressed (Peek, Aarts, & Wouters, 2017).

## Conclusion

Resilience refers to the risk of adversity and an individual's ability to overcome said adversity. Older adults may experience a myriad of diverse challenges as they age related to their physical, mental, and social health. Technology can provide older adults with new and exciting tools to combat these challenges in a variety of settings such as in the home or in a CCRC. Through increased communication with social networks, increased access to information like health information, or increased ability to perform functional tasks (e.g., managing diet, hailing a ride to the doctor), technology gives older adults the ability to live more independent lives.

As stated earlier in this chapter, older adults utilize technologies to a lesser degree compared to younger cohorts despite the apparent benefits of use. The reasons for this are numerous and include a lack of adequate training and experience with technology, decreased access, impaired physical and cognitive abilities that may prevent mastery, and decreased confidence in the ability to successfully use (Cotten et al., 2017), among others. Despite these barriers, older adults are able to use technology to their benefit should the technology be designed with their specific needs in mind and with adequate technology education. Tailoring technologies to the needs of older adults and providing tailored training may go a long way in giving older adults the equipment and skills needed to enhance resilience more successfully and live more functionally independent lives regardless of their life circumstances and of the challenges they face.

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