T

Tachycardia

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Definition

The word "tachycardia" means rapid heart rate. This condition is more precisely defined as a heart rate that is above the age-adjusted range of normal heart rates (see Table 1). Children normally have higher heart rates than adults and can tolerate rapid heart rates more easily.

Description

Normal Determinants of Heart Rate

Heart rate is normally established by the rate of spontaneous generation of an electrical signal (action potential) by "pacemaker" cells located in the sinoatrial (SA) node of the heart (in the wall of the right atrium near the entry of the superior vena cava) (Mohrman & Heller, 2011). These electrical signals are normally generated at a rate of 60–100 beats per min in a human adult. They are propagated from the SA node through the atrial and ventricular muscle cells in a set pathway that stimulates contraction in a pattern that optimizes pumping of blood from the heart. Most other cardiac muscle cells have the potential to act as pacemakers, but the SA nodal cells drive the heart at a slightly faster rate than any of these other "latent" pacemakers.

The normal fluctuations in heart rate that occur in response to normal changes in the body's metabolic demands are accomplished by altering autonomic neural influences on the SA nodal pacemaker cells from the parasympathetic and sympathetic nervous system. Increased sympathetic activity causes an increase in heart rate whereas increase in parasympathetic activity causes a decrease in heart rate.

Tachycardia, Table 1 Age-associated upper limit to normal human heart rates (Adapted from Greene, 1991)

Less than 1 year	~170 bpm
1–2 years	~150 bpm
3–5 years	~135 bpm
6–12 years	~130 bpm
12–15 years	~120 bpm
15 years through adulthood	~100 bpm

Symptoms of Tachycardia

A person with significant tachycardia may or may not be aware that their heart rate is fast without actually measuring their pulse rate (Valentin, O'Rourke, Walsh, & Poole-Wilson, 2008). However, tachycardia often results in a feeling of light-headedness, dizziness, tunnel vision, or fainting. Other symptoms may include muscle weakness, nervousness, sweating, pallor, or a feeling of fullness in the chest. The cause of

M.D. Gellman & J.R. Turner (eds.), *Encyclopedia of Behavioral Medicine*,
DOI 10.1007/978-1-4419-1005-9,

many of these symptoms is often related to a decrease in arterial blood pressure and therefore blood flow to the brain and other tissues.

Physiological Cause of the Symptoms

The amount of blood that the heart pumps in a minute is called the cardiac output (Mohrman & Heller, 2011). This is determined by the volume of blood ejected in each beat *(stroke volume)* and the number of beats per minute *(heart rate)*:

$$\text{Cardiac output} = \text{stroke volume} \times \text{heart rate}$$

One might predict from this equation that the cardiac output would increase whenever heart rate increased. This is true over the normal range of heart rates. However, when the heart rate exceeds this normal range, the cardiac output may actually fall. There are three primary reasons for this: (1) There is insufficient time between beats to allow the heart to fill adequately. (2) The coronary circulation to the cardiac muscle may be compromised by the compressive forces in the ventricular wall associated with each individual beat. (3) The energy requirements for the heart increase enormously and may not be met by the compromised coronary blood flow.

Physiological Causes of Tachycardia

1. *Atrial Tachycardia or Supraventricular Tachycardia* (i.e., associated with a narrow QRS complex on an ECG) (Valentin, O'Rourke, Walsh, & Poole-Wilson, 2008). This condition is more common than ventricular tachycardia (see below) and can often be successfully treated. It is often uncomfortable and alarming to the individual, but does not usually portend immediate, possibly fatal consequences.
   (a) *Sinus Tachycardia* – Elevated sympathetic neural activity or an increase in circulating catecholamines stimulates the normal pacemaker cells in the SA node to fire at a very rapid rate and this electrical signal is then carried via normal pathways through the entire heart.
   (b) *Ectopic Atrial Pacemakers* – Atrial cells that are not part of the SA node can sometimes become irritable and generate electrical signals that spread throughout the cardiac tissue.
   (c) *AV Nodal Reentrant Tachycardia* – This is a conduction defect rather than a pacemaker defect. In this case, a rapid heart rate may result from an abnormal portion of conduction pathway usually found in the AV node in which the electrical signal circles back on itself to rapidly re-excite the downstream tissue.
   (d) *Atrial Flutter* – An ectopic pacemaker or reentrant pathway in the atria evokes in a very rapid atrial rate such that AV node fails to conduct every signal. The atria may beat three or more times for each ventricular beat. The ventricular rate may be faster than normal or within the normal range but the atrial rate is faster.
   (e) *Atrial Fibrillation* – The atrial conduction pathways become disorganized and the normal synchronized excitation of the atrial tissue is disrupted. Electrical signals are initiated and conducted in bizarre patterns, resulting in unpredictable intermittent conduction through the AV node. This results in an irregular ventricular rhythm that may, on the average, be faster than normal (tachycardia), normal, or slower than normal (bradycardia).
2. *Ventricular Tachycardias* (i.e., associated with wide QRS complex on an ECG). This is a more serious condition than atrial tachycardia and needs immediate attention. The heart is still operating as a pump but the possibility of a sudden deterioration to ventricular fibrillation is high.
   (a) *Ectopic Ventricular Pacemakers* – Ventricular cells can sometimes become irritable and generate electrical signals that spread throughout the cardiac tissue. This may occur if blood flow to a portion of the ventricular wall is inadequate and the tissue becomes ischemic.
   (b) Ventricular Reentrant Pathways – In this case, a rapid heart rate may result from

abnormal conduction of the electrical signal through a small portion of ventricular muscle such that the electrical signal circles back on itself to rapidly re-excite the cardiac tissue. Because all cardiac muscle cells are electrically connected, this rapidly firing small group of cells can drive the ventricles at a fast rate.

Cross-References

- ▶ Arrhythmia
- ▶ Maximal Exercise Heart Rate

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Tailored Communications

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Synonyms

Tailored health behavior change interventions

Definition

"Tailored communications are any combination of information intended to reach one specific person, based on characteristics unique to that person, related to the outcome of interests, and derived from an individual assessment" (Kreuter & Farrell, 2000).

Description

Background

The field of behavioral medicine studies how behaviors affect health and medical conditions, as well as how behaviors can be changed. Good behavior-change interventions are, of course, guided by strong health behavior theories that elucidate factors (variables) affecting individuals' behaviors. One of most basic of these, the Health Belief Model (HBM), was developed in the 1950s when the US public health service consulted with psychologists to understand why people were not availing themselves of free tuberculosis screenings. This simple model delineates three major factors (or theoretical constructs) affecting whether people take a health action. They must feel susceptible to a health threat serious enough to warrant attempts to reduce the risk, believe that changing their behavior would reduce their risk, and overcome perceived barriers to behavior change (Champion & Skinner, 2008). Individuals can vary widely on these beliefs. One's threat perception may be low whereas another may perceive the threat but not believe the behavior change would have benefit for lowering it. Among those who perceive barriers to behavior change, specific types of barriers may vary widely. For example, not having a ride to a screening site is very different from not being able to afford screening or of being afraid the screen would find a problem.

Message Customization

Face-to-face communications are usually customized for different people. For example, nurses seeking to facilitate medication adherence communicate with different patients differently, depending on factors influencing *that persons'* behavior. The message differs when talking with someone who cannot remember to take the pills versus someone avoiding the medication due to side effects. But only recently did this kind of message customization become possible in mass-produced media such as print and video. From the 1950s through the 1980s, mass-media communications such as brochures and videos were developed to address an array of variables,

with the hope that at least some of the message components would be relevant to most audience members.

Mass-Produced Tailored Communications

In the 1980s, the rise of micro-computing capabilities opened possibilities for mass-producing communications that retained advantages of customized face-to-face interactions. These "tailored communications" are reminiscent of tailor-made clothing that is based on numerous measurements taken by the tailor before beginning his work. Tailored communications begin with measures of people's behavior-influencing factors such as the HBM variables of perceived risks and beliefs about the behavior's benefits and barriers. The "fabric" of tailored communications is distinct text, audio, or graphic components that are "sewn" together to fit the measurements of a particular message recipient.

In their 2000 book, *Tailored Health Messages; Customizing Communication with Computer Technology* Kreuter, Farrell et al. provide this elegant definition of tailored communications: "any combination of information intended to reach one specific person, based on characteristics unique to that person, related to the outcome of interests, and derived from an individual assessment." Continuing the clothing analogy, this definition distinguishes between tailored and targeted communications, as follows. *Tailored communications* – and tailored clothing – are intended to fit one individual. *Targeted communications* – and off-the-rack clothing – are intended to fit any one of a group sharing some common characteristics (e.g., men who wear a size 40 long, like pinstripes, and shop in a certain price range). Targeted messages are usually directed to a particular demographic group (i.e., African American church members) and address factors known to be important for *many* members of that group. In contrast, tailored communications are based on individual-level assessment of theory-based behavior-influencing variables, with a unique combination of messages assembled for each individual within the group (Kreuter & Skinner, 2000).

The original rational for tailoring was that tailored communications would be more noticeable and compelling and less burdensome because they are streamlined to only include content relevant to the recipient. According to Petty and Cacioppo (Petty, Cacioppo, & Goldman, 1981), the more personal involvement with the message, the more careful consideration (i.e., "central processing") and elaboration on the message which, in turn, increases likelihood of attitude and behavior change.

Early Trials of Tailored Print Communications

Several initial randomized trials compared printed communications that were v. were not tailored on theory-derived behavior-influencing variables (Skinner, Campbell, Rimer, Curry, & Prochaska, 1999). Three of these, targeting mammography screening (Skinner, Strecher, & Hospers, 1994), smoking cessation (Strecher et al., 1994), and dietary change (Campbell et al., 1994), were conducted among primary-care patients who completed telephone surveys and were randomly assigned to receive tailored or non-tailored printed newsletters. In addition to age, race, and risk factors, messages in the tailored letters directly addressed variables such as the recipients' perceived risk, benefits and barriers, their stage of behavior adoption, characteristics such as age, race, and risk factors and, for smokers, causal attributions for past failed quite attempts. In each of these three studies, the non-tailored letter version addressed a number of factors that had been shown to influence people's behaviors, in general. For example, the non-tailored mammography letter was adapted from a letter from US Surgeon General's office mailed to women who requested information about breast cancer screening. Because these three trials were designed to compare tailored versus non-tailored *content*, the tailored letters did not include statements such as "the information was prepared especially for you," as have later studies. Tailored and non-tailored letters looked very much alike. They were printed in black and white on two-column 8½ × 11 paper and included a head-and-shoulders line drawing. Therefore, it is remarkable that recipients of the tailored letters

were more likely to report remembering and reading their letters. Receipt of a tailored letter was also associated with behavior change (Campbell et al., 1994), at least among important subgroups (Skinner et al., 1994; Strecher et al., 1994). Indeed, of the seven initial comparisons of tailored versus. non-tailored print communications, six (Skinner et al., 1999) found more behavior change among tailored recipients.

Movement Toward Different Comparisons

Given these impressive results from studies comparing tailored versus similar non-tailored print, and with tailoring technology expanding rapidly, tailoring researchers moved on to different comparisons. Studies tested tailored communications as an adjunct to other intervention components such as self-help smoking manuals, and compared tailored messages delivered through different media, such as tailored print versus tailored telephone counseling (Champion et al., 2007; Rimer et al., 2002), tailored on different types of variables (Kreuter et al., 2005), and with and without booster doses (Skinner, 2006). Even within the tailored print medium, researchers moved beyond the newsletter format to tailored booklets and magazines with tailored features such as cartoons and advice columns (Rimer et al., 2002; Kreuter et al., 2005). Because there were so many kinds of comparisons of different tailoring approaches and for different target behaviors, data do not exist from head-to-head comparisons of every feature (e.g., more vs. less content, fewer vs. more graphics). As reported in a 1998 review of the "first generation" of tailored communications, these various comparisons showed mixed results, and "when (tailored print communications) are only one component of a complex intervention strategy without a factorial design, it is more difficult to isolate their relative contribution to the overall intervention effect" (Skinner et al., 1999, p 296). Nonetheless, this initial review and several others published subsequently (Kreuter & Farrell, 2000; Kroeze, Werkman, & Brug, 2006; Revere & Dunbar, 2001; Rimer & Glassman, 1999) reported that tailoring seems to "work" both for attracting and retaining attention and for facilitating behavior change. Further, delivering tailored messages via print plus another medium such as telephone generally is more effective than tailored print alone.

Interactive "Real-Time" Tailoring

Original print-tailored interventions collected questionnaire data and then used that entire "batch" of data to put together specific messages that, depending on algorithms, were selected from a library of potential messages. More recently, CD-ROMs, DVDs, and the internet have allowed for interactive tailoring based on data collected during program use rather than in questionnaire form before the intervention is delivered. For example, a DVD or CD-ROM can ask a question about barriers to behavior change, then immediately show videos, selected from a tailored video library, that address the specific barriers named by the user (Skinner et al., 2011). Some web-based programs provide tailored content based on predetermined algorithms, others allow users to "self-tailor" by selecting any content of interest to them. As described in Lustria, Cortese, Noar, & Glueckauf, 2009 review of computer-tailored health interventions delivered over the web, these interventions "have involved a great diversity of features and formats," and "further outcome research is needed to enhance our understanding of how and under what conditions computer-tailoring leads to positive health outcomes in online behavioral interventions" (Lustria et al., 2009, p. 156). Therefore, as with the print-tailored communications, it is difficult to draw conclusions across studies.

Conclusions and Challenges

One problem in understanding findings and implications of tailored communication intervention studies is that journals often severely limit the amount of space for intervention descriptions. As a result, we have many statistics associated with the intervention outcomes, but we know little about the interventions themselves. In other words, we may learn that "it worked" without knowing exactly what "it" was or with what "it" was compared. Tailoring researchers have,

therefore, recently called for new reporting standards through which intervention studies will report similar descriptions and metrics, which should help in evaluation and dissemination of best practices in tailored interventions (Harrington & Noar, 2011).

In summary, communication interventions that are tailored to include theory-based messages relevant to individual recipients, based on data collected from them, are generally better than non-tailored communications in drawing the attention of message recipients and facilitating their health behavior change. However, questions still remain about optimal amounts and types of tailoring for different behavioral targets and through different media.

Cross-References

- ▶ Health Behavior Change
- ▶ Health Behaviors
- ▶ Health Beliefs/Health Belief Model
- ▶ Health Communication
- ▶ Health Risk (Behavior)
- ▶ Stages-of-Change Model

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Tailored Health Behavior Change Interventions

▶ Tailored Communications

Teens

▶ Williams LifeSkills Program

Telehealth

▶ eHealth and Behavioral Intervention Technologies

Telemedicine

▶ eHealth and Behavioral Intervention Technologies

Telencephalon

▶ Brain, Cortex

Telephone Coaching

▶ Williams LifeSkills Program

Telomere and Telomerase

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Definition

Telomeres are noncoding repeat DNA sequences (consisting of TTAGGG) that cap the ends of eukaryotic chromosomes. Telomerase is an enzyme that adds basepairs to telomeres.

Description

Like the plastic tips that protect shoelaces from unravelling, telomeres protect DNA material. When cells divide, the enzymes that replicate the chromosomes are unable to do so fully. The main purpose of telomeres is to form a buffer so that genetic material is not lost in this process. With each cell division, telomeres can shorten, and when telomeres become critically short, a cell undergoes senescence (cell arrest). Telomeres also function to protect chromosomes from genomic instability, end-to-end chromosome fusion, less efficient cell division, loss of ability for cell replenishment, and apoptosis or cell death (Blackburn, 2000).

Because of these important functions, telomeres are related to a number of health outcomes and disease states. Shorter telomere length is associated with chronic diseases of aging such as cardiovascular disease, cancer development, and Alzheimer's disease, and is related to earlier mortality. Telomere length is also thought to be an indicator of biological, rather than chronological, age (Epel, 2009).

Telomere length is associated with a number of psychosocial factors. For example, depression, higher perceived stress, longer stress duration, caregiving, lower socioeconomic status, pessimism, childhood adversity, and lower subjective well-being are correlated with shorter telomere length. Health behaviors such as smoking, lack of physical activity, and repeated dieting as well as altered metabolic states such as obesity and insulin resistance are also linked with shorter telomere length (Lin, Epel, & Blackburn, 2009).

Telomerase is the enzyme that adds base pairs back onto telomeres. This serves to protect telomeres from shortening. Recent work suggests telomerase may have future applications for antiaging therapies as evidenced by telomerase knockout mice displaying reversed aging with telomerase treatment (Jaskelioff et al., 2010).

Telomerase, like telomeres, appears to be responsive to psychological states, and may

serve to protect cells under stress. Exposure to acute stress (Epel et al., 2010) as well as states of chronic psychosocial adversity are associated with high telomerase. Because telomerase levels change more dynamically than telomere length, psychosocial interventions such as meditation (Jacobs et al., 2010) and comprehensive lifestyle changes (Ornish et al., 2008) have been tested in preliminary studies as a potential treatment to increase telomerase, with promising results.

Cross-References

- ▶ Aging
- ▶ Alzheimer's Disease
- ▶ Cardiovascular Disease
- ▶ Chromosomes
- ▶ Depression
- ▶ Insulin Resistance
- ▶ Lifestyle changes
- ▶ Meditation
- ▶ Obesity
- ▶ Pessimism
- ▶ Physical Activity
- ▶ Smoking and Health
- ▶ Socioeconomic Status (SES)
- ▶ Subjective Well-Being

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Temporal

- ▶ Brain, Cortex

Temporal Self-Regulation Theory

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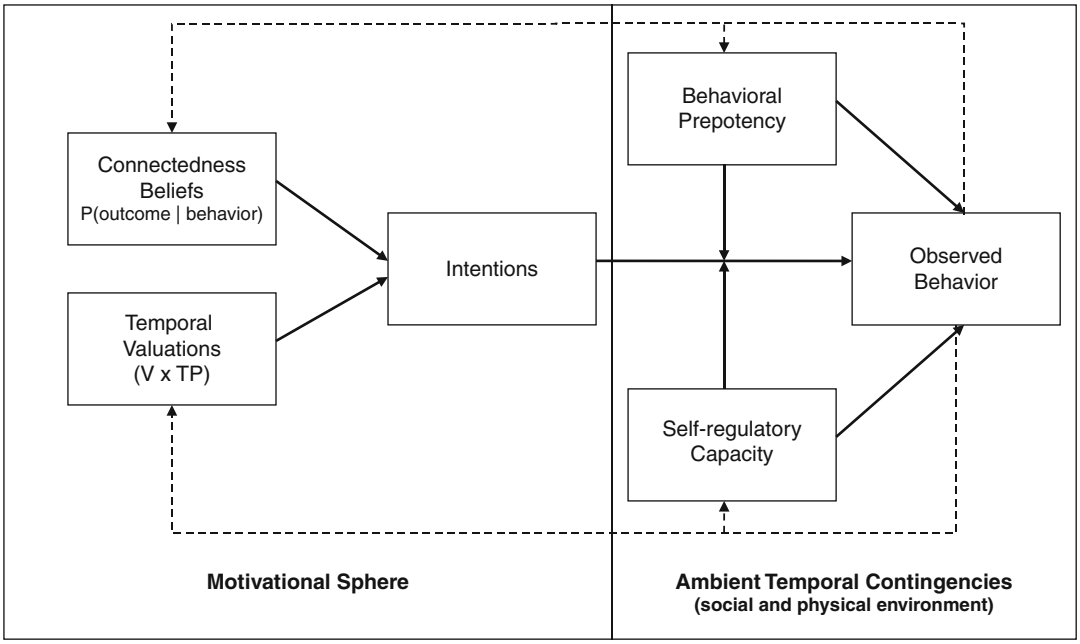
Synonyms

Dual process models of health behavior; Dual systems models

Definition

Temporal self-regulation theory (TST; Hall & Fong, 2007; Fig. 1) is a theoretical framework for explaining individual health behavior. TST posits that health behavior is proximally determined by three factors: *intention strength*, *behavioral prepotency*, and *self-regulatory capacity*. The latter two constructs are theorized to have direct influences on behavior and also to moderate the intention-behavior link. Specifically, intentions are proposed to have a stronger influence on behavioral performance in the presence of stronger self-regulatory capacity and/or when the behavioral prepotency is weak. Also included in the model is consideration of ecological context in the form of contingencies supplied to the behavior by the social and physical environment



Temporal Self-Regulation Theory, Fig. 1 Arrows between Behavioral Prepotency and Self-regulatory Capacity to the Intentions-Behavior arrow implies moderation; V = value; TP = perceived temporal proximity. Broken arrows denote weaker (i.e., secondary) hypothesized effects. Adapted from (Hall & Fong 2007).

(i.e., *ambient temporal contingencies*). In the TST model, *intention strength* is a function of anticipated connections between one's behavior and salient outcomes (i.e., *connectedness beliefs*); the valence of the latter can range from negative (i.e., costs) to positive (i.e., benefits). These beliefs are weighted by temporal proximity (i.e., *temporal valuations*). For example, the perceived self-relevant contingencies for making a healthy dietary choice might include eventual benefits (e.g., improved appearance, better health status), but more temporally proximal – therefore more heavily influential-immediate costs (e.g., inconvenience, monetary costs, time costs). The sum of the perceived contingencies weighted by their respective temporal proximities should determine intention strength to make a healthy dietary choice, according to the TST model.

Description

The aim of the TST is to explain variability in health behavior in a manner that is sensitive to biological capacities for self-control, motivation level, and the ecological context in which the behavior takes place. Given the complexities of the model and the fact that it crosses many levels of analysis (from biological to social to ecological), it is expected that the model is not testable in its entirety. Rather, individual components of the model may be tested individually or in relation to each other (e.g., hypothesized moderating effects).

The TST model was initially offered as an improvement over traditional models of individual health behavior which posited that behavior was most proximally determined by social cognitive variables, without direct or indirect links to neurobiological resources. While TST preserves the central role of intention strength, it adds two important moderating and direct effects on health behavior performance: (1) *self-regulatory capacity* (SRC) and (2) *behavioral prepotency* (BPP).

SRC is composed primarily of executive control resources and therefore ascribed to operation of the prefrontal cortex and associated neural

systems implicated in the neurobiology of self-control (Miller & Cohen, 2001). BPP is the psychological inertia of a given behavior, by virtue of frequent past performance in similar contexts, or via the presence of strong cues (which may be social or visceral in nature) to perform the behavior at a given time. The combination of SRC and BPP determines the likelihood that intentions will be translated into behavior, and each also has direct influences on behavior itself regardless of intention.

Additional components of TST that differentiate it from its predecessors are (1) an explicit focus on temporal proximity of behavioral contingencies as determinants of their relative potency and (2) a consideration of ecological factors as causal agents in health behavior performance. These two components are conceptually linked, as ecological contexts often determine what kinds of consequences (positive, neutral, or negative) are experienced following performance of a behavior, as well as the relative proximity of those consequences (immediate vs. long-term).

The primary contribution of the TST model has been to provide some basis for understanding the possibility of brain-behavior relationships as being partial determinants of health behavior trajectories, and to provide an interface for individual models of health behavior with ecological and social-level determinants of behavior. Given that intention strength (Armitage & Connor 2001) and behavioral prepotency (Ouellette & Wood, 1998) are among the most well-established determinants of behavior in the extant research literature, the construct within TST that has required the most empirical justification is the inclusion of biologically based SRC.

Though few studies of SRC as a determinant of health behavior existed prior to the introduction of the TST model, the early findings have been promising. In recent studies, it has been found that SRC predicts health behavior patterns directly and exerts an additional moderating influence on health behavior performance, both of which are hypothesized by TST (Hall, 2012). In addition, evidence has emerged to indicate that individual differences in SRC may be selectively responsible for the previously demonstrated association between IQ and longevity, and also predicts survival time among those living with chronic illnesses that carry significant self-care demands. Finally, recent research shows that SRC interacts with intentions such that intentions predict various health behaviors, only when SRC is high, not low.

Together these findings provide support for the inclusion of biologically based SRC in contemporary models of health behavior. It is expected that the next generation of research involving TST will include experimental designs that can isolate causal relations between SRC and health behavior performance (both directly and via its intention-moderating effect) in the laboratory setting, and test the efficacy of SRC-augmenting activities in the interventional context. Among the most promising interventions for augmenting SRC is the use of aerobic training, which has been shown to enhance structural and functional components of the brain regions that are known to support self-regulatory processes and self-control (McAuley & Hillman, 2012). One final novelty of this model is its use of various types of assessment methods (self-report and neuropsychological or reaction-time tests), which may overcome problems of shared-method variance and enhance its predictive validity.

Cross-References

- ▶ Executive Function
- ▶ Self-Regulatory Capacity
- ▶ Theory

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Tension

▶ Affect Arousal
▶ Asthma and Stress

Terminal Care

▶ End-of-Life Care
▶ Palliative Care

Tertiary Care

▶ Clinical Settings

Testicular Cancer

▶ Cancer, Testicular

Testicular Neoplasms

▶ Cancer, Testicular

Testoid

▶ Androgen

Thanatophobia

▶ Death Anxiety

Thanksgiving

▶ Prayer

Theories of Behavior Change

▶ Intervention Theories

Theory

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Synonyms

Conjecture; Model

Definition

A theory is a coherent set of statements or ideas used to organize, generalize, explain, and predict phenomena. Theories are based on observations, experimentation, and abstract reasoning, and play a fundamental role in scientific research.

Theories must (a) successfully describe and explain existing observations, (b) make predictions about future observations, and (c) be falsifiable, that is, they must be refutable by some conceivable event or observation.

While not directly verifiable, theories gain support as empirical evidence accumulates in their favor, particularly if such evidence results from "risky" predictions where the outcome could conceivably have been different (Popper, 1963/2004). An accumulation of contradictory empirical evidence results in the theory being abandoned, modified, or superseded by a new theory. This dynamic process of testing, evaluation, and change allows research to move forwards toward the "truth." Theories provide a shared language for researchers to use, enabling the development of a cumulative science. The most useful theories are those that make specific and relevant predictions that can be tested in a straightforward manner.

Prominent theories in behavioral medicine cover a range of domains and include the Transactional Theory of Stress and Coping (Lazarus & Folkman, 1984), Type D Personality (Denollet et al., 1996), the Theory of Planned Behavior (Ajzen, 1991), and the Common Sense Model of Self-Regulation of Health and Illness (Leventhal, Diefenbach, & Leventhal, 1992).

Cross-References

▶ Causal Diagrams
▶ Hypothesis Testing

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Theory of Planned Behavior

▶ Theory of Reasoned Action

Theory of Reasoned Action

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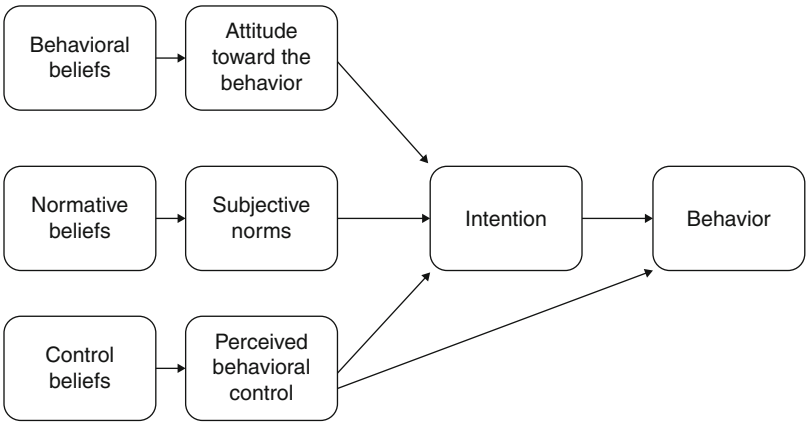
Definition

The Theory of Reasoned Action (TRA; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and its extension, the Theory of Planned Behavior (TPB; Ajzen, 1985, 1991), are cognitive theories that offer a conceptual framework for understanding human behavior in specific contexts. In particular, the theory of planned behavior has been widely used to assist in the prediction and explanation of several health behaviors.

Description

According to the initial Theory of Reasoned Action, an *intention* to engage in a certain behavior is considered the best predictor of whether or not a person actually engages in that behavior. Intentions, in turn, are predicted by *attitudes* and *subjective norms*. That is, the more positively a person regards a certain behavior or action and the more they perceive the behavior as being important to their friends, family, or society, the more likely they are to form intentions to engage in the behavior. Azjen, however, noted the importance of a behavior being under volitional control in both forming intentions and engaging in the actual behavior. Therefore, he added *perceived behavioral control* to the model, which is now known as the Theory of Planned Behavior. See Fig. 1.



Theory of Reasoned Action, Fig. 1 Theory of planned behavior

Description of the Theoretical Factors

Behavioral beliefs and attitudes: A person first forms beliefs about the outcomes of a given behavior (e.g., "If I exercise, I will improve my health, lose weight, and be more attractive"). These beliefs contribute to his or her attitude or evaluation of the outcome of the behavior (e.g., "Being healthy and attractive is good/valuable"). The more favorable the attitude, the stronger the intention.

Normative beliefs and subjective norms: Normative beliefs refer to a person's perception about the expectations of important others (e.g., "My friends think I should exercise"). These beliefs contribute to the perception of social pressure and contribute to motivation to comply (e.g., "I feel pressured to exercise and I want to fit in with my friends"). The more powerful the perceived norm/pressure, the stronger the intention.

Control beliefs and perceived behavioral control: A person forms beliefs about the factors that may facilitate or be barriers to engaging in the specific behavior (e.g., "I have time before work, I have access to a gym, and I am physically able to exercise"). These beliefs lead to a perception of behavioral control or sense of ease/difficulty in engaging in the behavior (e.g., "I will be able to exercise"). Although many researchers have used the terms self-efficacy and perceived behavioral control interchangeably, including Ajzen (1991), these concepts are not quite synonymous. Whereas self-efficacy reflects individuals' beliefs about their competence or internal control, perceived behavioral control also incorporates other external/environmental factors (e.g., time, resources, social support). The greater the perceived behavioral control, the stronger the intention and the greater the likelihood of engaging in the behavior.

Intention: Intentions refer to peoples' plan of action and represent their expressed motivation to perform the behavior.

Evaluation of the Model

Meta-analytic reviews have supported the predictive efficacy of the TPB model for both behavioral intentions and behaviors (Armitage & Conner, 2001; Godin & Kok, 1996; Sheeran, 2002). The theory typically accounts for about 40–50% of the variance in intentions and 20–40% of the variance in behavior. The relative importance of each of the three factors (attitudes, norms, perceived behavioral control) varies across behaviors and situations. Subjective norms are usually the weakest predictor, though this may reflect measurement issues or people's denial of the effects of social pressures. With regard to health behaviors, the model is better at predicting some behaviors (exercise, condom use, drug use, and cigarette smoking) than others

(weight loss and dietary behavior, clinical and screening behavior, oral hygiene; see Godin & Kok). Intentions are usually more potent than perceived behavioral control in predicting health behaviors, suggesting that such behaviors are largely driven by personal motivation.

Although TPB is widely used and offers one of the most robust set of predicators of human behavior, it has been criticized for failing to include emotional variables, such as perceptions of threat, mood, and affect, which may limit is predictive power, particularly with certain health behaviors. It has been argued that many behaviors are not rational and that one's affect may be counter to one's cognitions about engaging in a particular behavior. Thus, attitude may be shaped by affect in addition to beliefs. Another criticism of the TRA/TPB model is that the majority of research testing the theory has been correlational (cross-sectional or longitudinal, typically with brief follow-up periods). The experimental studies testing the theory have provided less support for the model (Webb & Sheeran, 2006).

Measurement of the Theory of Planned Behavior Constructs

It is common practice to assess each of the constructs with only one or two items, though multi-item measures are often recommended. Differences in the way the constructs are assessed have led to confusion and may account for some of the variation between studies (see Armitage & Conner (2001) for a meta-analytic review of such differences).

Attitude: Attitude is typically assessed via the use of semantic differential scales that tap into both affective and cognitive attitude. Pairs of adjectives (reflecting a positive and negative component of an attitude) that have relevance to the health behavior being studied are provided as anchors. For example, "To me, engaging in regular exercise is…" [*unpleasant-pleasant; unsatisfying-satisfying*(affective); *harmful-beneficial; useless-useful* (cognitive)].

Subjective norms: When assessing subjective norms, it is recommended to measure both injunctive norms (what others think) and descriptive norms (what others actually do). Social groups are often identified as peers, family, friends, or important people. Examples of items include the following: "People who are important to me think I should exercise regularly" (injunctive); "My friends exercise regularly" (descriptive). Items are usually measured using a 7-point Likert scale.

Perceived behavior control: Perceived behavioral control is often measured with Likert-scale items assessing both internal control (i.e., self-efficacy), such as "I am confident that I can exercise regularly," a perception of ease/difficulty of engaging in the behavior, such as "It is easy for me to exercise," and perception of control, such as "How much personal control do you feel you have over engaging in regular exercise?" In general, measures of self-efficacy account for the most added variance to intentions.

Intentions: Many researchers assess intentions with one Likert-scale item, such as "I intend to engage in regular exercise for the next 3 months." Although intentions tend to be highly reliable, additional items may strengthen the measurement of this construct. Items are sometimes phrased as, "I will try to…," "I plan to…," and "I will make an effort to…." This construct has also been assessed with questions related to self-prediction (e.g., "It is likely that I will engage in regular exercise over the next 3 months"), though such a conceptualization probably incorporates perceived behavioral control.

Behavior: Behavior is often assessed via self-report, but observed behavior is clearly preferred. The TPB model typically predicts more of the variance in self-reported behavior than observed behavior.

Specific recommendations and guidelines for developing questionnaires for use in a particular study are offered by Ajzen (see http://people.umass.edu/aizen/tpb.html), Fishbein and Ajzen (2010), Godin and Kok (1996), and the National Cancer Institute (see http://cancercontrol.cancer.gov/brp/constructs/index.html).

Cross-References

- ▶ Attitudes
- ▶ Behavior
- ▶ Self-efficacy

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Therapy

- ▶ Occupational Therapy

Therapy, Family and Marital

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Synonyms

Couple therapy; Family therapy; Interventions therapy

Definition

Both family and marital therapy are branches of psychotherapy that aim to facilitate positive change, by addressing the dyad and family as a whole. Broadly, these branches of psychotherapy help teaching communication and problem-solving techniques in an effort to ameliorate distress.

Description

There are a wide range of therapeutic interventions that work with families and couples during times of distress. The goal of each therapeutic approach is to alleviate the distress, to strengthen dyadic and family resources, and to improve well-being of the couple or family members. Although family and couple therapies can be applied with various techniques or theoretical approaches, there are common approaches that have been shown effective in alleviating family distress, such as behavioral family and couple therapy.

Family Therapy Techniques

Therapeutic techniques for families are grounded in family systems theory, which states that each member of the family is interconnected and one cannot just treat one family member independently (Segrin & Flora, 2005). The most common family therapy techniques address adolescent concerns in respect to the family dynamic.

Below, we review some of the commonly used therapies.

Bowen's family approach. Bowen's family systems theory views behavior within the family as an emotional unit. This theory operates under the balance of two forces: togetherness and individuality, whereby too much of any one force can create an imbalance in the system. Bowen's approach also uses eight concepts that aim to explain family development and functioning: (1) differentiation of self, (2) triangles, (3) nuclear emotional process, (4) family projection process, (5) multigenerational transmission process, (6) sibling position, (7) emotional cutoff, and (8) societal emotion process. Some of the main goals of therapy include reframing the family problem as a multigenerational problem that is caused by factors outside the individual and to lower the family "emotional turmoil" (Bowen, 2004; Bowen Center for the Study of the Family, 2011).

Structural family therapy (*SFT*). SFT is a way to address problems within the family by looking at the invisible rules or boundaries which help its functioning (family rules). The role of the therapist is to manipulate the therapy session in a way to accelerate change in the family, for example, by changing the seating of each family member. This helps the family members see the unbalance of the family system and the dysfunctional patterns that have developed (Minuchin, 1974).

Brief strategic family therapy (*BSFT*). BSFT aims to improve and change the family interaction patterns that have led to the disruptive behaviors in adolescents. Specifically, BSFT targets children between the ages of 6 and 17 that display or are at risk for developing behavior, conduct, and substance abuse problems. Specifically, BSFT focuses on inappropriate family alliances, poor boundaries (open vs. closed), and allows the parents to recognize the adolescent is not necessarily the cause for familial problems but the expression of dysfunctional family patterns (Szapocznik & Williams, 2000).

Functional family therapy (*FFT*). FFT is an intervention program that focuses on adolescents with disruptive behavior problems (conduct, alcohol, and/or substance abuse). The goal is to reduce the problem behavior while using an individualized nonjudgmental attitude, focusing on strengths and protective factors specific to each client. This intervention can be implemented in a variety of settings such as schools, probation and aftercare systems, and well as in mental health facilities (Alexander & Parsons, 1982).

Multisystemic therapy (*MST*). MST is an intensive family- and community-based treatment program that focuses on the entire "world" of chronic and violent juvenile offenders – their homes and families, schools and teachers, neighborhoods and friends (Heneggler, Schoenwald, Borduin, Rowland & Cunningham, 1998).

Other techniques, such as contextual therapy, focal family therapy, systemic therapy, and symbolic-experimental family therapy have also been used in family therapy (see Gurman & Kniskern, 1991, for an overview).

Marital Therapy

Traditional behavioral couple therapy (*TBCT*). TBCT attempts to increase the level of reinforcing exchange between the two partners. This approach classically aims at teaching more effective communication and problem-solving skills that will enhance the ability of the couple to effectively communicate as well as minimize punishment and maximize reward (Jacobson & Christensen, 1994; Jacobson & Margolin, 1979).

Cognitive behavioral couple therapy (*CBCT*). CBCT takes the basic principles of TCBT and incorporates partner's relationship assumptions, standards, expectancies, and attributions that contribute to the relationship distress (Baucom, Shoham, Mueser, Daiuto & Stickle, 1998; Epstein & Baucom, 2002).

Integrated behavioral couple therapy (*IBCT*). ICBT also takes the basic principles of CBCT and expands them to emphasize interventions aimed at increasing acceptance. The three components, empathetic joining, tolerance building, and detachment from the problem, are focused at enhancing the couple's ability to appreciate the differences in their marriage

(Christensen, Jacobson & Babcock, 1995; Jacobson & Christensen, 1998).

Emotion-focused couple therapy (EFCT). EFCT focuses on inner emotional experiences in combination with self-reinforcing interactions, based on adult attachments and attachment bonds. Therapists in this approach try to (1) access and reprocess the emotional experience of the partners' and (2) restructure the partner's interaction patterns. Partners are thought to learn new aspects about themselves and develop a more functional pattern of interaction with their partner that is cohesive with their specific attachment needs (Greenberg & Johnson, 1988; Johnson & Greenberg, 1985).

Integrated systematic couple therapy (*ISCT*). The specific goal of ISCT is not to resolve all of the issues causing distress but rather instigated a reversal of the negative interaction. ISCT is based on procedures from family and marital systems therapy and primarily targets the problem at the interaction level. Specifically, ISCT tries to initiate a reversal in the "fight cycle" by changing the meaning attributed to the situation. Empirical evidence exists for the efficacy of ISCT showing greater maintenance of marital satisfaction and goal attainment after the intervention (Greenberg & Goldman, 1985).

Insight-oriented therapy (*IOMT*). IOMT focuses on the interpretation of underlying intrapersonal and interpersonal dynamics between the couple partners contributing to the marital distress. IOMT also examines developmental issues, interactions, expectations, and maladaptive relationship patterns that may exist in the relationship. The role of the therapist is to guide the couple to gain a better understanding and clarification of each partner's unconscious feelings and beliefs that may be affecting the relationship (Snyder & Wills, 1989; Wills, 1982).

Coping-oriented couple therapy (*COCT*). COCT is based on stress and coping research in couples and cognitive behavioral couple therapy. It aims to enhance communication, problem-solving, and dyadic coping in both partners (Bodenmann, 2007, 2010). A main focus lies on dyadic coping and building mutual intimacy and understanding. A key element of this approach is the three-phase method. By means of this method the therapist aims to enhance mutual understanding for each partner's personal functioning (that becomes most evident in stressful situations) and its impact on the close relationship as well as the enhancement of mutual support that matches personal needs of the partner. Overall, this approach fosters (a) understanding for each partner's personality, (b) mutual dyadic coping, and (c) mutual intimacy, trust in the partner, cohesion, and emotional security (Table 1).

Prevention Programs

Several evidence-based programs aim to prevent marital distress (e.g., Couples Communication Program (CCP); Miller, Wackman & Nunnally, 1983; Premarital-Relationship Enhancement Program (PREP): Markman, Stanley & Blumberg, 1994, Couples Coping Enhancement Training (CCET); Bodenmann & Shantinath, 2004).

Efficacy of Marital and Family Therapy

The efficacy of family and couple therapies are well documented (Dunn & Schwebel, 1995; Shadish & Baldwin, 2005) including substantial mean effect sizes which demonstrate the effectiveness in relieving distress ($d = .74–.95$; Shadish, Montgomery, Wilson, Wilson, Bright & Okwumabua, 1993; $d = .50–1.30$; Shadish & Baldwin, 2003). Prior research has shown that approximately 70% of couples seeking evidence-based couple therapy report an improvement after therapy (Baucom et al., 1998; Christensen & Heavey, 1999), and more recent numbers suggest 46–56% of couples show significant clinical improvement (Christensen, Atkins, Baucom & Yi, 2010).

Application to Behavioral Medicine

Family and marital therapy techniques have been used to alleviate distress within the family, stemming from things such as communication issues or family dynamics. Nevertheless, some of these therapeutic approaches have been used for a range of behavioral and physical health problems (see Snyder, Castellani & Whisman, 2006 for

Therapy, Family and Marital, Table 1 Marital and family therapies

Marital and family therapies	Goal	Content
Family therapies		
Bowenian Family Therapy	Individuals are encouraged to look at the view they play in the family system, patterns of emotional reactivity, and interlocking triangles. In addition, the goal is to decrease anxiety	Examines how the family may operate as an "emotional system" using key concepts such as : triangles, differentiation of the self, emotional cutoff, and sibling position
Structural Family Therapy (SFT)	Address the problem in functioning within a family, in an attempt to restructure the family system's rules to become more flexible (Minuchin, 1974)	Therapist helps to show family how their family system may be unbalanced and to help the family see the dysfunctional patterns they have created. SFT also helps families move toward an understanding of how the behavior has developed into a positive feedback loop
Brief Strategic Family Therapy (BSFT)	Aims to improve family interaction and change family interaction patterns that have led to disruptive behaviors in adolescents (e.g., conduct problems, delinquency, and drug abuse) (Szapocznik & Williams, 2000)	BSFT operates on five basic concepts: (1) *context* – the behavior cannot be understood outside the context to which it occurs; (2) *systems* – the family is an interconnected entity that cannot be understood by just examining one member; (3) *structure* – provides the habitual and repetitive patterns of family interaction; (4) *strategy* – interventions tend to be practical, problem-focused, and planned; and (5) *content versus process* – the therapist's focus is on **how** the family members' interaction, not **what** the family members discuss, is the problem
Functional Family Therapy (FFT)	Family intervention program for adolescents with disrupting behavior problems (conduct, alcohol, and/or substance abuse). The goal is to reduce the problem behavior while using an individualized nonjudgmental attitude, focusing on strength/protective factors that are linked to each client (Alexander & Parsons, 1982; Alexander et al., 2000)	FFT operates on five major components: (1) *engagement phase* – the goal of this phase is to demonstrate a desire to listen and help. The therapist focuses on immediate responsiveness and maintains a strength-based focus; (2) *motivational phase* – the goals of this phase include creating a positive motivational context that will facilitate change, minimizing hopelessness, and changing the meaning of the family context to promote change; (3) *relational assessment* – the focus of this phase is on intra- and extra-familial context (e.g., values, interaction patterns, and sources of resistance, resources, and limitation); (4) *behavior change phase* – this phase helps build coping patterns, such as teaching communication as well as training conflict resolution; and (5) *generalization phase* – this phase focuses on extending positive family functions and helps the family plan for relapse prevention (e.g., using other family and community members for support)
Multisystemic Therapy (MST)	Intensive family and community-based treatment program that focuses on violent and criminal youth behavior (Heneggler et al., 1998)	MST views the child/adolescent embedded within interconnected systems: family, peers, school, neighborhood, and community/culture. Focus is on increasing parenting skills: spending time with children, teaching communication techniques and how to develop boundaries/ discipline, and teaching skills on how to deal with conflict. Help adolescents participate in positive activities (sports or extracurricular clubs) and create a supportive social network among family, peers, and community to maintain change

(*continued*)

Therapy, Family and Marital, Table 1 (continued)

Marital and family therapies	Goal	Content
Couple therapies		
Traditional Behavioral Couple Therapy	Attempts to increase the level of reinforcing exchange between partners Minimize punishment and maximize reinforcement (Jacobson & Margolin, 1979; Jacobson & Christensen, 1994)	Help couples identify positive behaviors that they can do for one another (e.g., show more affection). Help guide couples to engage in these behaviors and acknowledge when they occur (e.g., to give praise)
Cognitive Behavioral Couple Therapy (CBCT)	Examined the evidence about their thoughts about their partner Alter assumptions and standards, couple evaluates consequences of living according to their standards and assumptions about their partner (Baucom et al., 1998; Epstein & Baucom, 2002)	Use of cognitive restructuring strategies to modify different types of dysfunctional cognitions. Examine the interplay between thoughts, emotions, and behavior
Integrated Behavioral Couple Therapy (IBCT)	To help the couple think about the problem and identify feelings associated with that issue before one can accept them (Christensen et al., 1995; Jacobson & Christensen, 1998)	Educate couples that partners need to learn a way to alter negative emotional responses that make them and their partners unhappy Teaches couple new ways to resolve problems and emotions through three steps: (1) Empathetic joining, (2) tolerance building, and (3) detachment from the problem
Emotion-Focused Couple Therapy (EFCT)	Conceptualizes distress in adult romantic relationships in terms of attachment theory. Focus on re-establishing attachment bonds (Johnson & Greenberg, 1985; Greenberg & Johnson, 1988)	(1) Identify the negative interaction cycle of the conflict, (2) access unacknowledged feelings, (3) reframe the problem(s) in terms of underlying feelings, (4) promote identification with disowned needs and aspects of self, (5) promote acceptance by each partner; (6) facilitate the expression of needs and wants to restructure the interaction based on the new understandings, (7) establish the emergence of new solutions (cycles), and (8) consolidate new positions
Integrated Systematic Couple Therapy (ISCT)	Try to change meaning attributed to situation that caused distress. Aims to initiate a reversal in the "fight cycle" (self-perpetuating negative cycles that lead to changes in behavior) (Greenberg & Goldman, 1985)	(1) Define the issue presented, (2) identify the negative interactional cycle, (3) attempt restructuring, (4) reframe the problem using positive connotation followed by prescribing the symptom, (5) restrain using "go slow" and dangers of improvement, (6) consolidate the frame, and (7) prescribe a relapse
Insight-Oriented Marital Therapy (IOMT)	Emphasis is on the interpretation of underlying intra- and interpersonal dynamics that influence relationship distress (Wills, 1982; Snyder et al., 1989)	Focus on expectations, interactions, and maladaptive relationship rules using clarification and interpretation, to highlight unconscious feelings, beliefs, or thoughts causing the marital discord
Copying-Oriented Couple Techniques (COCT)	Teach couples the notion the better the partners *together* can cope with stress, the higher their chance for optimal marital satisfaction and stability. Bodenmann, Plancherel, Beach, Widmer, Gabriel & Meuwly, 2008)	Focus on educating the couple about the effects stress has on the relationship. Couples become aware of the influence of environmental factors on their close relationship. Focus on teaching dyadic copying that goes beyond the traditional models of interpersonal communication and social support in close relationships

a review). Additionally, CanCOPE is an education program developed for people facing cancer (personally or within the family). The focus of this program is to strengthen the resources within the family so that they can more effectively deal with the realities of cancer management (Scott, Halford & Ward, 2004). Family-based obesity treatment programs have also been

developed, and show that child–parent interactions can influence the outcome of obesity treatment (Temple, Wrotniak, Paluch, Roemmich & Epstein, 2006). Osterman, Sher, Hales, Canar, Singla and Tilton (2003) encourage health psychologists to incorporate more of a couple's perspective into illness, so that the partner can facilitate health-promoting attitudes and behaviors.

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► Family Stress

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Therapy, Occupational

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Synonyms

Ergotherapist; Occupational therapist

Definition

Therapy with focus on people's occupational performances and behavior that is using occupation as the therapeutic medium is carried out by registered or legitimated occupational therapists (ergotherapists). Major goals of occupational therapy and major roles of occupational therapists are to (a) manage environmental, temporal, and occupational adaptations that facilitate clients' way of life and well-being, (b) teach clients to learn or relearn performance of activities in daily life and work, (c) enable clients to be meaningfully occupied, and (d) promote clients' health and wellness through preventive measures (Söderback, 2009).

Description

Occupational therapy is concerned with the activities and occupations that make up the pattern of people's lives, and with people's capacity to carry out those activities in ways that support their health and well-being. For occupational therapists, the concept of *occupation* encompasses everything that people do in their daily lives, including self-care, domestic activities, interactions with others, work and leisure activities (Fidler & Fidler, 1978; WFOT, 2010).

Occupational therapists understand that occupation is essential to human development and learning, to social relations, to individual health and well-being and to the well-being of communities. Occupation enables the development and integration of bodily systems, promotes socialization, and verifies the individual's identity as a contributing member of society. Further, purposeful activity can mitigate the effects of disease or injury and prevent secondary disability (Creek, 2003). Occupational therapists are concerned with the impact of illness, injury, or disability on people's ability to carry out the activities and occupations that they want to do, need to do, or expect to do. The focus of intervention is not on the client's impairment or diagnosis but on the impact that illness or

disability can have on the individual's ability to carry out his or her expected daily activities. This means that the occupational therapist works not only with the client's functional problems but also with the *meaning* of illness or injury to his or her life. This has been called a two-body practice, because occupational therapy is concerned both with the physical body and with the whole person, including social, cultural, and psychological issues. The knowledge base that supports a two-body practice is necessarily broad and varied (Mattingly, 1994). Occupational therapists have a deep understanding of the importance of activity and occupation in people's lives and they also make use of relevant knowledge from the biological, medical, psychological, social, and technological sciences. Areas of knowledge include theory, research, policy, and legislation. In most countries, occupational therapy education is at bachelors or master's degree level, although the qualification is a diploma in some countries (College of Occupational Therapists, 2009). Occupational therapists are experts in assessing function in the activities of daily life, including personal care, mobility, domestic activities, social interactions, education, leisure, and work. When a person is unable to perform the activities of daily life to an acceptable standard, the occupational therapist can assist him or her to relearn the necessary skills, develop new skills, or adapt activities so that they are within the individual's capabilities. The occupational therapist can also recommend aids, equipment, and environmental modifications to support function or compensate for loss of function.

Occupational therapists practice a set of principles that influence both what is done and how the therapeutic relationship works. These principles include respect for diversity, customs and preferences; recognition of the client's rights; incorporation of the client's perspective at all stages of intervention; promotion of client autonomy and choice, and sharing power with the client and/or carer. Intervention does not follow a standard process but is highly individualized and specific to the client, the context, and the environment. This means that the way in which occupational therapy is practiced is strongly influenced by the social context in which the therapist is working, the work setting, government policies and standards, local norms and procedures, and the available research evidence (White, 2007). Person-centered intervention takes account of the individual's current circumstances, cultural background, social context, educational experiences, employment status, personal beliefs and values, skills, interests, needs, and aspirations. Interventions are designed to suit the person's living environment, family, neighborhood, workplace, financial situation, social networks, and support systems. An expert occupational therapist is able to engage with each service user within his or her own environments, to identify the activities that have meaning and relevance for each person and to work in partnership to devise individually tailored interventions. The occupational therapist works in collaboration with the client, families, caregivers, employers, teachers, coworkers, and colleagues to develop and deliver relevant and effective interventions. As far as possible, the client is engaged as an active partner throughout, and the intervention is carried out within his or her own living or working environments.

The core skills of the occupational therapist are collaboration with the client, assessment of function, problem solving, therapeutic use of activity, group work, and environmental adaptation. Activity is the main tool employed to achieve therapeutic goals: It can be used to develop and maintain skills, to improve occupational performance, to enhance self-esteem, and to increase social participation. Activities are chosen both for their potential to engage client participation and for their potential to meet treatment objectives. Throughout the intervention, activities are monitored and adapted to maintain client interest and therapeutic effectiveness.

Occupational therapists also use environmental adaptation to enhance functional and occupational performance. Changes to the client's environment have to be negotiated and agreed with the client and relevant others, taking into account the dynamics of the household or other setting. Environmental modifications may be made over time, as the client's circumstances

change. The therapist may also recommend the introduction of paid carers to improve the client's functional capacity and quality of life, or to relieve carers.

Occupational therapy has relevance for everyone who is experiencing occupational dysfunction and it is practiced in many countries throughout the world. In most countries, it is regulated as a health profession. The worldwide professional body for occupational therapy is the World Federation of Occupational Therapists: Member countries all have a national professional body and full member countries also have at least one approved program of occupational therapy education (White, 2007; Christiansen & Baum, 1997).

Occupational therapists are working in a wide range of public, private, and voluntary sector settings, although most occupational therapists work in the fields of health and social care. People of all ages, who have functional problems arising from physical, psychological, social, educational, economic, or other difficulties, participate in occupational therapy. Clients may be individuals, groups of people, communities, health and social care agencies, or other organizations. Individual clients may be hospital or community patients, schoolchildren, workers, compensation claimants, caregivers, homeless people, or anyone who is experiencing occupational dysfunction. Group clients can be families, coworkers, paid carers, or groups of patients. Some occupational therapists work in the areas of public health, occupational health, or health promotion. They may work in the field of law as expert witnesses or consultants, for example, carrying out assessments to ascertain the level of disability sustained following an accident (Radomski & Trombly, 2008). Occupational therapy contributes to the treatment of, and early recovery from, injury and disease, and is making an increasing contribution to health promotion and disease prevention. However, the profession's major role is in habilitation and rehabilitation: helping people to gain or regain the ability to perform their occupations and preventing secondary disability. Occupational therapists also work with people who have long-term or deteriorating health conditions, assisting them to remain active for as long as possible and slowing down the decline of functional ability (Christiansen & Baum, 1997).

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▶ Occupational Therapy

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Therapy, Physical

▶ Physical Therapy

Therapy, Speech

▶ Speech Therapy

Thoughts

► Cognitions

Thriving

► Perceived Benefits

Thrombosis

► Coagulation of Blood

Tinnitus

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Synonyms

Ringing in the ears

Definition

Tinnitus is a condition characterized by the perception of sound in the ears or head without the presence of an external source. Tinnitus itself is not a disease, but a symptom that can result from a number of different causes. Sounds heard can manifest in many different ways such as low to high pitched, heard in one or both ears, heard as a single noise or competing noises, or be heard intermittently or continuously. Sounds have been described as ringing, buzzing, blowing, humming, hissing, whooshing, hissing, and whistling among many others. Mild forms of tinnitus are very common and experienced by most people at some point in their lives. More severe forms, however, are less common and can lead to chronic sleep disturbance, anxiety, and depression.

Description

Tinnitus is generally categorized into two types: subjective tinnitus and objective tinnitus. Objective tinnitus is the less common of the two types and sound is not only heard by the patient, but also audible to other people, most often a clinician listening with a stethoscope or an ear tube. Pulsatile tinnitus is a common example of objective tinnitus. It is caused by muscle contractions or audible blood flow in arteries or veins (e.g., bruits) close to the inner ear that resonate as rhythmic pulsing in the ear. Subjective tinnitus is the most common form and is heard exclusively by the patient. This type of tinnitus has many causes and pathologies.

Although tinnitus is most often associated with abnormalities of the auditory or central nervous systems, it can also be caused by nonauditory etiologies. These include hypertension and cardiovascular disease, hypo- and hyperthyroidism, stress and fatigue, temporomandibular joint (TMJ) disorder, poor diet and physical inactivity, and wax buildup in the outer ear putting pressure on the tympanic membrane. Exposure to excessive noise is also a common cause of tinnitus, which can precede hearing loss and should therefore be an indicator of the need for protection from excessive noise exposure. Tinnitus associated with abnormalities of the auditory or central nervous systems including middle ear infections, damage to the inner ear, disorders that affect the central nervous system such as meningitis, encephalitis, and stroke; head and neck trauma; surgical injury; and tumors affecting the acoustic nerve (cranial nerve VIII); Meniere's disease (an inner ear disorder characterized by hearing loss vertigo, and tinnitus); and vestibular schwannoma (e.g., acoustic neuroma). Over 200 ototoxic medications are associated with inducing tinnitus. These medications include aspirin, some

antibiotics, diuretics, cancer chemotherapy drugs, and quinine.

With many causes of tinnitus, treatment of the underlying disease often alleviates symptoms. Drug therapies include benzodiazepines, anticonvulsants, antidepressants, vasodilators, tranquilizers, and antihistamines. Acamprosate, a drug used to treat alcohol dependence, has shown to have potential as a treatment, as well as zinc and gabapentin. Antiarrhythmic agents such as lidocaine have also shown to have tinnitus-suppressing qualities.

Hearing aides are another modality shown to benefit patients. Loss of hearing often increases awareness of tinnitus and a hearing aid, which amplifies external sound, often helps mask the perception of tinnitus. Wearable sound generators or tinnitus maskers are also used. These devices fit into the ear much like a hearing aid and deliver low-level sound directly into the ear.

Cochlear implant is a treatment used in patients whose tinnitus is accompanied by severe hearing loss. Electrical and magnetic stimulation treatments include transcranial magnetic stimulation and trans-electrical nerve stimulation. Cognitive behavioral therapy treatments include tinnitus retraining therapy (TRT), tinnitus activities treatment, sound therapies, auditory discrimination therapy, and neurofeedback. Alternative therapies for tinnitus have included acupuncture, hypnosis, craniosacral therapy, antioxidants, vitamin and herbal remedies.

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Tinnitus and Cognitive Behavior Therapy

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Synonyms

Hearing disturbances; Perception of internal noise (false)

Definition

Tinnitus is an auditory perceptual phenomenon that is defined as the conscious perception of internal noises without any outer auditory stimulation. The sounds may be very loud and bizarre, and the most common ones are heard like a high-pitched musical tone or a rushing sound like escaping steam or air. Other descriptions can be more complicated such as metallic sounds, multiple tones of varying frequencies, and mixtures between buzzing and ringing.

Tinnitus is in most cases a temporary sensation, which many people have experienced at least sometime in their life. However, it may develop into a chronic condition, and prevalence figures show that at least 10–15% of the general population have tinnitus. Fortunately, most persons do not have severe tinnitus. Only about 1–3% of the adult population has severe tinnitus, in the sense that it causes marked disruption of everyday activities, mood changes, reduced quality of life, and disrupted sleep patterns. Tinnitus has been reported in children, but in its severe form, it is more common in adults and in particular in the elderly.

Tinnitus is known to occur in association with almost all the dysfunctions that involve the human auditory system. This includes damage to the middle ear, the cochlea, the audiovestibular cranial nerve, and pathways in the brain from cochlear nucleus to primary auditory cortex.

A common distinction is often made between so-called objective (somatosounds, which can actually be heard from the outside) and subjective tinnitus (that are heard only by the afflicted person). Objective tinnitus represents a minority of cases. Subjective tinnitus has been linked to sensorineural hearing loss, caused by various deficits such as age-related hearing loss and noise exposure. Links to other conditions such as temporomandibular joint dysfunction have also been found. Tinnitus has been explained as the result of increased neural activity in the form of increased burst firing or as a result from pathological synchronization of neural activity. Other suggested mechanisms are hypersensitivity and cortical reorganization. With the advent of modern imaging techniques, it has been observed that tinnitus involves certain areas of the brain, particularly those that are related to hearing and processing of sounds. Some involvement of the brain's attentional and emotional systems has also been seen (Cacace, 2003).

Description

Distress and Tinnitus

What distinguishes mild from severe tinnitus is not easily established, apart from variations in subjective ratings of intrusiveness and loudness. In particular, in attempts to determine the handicap caused by tinnitus, it has not been possible to make the determination using the characteristics of the tinnitus itself (e.g., loudness, pitch, etc.). However, psychological factors are of major importance in determining the severity of tinnitus, and this has been observed in both clinical and epidemiological studies.

The problems experienced by tinnitus patients can be divided into four categories: hearing difficulties including noise sensitivity, emotional consequences, concentration problems, and insomnia. In addition, there might be interpersonal consequences and occupational difficulties (e.g., for a musician, admitting tinnitus can be regarded as a sign of weakness).

Hearing loss is the most common symptom that goes together with tinnitus and that can in itself be a great problem. Another common problem is noise sensitivity, which in its severe form can develop into hyperacusis, which is sensitivity to everyday sounds not regarded as loud by most people.

In its severe form, tinnitus is strongly associated with lowered mood and depression. Suicide caused by tinnitus is however rare. Most cases reported have had comorbid psychiatric disturbances. Anxiety, and in particular anxious preoccupation with somatic sensations, is an aggravating factor, and stress is often mentioned as a negative factor for tinnitus and in particular in association with major adverse life events, but the evidence for this notion is weak. Personality factors have been investigated, and associations have been reported between degree of optimism and tinnitus distress (Andersson, 1996) and between perfectionism and tinnitus distress (Andersson Airikka, Buhrman, & Kaldo, 2005).

Tinnitus patients often report difficulties with concentration, for example, with reading. Often this is perceived as auditory intrusions while trying to hold concentration on a task. Until recently, there have been few attempts to measure tinnitus patients' performance on tests of cognitive functioning, but recent research implies a role of the working memory system (Hallam, Shurlock, & McKenna, 2004). Another line of research has focused on the role of selective information processing. Finally, sleep problems represent a significant element in tinnitus patients' complaints and are often a driving reason for seeking help.

Theories

Among the most influential psychological theories on why tinnitus becomes annoying is Hallam et al.'s (1984) habituation model of tinnitus, which presents the notion that tinnitus annoyance is caused by lack of habituation, and the neurophysiological model by Jastreboff and coworkers (Jastreboff, 1990), which is a classical conditioning model where the tinnitus signal is conditioned to aversive reactions such as anxiety and fear. The latter model puts less emphasis on conscious mechanisms involved in tinnitus perception. Other researchers have endorsed

a cognitive-behavioral conceptualization of tinnitus, suggesting a major role for thoughts and beliefs regarding tinnitus (Andersson, 2002).

In clinical settings, management of tinnitus involves taking history of its characteristics such as onset, loudness, character, fluctuations, and severity. Audiological and neuro-otological measurements such as pure-tone audiometry, otoscopy, and brain stem audiometry are also included in routine assessment to exclude treatable conditions (Andersson, Baguley, McKenna, & McFerran, 2005).

Treatments

There is a long history of attempts to cure tinnitus, but surgical and pharmacological interventions have been largely without any success. When the aim is to reduce the suffering, treatment outcome is more promising, and psychologically informed treatments have been found to be helpful in randomized trials (Andersson & Lyttkens, 1999).

Among the psychosocial treatments, cognitive-behavioral therapy (CBT) is the most researched alternative. As for other medical conditions such as chronic pain, CBT for tinnitus distress is directed at identifying and modifying maladaptive behaviors and cognitions by means of behavior change and cognitive restructuring. The focus is on applying techniques such as applied relaxation in real-life settings. An overview of the techniques used in CBT for tinnitus is presented in the Table. There is now evidence from randomized trials that CBT can be effective for alleviating the distress caused by tinnitus in adults (e.g., Hesser, Weise, Zetterqvist Westin, & Andersson, 2011), including a trial on the use of CBT with older adults, and also that it works in a self-help format presented via the Internet (Kaldo et al., 2008). However, while the effects are promising, there is room for more improvement, and tinnitus is a typical example of an area where multidisciplinary input is necessary. Most recent development in CBT for tinnitus is to incorporate treatment procedures from acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999).

Tinnitus and Cognitive Behavior Therapy, Table 1 Overview of cognitive-behavioral treatment for tinnitus

Case formulation
Structured clinical interview following audiological screening
Questionnaire assessment
Treatment rationale and information
Treatment presented in 6–10 sessions
Applied relaxation (1. progressive relaxation, 2. short progressive relaxation, 3. cue-controlled relaxation, and 4. rapid relaxation)
Positive imagery
Sound enrichment by means of external sounds
Hearing tactics and advice regarding noise sensitivity
Modification of negative thoughts and beliefs
Behavioral sleep management
Advice regarding concentration difficulties, exercises of concentration (mindfulness)
Exposure to tinnitus
Advice regarding physical activity
Relapse prevention
Follow-up
Interview and questionnaires

Conclusion

Tinnitus is a poorly understood phenomenon, and while the role of psychological factors is widely acknowledged, there is yet little research on basic mechanisms such as information processing bias, the role of psychopathology, and the influence of the tinnitus sound on working memory capacity. While there are few cases of tinnitus for which surgical and medical interventions might help, in most cases, there is no cure in the sense that the tinnitus sound will not disappear. However, longitudinal fluctuations of both loudness and severity of tinnitus have been observed, and health psychologists could benefit in the pursuit of an explanation why it is that tinnitus becomes bothersome only for a proportion of individuals. When it comes to methods to lessen the distress and to cope with the adverse consequences, such as lowered mood and sleep difficulties, CBT is a promising approach. However, the dissemination of CBT into audiological hospital settings has been slow, and there are very few clinical

psychologists working with tinnitus. Self-help methods are promising and could at least partly solve that problem, and there is also much to be done regarding preventive work as noise-induced hearing loss is the cause of tinnitus in one third of cases with recent onset of tinnitus (Table 1).

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► Cognitive Behavioral Therapy (CBT)

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Tiredness

► Fatigue

Tissue Repair

► Wound Healing

Tobacco

► Nicotine

Tobacco Advertising

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Synonyms

Tobacco marketing; Tobacco promotion

Definition

Tobacco advertising is a form of communication by the tobacco industry with the aim of promoting tobacco products (typically cigarettes) and use. Different forms of advertising can be classified into "above the line" (ATL) and "below the line" (BTL) advertising. ATL advertising is traditional mass media advertising in print, television, radio, in cinemas, and on billboards. BTL advertising focuses more on specific target groups and uses less traditional advertising methods, such as sponsoring, promotion, event marketing, point-of-sale displays, product placements, direct marketing, ambient marketing, viral marketing, or brand stretching. Most research on the effects of tobacco advertising focuses on ATL advertising. However, the importance of BTL

tobacco advertising is growing in the light of bans or partial bans of traditional tobacco advertising in most countries.

Description

A fundamental premise for the tobacco industry to spend money into tobacco advertising is the assumption that it is effective. The term "effective" can refer to different levels or "outcomes." It can either mean that tobacco advertising increases the market share of a specific brand, given a fixed market size for tobacco products. It can also mean that tobacco advertising increases or stabilizes the market size, by recruiting new smokers and by stimulating current smokers not to quit or ex-smokers to relapse. Empirical research conducted by non-industry-funded researchers has mainly focused on the latter interpretation of effectiveness, which is the one with high impact from a public health perspective.

One type of study in this field has analyzed changes in the global or country-specific tobacco market size dependent on advertising spending or dependent on changes in tobacco policy (e.g. implementation of advertising bans). These studies are usually time series or interrupted time-series designs and use highly aggregated data. While many of the early econometric studies found no association between aggregate cigarette advertising spending and total market sales, there are also studies that found positive relations, especially if the aggregation of the data was reduced (Saffer & Chaloupka, 2000). Studies that compare countries with and without advertising bans or that conduct comparisons within a country before and after an advertising ban often find that bans reduce overall consumption of tobacco (Quentin, Neubauer, Leidl, & Konig, 2007). The effect is stronger in countries with comprehensive bans compared to partial bans.

A second type of studies uses individual-level data, looking at the effects of tobacco advertising on smoking behavior, mostly of young people. These studies are either experimental and quasi-experimental studies or cross-sectional and longitudinal observational studies. The effect of tobacco advertising is usually studied in terms of individual exposure to tobacco advertising. This is some form of induced exposure in the experimental studies or a measure of self-reported advertising exposure in the observational studies. Measures of exposure can be direct (e.g., advertising recall, brand recall, notice of advertising, liking of advertising, ownership of promotional items) or indirect (e.g., television screen times, reception and liking of specific television programs, movies, sports, or magazines). A 2006 systematic review of the empirical evidence based on individual-level studies found 29 studies from 5 continents with more than 300,000 participants (DiFranza et al., 2006). The authors concluded that there is strong evidence for a link between exposure to tobacco promotion and tobacco use of children and adolescents. Applying Hill's criteria for judging the likelihood of a causal relationship between exposure and behavior, the authors found that many of Hill's criteria of causation were fulfilled (Hill, 1965). They found that (1) children are exposed to tobacco promotion before the initiation of tobacco use (criterion temporality), (2) exposure increases the risk for initiation (criterion strength), (3) greater exposure results in higher risk (criterion dose–response), (4) the increased risk is robust (criterion consistency), (5) the risk is scientifically plausible (criterion plausibility), and (6) no other explanation can account for the evidence (criterion analogy). A recent study additionally confirmed the Hill criterion "specificity" (Hanewinkel, Isensee, Sargent, & Morgenstern, 2011).

It is less explicitly studied *how* this effect is mediated, i.e., how tobacco advertising leads to an increase in market size. However, tobacco advertising is not systematically different from other forms of advertising and can, therefore, be conceptualized within broader psychological and marketing theories. Most psychological theories of advertising can be classified as "hierarchy of effects" models (Vakratsas & Ambler, 1999). These models suggest that advertising is not directly influencing behavioral responses, but that the effects are always mediated by a mental process. In the broadest sense, this mental process is a change in object valence, the object being the brand, the product, the product group, or the advertising itself. The most common models used to

explain the effects of advertising are based on the information processing approach (McGuire, 1976). They assume that people are persuaded by the contents of the advertising and consciously follow a cognitive path which is mediated by preferences, attitudes, norms, and beliefs about the advertised object. Newer variants of these models are the so-called dual-process models which conceptualize two routes of information processing, a central route and a peripheral route (Eagly & Chaiken, 1993; Petty & Cacioppo, 1986). The central route is activated if advertising contents are thoughtfully elaborated and recipients have high involvement and attention. On the peripheral route, information is less thoughtfully processed (low involvement) which happens if advertisings are consumed rather casually. Recipients with low involvement are more influenced by peripheral or emotional characteristics of the advertising (e.g., attractiveness of the source, colors, music). Most recent psychological theories even go a step further and assume that conscious mental processes are not a necessary precondition for behavioral influences (Bargh, 2002; Harris, Bargh, & Brownell, 2009). From this perspective, advertising is a form of behavioral priming that automatically affects the perceiver. The term "automatic" implies that the consumer does not have to be aware of having seen the advertising and also does not have to be aware that she/he responded to it. Such conceptions of advertising effects have, of course, strong implications for prevention strategies as it may be very difficult to counteract unconscious advertising effects.

Cross-References

► Tobacco Control
► Tobacco Use

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Tobacco Cessation

► Smoking Cessation

Tobacco Control

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Synonyms

Secondhand smoke; Smokeless tobacco; Smoking; Smoking cessation; Smoking prevention; Tobacco policy

Definition

Tobacco control includes all measures aiming at reduction of tobacco use and of its harmful consequences in the population.

Thus, tobacco control includes measures aiming at both prevention and cessation of use of all tobacco products – both smoking and use of smokeless tobacco.

Description

Introduction

The great health risks from smoking have been convincingly shown since the 1950s. It is now known that all forms of tobacco use, i.e., smoking and use of smokeless tobacco, are addictive and potentially lethal. Scientific evidence confirms that smokers have significantly elevated risks of death from many cancers, cardiovascular and respiratory diseases, and many other fatal conditions (US Department of Health and Education and Welfare, 1972). The harmful effects of secondhand smoke have also been convincingly established (Öberg, Jaakkola, Woodward, Peruga, & Prüss-Ustün, 2011).

Tobacco is a highly addictive substance that directly kills half of its users, as well as many nonsmokers exposed to secondhand smoke. There is no safe form of tobacco use or no safe level of exposure to secondhand smoke.

It is estimated that currently about 1 billion of men (nearly 50% of adult men) and about 250 million women (over 10% of women) in the world smoke. Smoking rates among men seem to have peaked, but among women, they are still increasing on global scale.

Tobacco kills currently annually some six million people (about 10% of world deaths), and with current trends some eight million people annually by 2030. Of the tobacco deaths some three fourth occur in low- and middle-income countries, and generally proportionally more among lower socioeconomic segments of the population. The economic costs of tobacco-related harms are enormous: both the direct costs to health services and the indirect societal costs (Shafey, Eriksen, Ross, & Mackay, 2009).

Health professionals started to warn about the harmful consequences of tobacco use already in the 1950s. Because of the disinformation and lobbying of the big tobacco industry, policy actions to reduce tobacco use started much later, generally only in the 1980s and the 1990s. A milestone was the adoption of the WHO Framework Convention on Tobacco Control (FCTC) in 2003 (World Health Organization [WHO], 2003). Currently, over 170 countries have ratified the convention that is a pioneering example of use of international law in the field of public health. FCTC covers all the main elements of tobacco control.

Elements of Tobacco Control

Reduction of Demand for Tobacco

Education and communication: Included are comprehensive educational and public awareness programs on the health risks and on the addictive nature of tobacco products and exposure to tobacco smoke. This includes also effective training programs on tobacco control to health workers, to other professional and community groups dealing potentially with tobacco control, as well as to decision makers.

Tobacco cessation: Stopping tobacco use is often difficult because of strong physical addiction to nicotine and to the psychosocial dependence to the habit. During the last few decades, pharmacological and nonpharmacological (psychological, educational) methods have been developed to effectively help smokers and other tobacco users to quit the habit. Tobacco control policies include measures to provide tobacco users access to cessation services.

Elimination of tobacco advertising and promotion: An important background for the global tobacco epidemic is the powerful push from the multinational tobacco industry in form of effective advertising, promotion, sponsorship, and lobbying of decision makers. Thus, important component of tobacco control is a comprehensive ban on advertising, promotion, and sponsorship. Here an international agreement is

especially important because of the cross-border spreading of advertising. It is also important to eliminate false or misleading messages about the tobacco products.

Price and tax measures: Price is an important aspect of use of any product. Accordingly, price and tax measures are effective and important means of reducing tobacco consumption, in particular among young persons.

Regulation on the contents of tobacco products: Although there is no safe tobacco products, authorities can introduce regulations on testing, measuring and levels of the contents and emissions of tobacco products. This can also include introduction of self-extinguishing cigarettes to reduce fires. National legislation can also regulate tobacco product disclosures.

Smoke-free environments: Exposure to tobacco smoke, especially indoors, is a health risk to everybody and especially to vulnerable population groups like children. At the same time, smoke-free environments discourage initiation and continuation of smoking. Thus, important elements of any tobacco control policies include prohibition of smoking in indoor workplaces, public transport, indoor public places, and also in other public places (e.g., stadia).

Packaging and labeling of tobacco products: Tobacco product packages and labels should not promote the product by any false, misleading, or deceptive messages. Such messages may include terms like "low tar," "light," "ultralight," or "mild." Tobacco products should carry large and clear health warnings in text or in form of pictures. Recently, also generic tobacco packages have been proposed.

Reduction of the Supply of Tobacco

Sale to minors: An important part of tobacco-related health work is prevention of tobacco use among children and youth, and moving the possible initiation to as late as possible. Thus, sale of tobacco to minors should be prohibited, and this legislation well enforced, e.g., by requiring the purchaser to provide appropriate evidence of age. Vending machines should be placed so that minors cannot use them. Regulations should also prohibit sale of tobacco products by minors, as well as sale of individual cigarettes or small cigarette packets.

Illicit trade: Surprisingly, large part of tobacco products used in the world is smuggled, manufactured illicitly, or counterfeited. Thus, elimination of illicit trade of tobacco products is important, and an issue in which international collaboration by authorities is especially needed.

Economic alternatives to tobacco business: Reduction of tobacco use calls also for reduction of tobacco growing. Thus, alternatives for tobacco growing should be encouraged, as well as also other viable alternatives for other tobacco-related occupations.

Other Aspects of Tobacco Control

Research, monitoring, and surveillance: Although the scientific base of tobacco control is very strong, further research is needed in several areas. It is also important that every country has own tobacco research. Monitoring of tobacco use trends in the population and its subgroups is crucial. It is also important to monitor many aspects of determinants and process of tobacco use as well as activities related to tobacco control.

Exchange of information: For the international collaboration and the reporting of the FCTC implementation exchange of tobacco control–related information is needed. This includes, e.g., information on legislative, administrative, and other tobacco control measures, as well information on tobacco use trends.

International collaboration in scientific, technical, and legal fields of tobacco control: Because of the global nature of the tobacco epidemic, also the tobacco control calls for strong international collaboration, much assisted by the international FCTC-related work.

Implementation of International Tobacco Control

The FCTC Convention Secretariat published in 2009 a summary report on the global progress in implementation of the FCTC (FCTC, 2009). The report concluded that the implementation levels vary substantially between different policy

measures. Overall, countries report high implementation rates for measures on packaging and labeling, sales to minors, and education, training, and public awareness. Rates remain low in areas like disclosure of marketing expenditures or programs for tobacco use cessation.

The implementation of tobacco control measures varies across different regions of the world. Also comparability of reports from different countries varies concerning both implementation measures and tobacco use data.

Overall, there seems to be notable progress in introduction and implementation of various tobacco control measures in most parts of the world.

Cross-References

- ▶ Health Promotion and Disease Prevention
- ▶ Public Health
- ▶ Risk Factors and Their Management
- ▶ Smoking Prevention Policies and Programs

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Tobacco Marketing

▶ Tobacco Advertising

Tobacco Policy

▶ Tobacco Control

Tobacco Promotion

▶ Tobacco Advertising

Tobacco Smoking and Health

▶ Smoking and Health

Tobacco Smoking Cessation

▶ Smoking Cessation

Tobacco Use

▶ Smoking Behavior

Tonic REM

▶ REM Sleep

Total Cholesterol

▶ Lipid

Total Cholesterol in the Blood

▶ Lipid, Plasma

Total Sleep Time

▶ Sleep Duration

Touch

▶ Massage Therapy

Traditional Chinese Medicine

▶ Acupuncture

Trail-Making Test

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Synonyms

Trails

Definition

This term refers to a widely used test assessing organized visual search, planning, attention, set shifting, cognitive flexibility, and divided attention (Rabin, Barr, & Butler, 2005), all capacities thought to be executive in nature. Originally developed by Partington (Brown & Partington, 1942), it was first published as part of the *Army Individual Test Battery* (1984). The test is currently available in public domain (see Lezak, Howieson, Loring, Hannay, & Fischer, 2004; Strauss, Sherman, & Spreen, 2006) and revised versions (e.g., Reynolds, 2002) and as part of a number of assessment batteries (e.g., Delis, Kaplan, & Kramer, 2001).

The standard trail-making test (TMT) contains two parts: Trails A and Trails B, which usually takes no more than 5–10 min to complete. In Trails A, the subject draws lines to connect consecutively numbered circles, drawn on a single A4 sheet (1-2-3. . .). In Trails B, the subject connects consecutively numbered and lettered circles, alternating between them (1-A-2-B-3. . .) on a second sheet. The subject is asked to connect the numbers, or numbers and letters, as fast as possible without lifting the pencil from the sheet. Revised versions (e.g., Delis et al., 2001; Reynolds, 2002) usually contain an equivalent to Trails B, plus up to four other subtests designed to help the assessor distinguish the cause(s) of difficulties in the switching task, such as number or letter sequencing, visual scanning, or motor deficits.

The main performance measure is time taken to complete the sequence, but errors are commonly recorded as they can also be clinically useful (Lezak et al., 2004). Because of the significant motor requirements of the task, normative data must be age-stratified (e.g., Mitrushina, Boone, & D'Elia, 1999; Tombaugh, 2004). Education-based norms are also recommended (Tombaugh, 2004). Generally, Trails B is thought to require more executive skills because it requires shifting between sequences (Kortte, Horner, & Windham, 2002). Evidence suggests that the difference between Trails A and B, or their ratio, may be "cleaner" indices of executive function by controlling for baseline motor, visual tracking, and sequencing abilities (Arbuthnott & Frank, 2000; see e.g., Hester, Kinsella, Ong, & McGregor, 2005, for difference and ratio norms). Indeed, fMRI evidence supports this view: Zakzanis, Mraz, & Graham (2005) found greater left frontal activation in the dorsolateral prefrontal cortex during Trails B than Trails A.

Both parts of the TMT are highly sensitive to dementia and brain injury, including Parkinson's (Goldman, Baty, Buckles, Sahrmann, & Morris, 1998) and Alzheimer's disease (Chen et al., 2000). Importantly, deficits in TMT performance predict everyday activities of daily living difficulties (Bell-McGinty, Podell, Franzen, Baird, & Williams, 2002) and mortality (Vazzana et al., 2010) and may indicate preclinical Alzheimer's dementia (Chen et al., 2000).

Cross-References

- ▶ Executive Function
- ▶ Neuropsychology

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Trails

- ▶ Trail-Making Test

Trait Anger

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Synonyms

Hostile affect; Hostility

Definition

Trait anger is described as a dispositional characteristic where one experiences frequent anger, with varying intensity (e.g., mild irritability, intense rage), and is often accompanied by related negative emotions such as envy, resentment, hate, and disgust (Buss, 1961; Siegman & Smith, 1994). There is considerable construct overlap between hostile dispositions and trait anger, making it difficult to disentangle. Martin, Watson, and Wan (2000) have proposed a three-factor model of trait anger, which includes the anger-related affect, behavior (i.e., aggression), and cognitions (i.e., cynicism), similar to several of the subscales

of the Cook-Medley Hostility Scale (Barefoot, Dodge, Peterson, Dahlstrom, & Williams, 1989). A frequently used measure of trait anger is the Spielberger State-Trait Anger Expression Inventory (STAXI), which measures trait anger as having a proneness to experiencing anger either as a general tendency (*Anger temperament)*, or with provocation (*Anger Reactions*) (Spielberger, 1988, Spielberger & Sydeman, 1994). Furthermore, Speilberger describes three different styles of anger expression: (1) showing anger emotions (*Anger-Out*), (2) preventing anger from being expressed but still experiencing it internally (*Anger-In*), or (3) having the initial affective response but then regulating it well (*Anger-Control*) (Spielberger, 1988).

Behavioral medicine research has documented associations of trait anger, and the related constructs of hostility, with greater cardiovascular disease incidence and progression (al'Absi & Bongard, 2006; Chida & Steptoe, 2009; Miller, Smith, Turner, Guijarro, & Hallet, 1996; Siegman & Smith, 1994; Smith, Glaser, Ruiz, & Gallo, 2004). Although poor health behaviors are thought to partially explain these associations (Everson et al., 1997; Siegman & Smith, 1994), it is also likely that this trait disposition contributes to worse health through the repeated emotionally driven activation of the neuroendocrine stress response and its associated downstream biological effects, including increases in blood pressure, inflammation, and oxidative stress (Carroll et al., 2010, 2011; Greeson et al., 2009; Smith & Gallo, 1999; Suarez, Kuhn, Schanberg, Williams, & Zimmermann, 1998). Further work is needed to better define the mechanisms of this association.

Cross-References

- ▶ Anger Expression
- ▶ Anger, Measurement
- ▶ Anger-In
- ▶ Anger-Out
- ▶ Hostility, Cynical
- ▶ Hostility, Measurement of

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Trait Anxiety

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Definition

Trait anxiety refers to the stable tendency to attend to, experience, and report negative emotions such as fears, worries, and anxiety across many situations. This is part of the personality dimension of neuroticism versus emotional stability. Trait anxiety also manifests by repeated concerns about and reporting of body symptoms. Trait anxiety is characterized by a stable perception of environmental stimuli (events, others' statements) as threatening. Trait-anxious people often experience and express also state anxiety, in situations in which most people do not experience such responses. This bias is thought to reflect a cognitive-perceptual bias. At the perceptual level, there is an overattentional bias to threatening stimuli. At the cognitive level, there is a distorted negative interpretation of information congruent with and fostering anxious responses. Finally, at the level of memory, there is overrecall of threatening information. These three biases are common in people with a trait-anxious personality type and have important etiological roles in various types of affective disorders (Mathews & Macleod, 2005). Trait anxiety is commonly assessed with the state-trait anxiety inventory – trait version (Spielberger, Gorsuch, & Lushene, 1970), though other instruments exist as well. Trait anxiety is an important predictor and moderator in behavior medicine. For example, trait anxiety predicts functional recovery following spine surgery, risk of posttraumatic stress disorder, as well as adaptation to and risk of death following myocardial infarction (e.g., Szekely et al., 2007). These relationships could occur since trait anxiety is related to various coping strategies and to various neurophysiological responses. For example, high trait-anxious people demonstrate greater activity in the amygdala and reduced activity in the inhibitory dorsal anterior cingulate cortex, during extinction of fear responses (Sehlmeyer et al., 2011). This brain pattern can explain their increased vulnerability for psychological disorders and adaptation problems. As such, this psychological trait deserves attention in research and clinical applications of behavior medicine. The underlying causes, mechanisms for contributing to poor health outcomes, and ways for reducing the consequences of trait anxiety are important avenues of research for the benefit of clinical practice.

Cross-References

▶ Anxiety and Heart Disease
▶ Anxiety and Its Measurement
▶ Anxiety Disorder

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Traits

▶ Personality

Trans Fats

▶ Fat, Dietary Intake
▶ Trans Fatty Acids

Trans Fatty Acids

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Synonyms

Trans fats

Definition

Trans fatty acids are unsaturated fatty acids with one double bond in the *trans* structural configuration as opposed to the *cis* conformation. These differences in conformation likely have consequences in the development of atherosclerosis secondary to diets rich in trans fatty acids. Dyslipidemia and adverse health outcomes have been linked to frequent consumption of *trans* fatty acids. While *trans* fatty acids do appear in nature, the vast majority in industrialized-world diets are manufactured to promote shelf life stability and enhance flavor in prepared foods. Preventative approaches to cardiovascular disease prevention and management include elimination of *trans* fatty acid consumption (Curhan & Mitch, 2007). Certain municipalities, such as New York City, have recently enacted prohibitions against the use of *trans* fatty acids in restaurant food.

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Transactional Model

▶ Cognitive Appraisal

Transcendental Meditation

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Synonyms

Attention training; Concentration; Contemplation; Meditation; Mental training

Definition

Transcendental meditation (TM) is a meditation technique that has its origins in the ancient Vedic tradition of India. In the 1960s, Maharishi Mahesh Yogi introduced this meditative technique to the western world in a simple, nonreligious fashion, and since then TM has been practiced by millions of people worldwide. A considerable amount of research has been conducted on the effects of TM on physiological and psychological outcomes. Overall, the results of this research indicate that the practice of TM has beneficial effects in individuals with chronic health conditions as well as healthy people.

TM is classified as a concentrative meditation technique. The method consists of twice-daily 20 min practice in which the individual focuses on their mantra which is individually prescribed by a certified instructor. The individual is

instructed to sit in a relaxed posture in a quiet environment and focus on the silent repetition of their mantra in their mind to the exclusion of other thoughts or feelings.

As concentration deepens, feelings of calm or tranquility are experienced. Research has shown that when individuals practice this type of meditation, they experience a restful hypometabolic state in which their respiration, heart-rate, blood pressure, muscle tension, and other indicators of sympathetic nervous system activation all decrease. This state of hypometabolic, restful alertness has been termed "the relaxation response." The relaxation response can be reliably elicited by the repetition of a mental stimulus (e.g., a mantra) while the individual adopts a relaxed mental attitude in a quiet environment.

Cross-References

- ▶ Meditation
- ▶ Mindfulness
- ▶ Relaxation

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Transducer

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Definition

In physics, a transducer is a device or system which converts one type of energy to another type. In biology, this term can refer to cells or intracellular elements which transform one form of input into another. Both are applicable for behavior medicine. Looking at devices, transducers are found in any machine which measures bodily parameters and depicts them electronically. A device measuring heart rate or pulse can detect changes in light in blood vessels, which reflect amount of blood as a function of one's heart rate. These changes in light are sensed, for example, by photoresistors, which are then translated to changes in electrical energy (current), which is then translated to digital numbers reflecting the rate of change in heart rate. Such devices are pivotal in medical diagnosis and in psychophysiological research. Another example of a device would be a galvanic skin conductance measure, which detects changes in electrical conductance of the skin, which reflects sympathetic activity and input into the skin. The conductance is translated into a digital representation, to reflect sympathetic activity. This too is used in psychophysiological research on stress responses.

Biologically, numerous transducers exist in the pathways of the sensory system and in cells. In the eyes, for example, the retina contains numerous photoreceptor cells that contain

molecules called opsins. These photoreceptor cells synapse onto neuronal pathways and, via signal transducers, convert light energy detected by the opsins to neuronal energy, for visual processing in the brain. In the auditory system, sound reaches the middle ear after being channeled by the ear's shape. The eardrum and bones carry vibrations to the inner ear, where physical movements are transformed to fluid movement in the cochlea. This fluid movement excites hair cells in the basilar membrane that generates, via transduction, neuronal signals to the auditory cortex for higher auditory processing. Another example is the neuroendocrine transducer, where a neuron, for example, in the pituitary gland, translates electrical stimulation in its input to secretion of hormones at its output. In recent years, the vagus nerve has been found to be a pivotal neuroimmune transducer since its paraganglia express receptors for interleukin-1. Upon signaling by that cytokine, neuronal information is carried to the brain via acetylcholine, thus translating immune to nerve information, which then triggers several negative feedback anti-inflammatory loops (Tracey, 2009). Transducers also play major roles in diseases. In cancer, for example, among multiple intracellular signaling pathways, the signal transducer and activator of transcription 3 (STAT3) is a transcription factor which is active upon extracellular activation by many signals including cytokines and growth factors. STAT3 plays a role in cell apoptosis and growth. In some cancers, constant activity of STAT3 is related to procarcinogenic activity and to poor prognosis (e.g., Alvarez, Greulich, Sellers, Meyerson, & Frank, 2006). Thus, transducers are omnipresent in the body (or in devices) and are crucial for communication between the body and the external world as well as between different types of signals inside the body, in relation to health and disease.

Cross-References

► Psychophysiological

References and Readings

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Trans-fatty Acids

► Fat: Saturated, Unsaturated

Transfer RNA

► RNA

Transformational Coping

► Posttraumatic Growth

Translational Behavioral Medicine

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Synonyms

Implementation; Integrated behavioral medicine research, practice, policy; Research to practice translation

Definition

Translational behavioral medicine (TBM) is an approach that concerns the transfer of knowledge

from the psychosocial and biomedical sciences in order to develop behavioral interventions to improve health, evaluate the effectiveness of those interventions, and study and improve their implementation in practice and policy. The overarching objective of TBM is to advance, integrate, and actualize knowledge from the research, practice, and policy arenas to improve the health of individuals and communities. *Translational Behavioral Medicine: Practice, Policy, Research*, a scholarly professional journal devoted to the topic, was established in 2011 by the Society of Behavioral Medicine, with founding editor, Bonnie Spring.

Description

In 2001, the Institute of Medicine (IOM) published a report on the quality of health care in the United States. The IOM perceived a chasm between the health care Americans receive and the kind they could and should receive. They attributed this gap largely to inadequate translation of scientific discoveries into actual practices. An often-cited statistic is that it takes 15–20 years for a scientific discovery to influence clinical practice (Balas and Boren, 2000). Moreover, even when a research-supported treatment does become recognized as a best practice, practitioner adherence is highly variable.

"Translation" is the process of adapting theoretical principles and empirical findings from research so that these can be applied to the worlds of clinical and public health practice (Sung et al., 2003; Westfall, Mold, & Fagnan, 2007; Woolf, 2008). The translation process proceeds through a series of phases, as illustrated in the conceptual model by Westfall et al. (2007), shown in Fig. 1.

T1 Translation

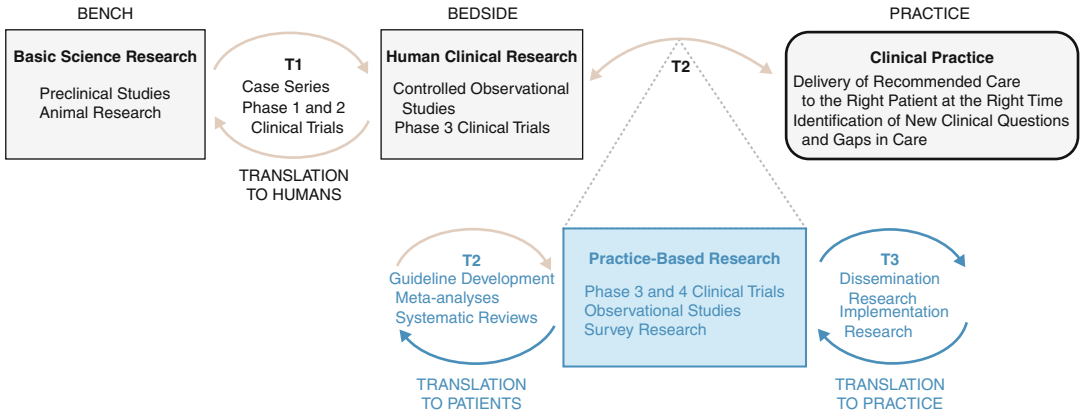
The first translational phase (T1) is focused on using knowledge obtained from the study of basic biological, psychosocial, and behavioral processes to inform the development and refinement of promising interventions for health conditions. T1 research is sometimes called "bench to bedside," as it provides the first link from basic science to human clinical studies. Basic scientists address fundamental questions about mechanisms that underlie human functioning. T1 researchers then apply these understandings of biopsychosocial mechanisms to develop efficacious behavioral interventions and assessments of how they work. T1 research can be performed using a number of different types of research designs.

Case Series

A case series (or clinical series) is a form of observational research design. In a T1 case series to develop a new treatment, a single individual or small group of individuals is observed (either prospectively or retrospectively using recorded information). The aim is to examine whether there is an association between exposure to the treatment elements and a clinical event (e.g., symptom improvement or remission). Usually applied in the earliest phases of treatment development, a series of cases may be gathered to establish "proof of concept" that a new treatment holds sufficient promise to warrant further study. An advantage of case series studies is that they capture clinical events in a naturalistic context. Disadvantages are that they examine small, highly selected samples of people who may be atypical, and can demonstrate only correlation, not causation.

Randomized Controlled Trials

Randomized controlled trials (RCTs) are the gold standard method of testing whether a treatment works. After participants are screened for inclusion and exclusion criteria, they are assigned randomly to two or more groups or conditions. In a two-group design, participants in one group receive the active intervention (e.g., smoking cessation treatment), and participants in the other group receive a control intervention (e.g., general health education) that is comparable in some elements (e.g., credibility, contact time) but inert in the active elements (e.g., specific skills training) thought responsible for the treatment's effect. The primary outcome might be change from baseline in the number of study participants who smoke. Because the group allocation is concealed until randomization has occurred,



Translational Behavioral Medicine, Fig. 1 Translational research phases from the NIH roadmap. Reprinted with permission from Westfall, Mold, & Fagnan (2007)

neither investigator nor patient can influence the treatment assignment, so that participants have an equal chance of being assigned to either the intervention or control group. This enables researchers to eliminate any bias that might otherwise occur in the group assignment.

Two different randomization procedures are employed in RCTs. They are: (1) fixed allocation randomization (which includes simple, blocked, or stratified randomization), and (2) adaptive randomization (which includes baseline adaptive- or response adaptive randomization). Simple randomization is analogous to repeated fair-coin tossing. However, this procedure is prone to creating imbalanced group sizes. Blocked randomization (also referred to as permuted block randomization) instead ensures that at no time during the randomization will the difference between group sizes be large, and at some points, groups will be equal. Stratified randomization helps to ensure the even distribution of certain factors (e.g., gender) between the groups or conditions. In adaptive randomization, the probability of being randomized to different groups changes as the study progresses. Altering the randomization procedure can help to overcome imbalances based on differences in participants' baseline characteristics (i.e., baseline adaptive randomization) or based on their responses at a later point in the study (i.e., response adaptive randomization).

In RCTs testing drug treatments, the use of identical appearing pills to contain active and inactive agents makes it possible to keep both participants and study personnel naïve to group assignment, a state of affairs referred to as double blind. When only participants are naive, the trial is described as being single blind. Blinding participants and personnel to study conditions helps to ensure that treatment effects are due to the intervention, rather than person-level factors (e.g., knowledge or expectancies about the treatment or outcome). However, double blinding is rarely feasible in trials of behavioral interventions: Both patients and interventionists usually know which treatment is being given. One important form of blinding that does remain feasible is blinding of outcome assessors. When blinded, the assessors who evaluate study outcomes are unaware of whether patients belong to the treatment or the control group.

RCTs are the gold standard for evaluating treatments because this design surpasses others in its internal validity. This means that differences between the study groups in their outcome can be attributed to the treatment, because the researchers held constant other extraneous variation between the groups. The presence of the control group enables the researcher to account for shared influences, such as being repeatedly assessed or receiving attention from professionals. Equally important is the need to establish treatment fidelity; that is, that the intended intervention was delivered as planned. Fidelity is induced by training and supervising therapists to

follow a treatment protocol (i.e., a treatment manual or algorithm) and is assessed by monitoring to ensure that critical intervention elements are delivered. The RCT's internal validity permits researchers to make causal inferences; that is, to attribute between group differences in patient outcomes to variation in the treatment. Its drawbacks are that RCTs are expensive and time consuming to implement, and that random assignment of study participants to conditions is not always feasible. Just as an RCT's validity is compromised by low-quality design or execution, its utility is undermined by incomplete reporting. To facilitate comprehensive, uniform reporting of RCTs, most scholarly journals in health have adopted the international CONSORT guidelines which guide the information to be reported when publishing a RCT (Moher et al., 2010).

Intervention Development via Optimization Design

Behavioral medicine interventions usually combine multiple treatment components brought together in a compilation intended to achieve maximal benefit. For example, an exercise intervention may combine individual coaching from an exercise physiologist with peer support groups, a free gym membership, and incentives for monitoring physical activity and reaching behavioral goals. Although the practice of testing a bundled treatment package in an RCT maximizes the likelihood of detecting a treatment effect, it can be inefficient for long-term policy. After a treatment package has been found effective, it remains unclear which treatment components have produced the positive effect, whether some treatment elements are inert and could be eliminated (potentially reducing costs), and whether the dose and timing of other components is optimal. Subsequent "dismantling" trials are needed to answer those questions.

Multiphase optimization strategy (MOST), adapted from engineering science, is a methodology designed to build new interventions from the ground up by first optimizing and evaluating the contribution of multiple intervention components. MOST follows a sequential, stepped approach to intervention development. The first step is to establish a conceptual, theoretical model of how the eventual intervention should produce benefit and apply the model to derive the intervention components to be examined. The second step involves experimentation to examine the impact of individual intervention components. That stage may be followed by further experimentation to refine and optimize the components (e.g., by modifying their dose, timing, format, or delivery channel). Once the individual treatment components have been optimized, the third step is to assemble the treatment package (the beta intervention) and confirm its efficacy via an RCT. If the trial proves successful, the fourth step is that the new intervention can be released and tested further for effectiveness.

Note that the MOST approach delays the RCT of a bundled treatment package until the third step in intervention development. A key feature of the MOST strategy is that each subsequent intervention will have been engineered, and empirically validated to be superior to the previous one on whatever optimization parameter the interventionist desires. For example, a treatment can be optimized to have no inactive components, to produce the maximum change attainable for a given level of financial resource or time, to maximize the number of people that can be exposed to an intervention, etc. By optimizing for a specific context, MOST emphasizes efficiency and careful management of resources to increase the implementation rate of science.

T2 Translation

The second translational phase (T2), sometimes called "bench to trench," is concerned with evaluating the effectiveness of interventions under conditions that become progressively less controlled and more representative of the general population and usual practice settings. For example, the studies conducted during T1 are usually experiments or phase I and phase II clinical trials. These trials are characterized by their strict control of extraneous variables. The intent of a phase I clinical trial is to pilot test the intensity, timing, duration, or format of an intervention, with participant safety being a primary outcome.

Consequently, phase I trials are often conducted with small samples of participants, who are relatively free of complex medical histories. Once patient safety is established, phase II trials are undertaken. The goal of a phase II clinical trial is to evaluate the efficacy of an intervention for the treatment of a specific, circumscribed problem. Efficacy testing is performed under optimal conditions; for example, in an academic medical setting, employing highly trained research staff as interventionists, and involving patients without co-occurring health conditions. The progression to T2 research introduces phase III trials, in which local staff in a community setting may deliver an intervention as part of their regular job duties. Such trials impose few exclusion criteria and enroll patients even if they have comorbidities. Phase III trials are often called studies of effectiveness (in contrast to efficacy) because they involve more "real world," less highly selected settings, interventionists, and patients.

Another component of T2 research involves the creation of systematic evidence reviews and practice guidelines. Unlike primary research, which involves the collection of new data, systematic evidence reviews are secondary research that culls and combines information from prior reports. The science of systematic reviewing is in itself a sophisticated and evolving field with many nuances that surround the unbiased acquisition of publications, extraction and analysis of data, and interpretation of results. Systematic reviews offer a means to evaluate whether the evidence about a treatment's effectiveness is strong and consistent enough to warrant widespread application in practice. If the data are plentiful and the studies sufficiently similar, a systematic review can provide evidence about whether a treatment's effects are broadly generalizable. In other words, the review can indicate whether there are boundary conditions or types of people for whom the treatment is less helpful or even contraindicated. The comprehensive, unbiased evidence base analyzed for a systematic review affords an excellent grounding from which experts can formulate practice guidelines. The dissemination of evidence-based guidelines concludes the T2 translational phase by conveying best research-tested practices to clinicians and policy makers.

T3 Translation

The third translational phase (T3) is also called Dissemination and Implementation (D & I) research. D & I studies examine how to facilitate the uptake of evidence-based (research-supported) interventions into routine, day-to-day provision of clinical care and public health services. In contrast to T1 and T2, which concern determining whether treatments work (and for whom), T3 research examines how to get effective treatments widely implemented in real-world settings. D & I research focuses on identifying and learning how to overcome barriers at the practitioner, institutional, and system levels that keep effective treatments from being used. Barriers may include limitations in clinician training or skills, lack of available resources for training, competing institutional priorities, or policy barriers (e.g., lack of insurance reimbursement).

Quasi-Experimental Designs

Quasi-experimental designs emerged from social science research because true experimentation (i.e., randomization of participants to groups or conditions) was sometimes challenging to implement. These designs gained popularity with the development of advanced statistical procedures to control for the effect of extraneous variables associated with group membership. In essence, these procedures help researchers to overcome some of the limitations of non-randomization. Quasi-experimental designs are often used when randomization of participants to groups or conditions is infeasible (or impossible). Suppose, for example, a researcher wished to study the effect of preventive care reimbursement policy on the frequency with which clinicians counsel patients for smoking and obesity. Ideally, one would randomize practices to different levels of preventive care coverage. However, that will not be feasible. Therefore, instead of being randomized, practices will be grouped into those where most patients have preventive care coverage versus those where most patients lack such coverage. Quasi-experimental designs are more susceptible than

RCTs to confounding variables that may affect the outcomes of interest. For example, universal preventive coverage may prevail in cooperative, single payer systems (e.g., Group Health, Kaiser Permanente) that are geographically and demographically distinct from practices where majority preventive care is rarer. It will not be possible to determine whether these extraneous differences or differences in insurance coverage account for observed variations in clinician counseling behavior.

Examples of quasi-experimental designs include: time-series designs (i.e., following a single group of participants longitudinally to obtain a large number of data points), single group pretest posttest design, and case–control design (i.e., observational design where participants selected for a certain condition, such as insomnia treated with cognitive behavioral therapy, are compared with a control group whose insomnia is untreated). The advantage of quasi-experimental designs is that they are broadly applicable and easy to implement. For policy interventions or other contexts that preclude randomization, quasi-experimental designs may be the only option available. Their disadvantage is that non-randomization prevents researchers from being able to make causal inferences about what generated the outcomes, particularly because confounding variables (both measured and unmeasured) offer alternative explanations.

Cross-References

- ▶ Evidence-Based Behavioral Medicine (EBBM)
- ▶ Research to Practice Translation

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Translational Research

- ▶ Research to Practice Translation

Transmethylation

- ▶ Methylation

Transtheoretical Model of Behavior Change

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Synonyms

Stages-of-change model

Definition

The Transtheoretical Model (TTM) construes behavior change as an intentional process that unfolds over time and involves progress through a series of six stages of change (Prochaska, DiClemente, & Norcross, 1992a). TTM integrates processes and principles of change from across leading theories, hence the name Transtheoretical.

Description

Precontemplation is the initial stage in which individuals are not intending to take action in the foreseeable future, usually assessed as the next 6 months.

People can be in this stage due to a lack of awareness of the health consequences of a behavior.

Or, they can be demoralized about their abilities to change, like millions of people who have tried to lose weight multiple times in multiple ways. This stage is often misunderstood to mean that these people do not want to change.

The history of demoralized individuals indicates that they want to change, but they have given up on their abilities to change.

Contemplation is the stage in which individuals are intending to change in the next 6 months, but not immediately in the next month. These individuals are more aware of the benefits or pros of changing, but can also be acutely aware of the cons, such as having to give up some of their favorite foods or having to risk failure. Decisional conflict between the pros and cons can lead to profound ambivalence reflected in the motto: "When in doubt, don't act." With smokers intending to quit for good in the next 6 months, without help, less than 50% will quit for 24 h in the next 12 months.

In the preparation stage, individuals are intending to take action in the next month. Their number one concern is, "If I act, will I fail?" The emphasis here is helping them to be well-prepared, because people know in growing up, the better prepared they are in academics or athletics, the more likely they are to reach their goal.

In the Action stage, change is typically overt and observable, with individuals having quit smoking, started exercising, or practicing stress management. This is the busiest stage, where people have to work the hardest to keep from regressing or returning to an earlier stage. Many people believe the worst risks for relapse will be over in a few days or few weeks. We find that people who progress through action work the hardest for about 6 months, which happens to represent the steepest part of relapse curves across addictions (Prochaska & DiClemente, 1983). So, Action is defined as 6 months being risk-free and we encourage individuals to think of this time as the behavior medicine equivalent of life-saving surgery. Following such surgery, would they give themselves 6 months to recover? Will they let others know they will not be at their best and will need more support? This is the type of priority needed to progress through this tough time.

Maintenance is the stage in which people are free from their problem for 6 months to 5 years. People are considered cured from cancer after 5 years without symptom remission. For many people, it may take 5 years to get free from behavioral causes of cancer. During this stage, individuals do not have to work as hard, but they do have to be prepared to cope with the most common causes of relapse. These causes are times of distress, when people are anxious, depressed, lonely, bored, or stressed. Average Americans cope with such distress by increasing unhealthy habits. We try to prepare people to cope with such temptations through healthy alternatives, like talking with a supportive person, walking, or relaxing.

Termination is the stage in which people are totally confident that they are never going back to their high-risk behavior and have no temptation to return. We have found that of alcoholics and smokers in their first 5 years of abstinence, about 20% have reached this criteria (Snow, Prochaska, & Ross, 1992). These people can put all of their change efforts into enhancing other aspects of

their lives. But, for many it may mean a lifetime of maintenance. The ideal goal is to have a new healthy behavior be automatic and under stimulus control, like taking their aspirin every day at the same time and place.

Applying TTM usually begins by assessing which stage the patient is in and then helping them set a realistic goal for now, like progressing to the next stage. Research shows that if we try to pressure patients to progress quickly from precontemplation to action, there can be unforeseen consequences of dropping out of treatment, stopping until treatment is over and then quickly relapsing or simply lying.

What are the principles for helping patients progress from precontemplation to contemplation? A meta-analysis of the pros and cons of changing for 48 health behaviors revealed some remarkable results from 140 studies from 10 countries in 9 languages (Hall & Rossi, 2008). The cons are clearly greater than the pros in precontemplation (PC) and the pros are clearly higher in contemplation (C). So, the first principle of progress is to raise the pros. With sedentary individuals, we might ask them if they like bargains and tell them that if so, physical activity (PA) is the bargain basement of behaviors. There is no other behavior from which they can get as many benefits as PA. We would ask them to list all the benefits that they believe they could get from regular PA, chart their list, and then challenge them to try to double the list. Most have five or six and we tell them there are over 60 scientific benefits and we only want them to find five more. If we see the list going up, it is like seeing cholesterol or blood pressure coming down. We know our behavior medicine is working.

In contemplation, the pros and cons are exactly tied, reflecting their profound ambivalence. From C to preparation (P), the cons come down, so the second principle is to help lower the cons. The number one con for PA is time, so some individuals lower this con by riding a lifecycle where they can multitask and read or review an article for work, read a book for pleasure, or catch up on the news. Others may volunteer to help coach their kid's soccer team and at the same time, get some PA, be with their child, do community service, meet more parents, and have fun. Fortunately, the cons have to decrease only half as much as the pros increase, so we put twice as much emphasis on raising the pros.

In the preparation stage, the pros clearly outweigh the cons, so individuals are not encouraged to take action until they have a favorable profile. Once in the action stage, they can use their growing list of pros to put other principles and processes of change into operation. When they write down on their "To-Do" list, "walking for my heart" they are making a daily commitment based on the process of self-liberation from Existential therapy. When they look at the list they are cued to action based on stimulus control from Behavior Therapy. When they scratch off their list, they are reinforcing themselves based on Skinnerian Theory. As they move from one pro to the next each week, like walking for my weight, my sleep, my self-esteem, my immune system, and my sex life, after a while they may be running. Over time, they are using PA to affirm so much of their body, selves, and others based on self-reevaluation from cognitive theory and self-psychology.

This description illustrates how different principles and processes are applied to produce progress at different stages of change. This integrative approach led to the development of computer-tailored interventions (CTIs) by which individuals are assessed on TTM variables related to their current stage. Their assessment is compared to a normative database and they can be given feedback on how they are applying principles and processes compared to peers who make the most progress. Over time, they can be given feedback compared to themselves, such as "Congratulations, you have progressed two stages, which means you have about tripled the chances you will be taking effective action in the next few months."

Such CTIs have been found in randomized population trials to be effective with a growing

range of problems, including smoking, exercise, diet, stress, depression, bullying, partner violence, and medication adherence. The percentage of those in the action or maintenance stage at long-term follow-up ranges from about 25% for smoking (Prochaska, Velicer, Fava, Rossi, & Tsoh, 2001), to about 45% for exercise and diet (Prochaska, Wright, & Velicer, 2008), to over 65% for stress (Evers et al., 2006) and medication adherence (Johnson et al., 2006). These results are with populations in which typically the majority, like 80%, would be labeled as unmotivated or not ready to change when we proactively reached out to them at home, school, work, or in clinics to offer them help matched to their personal needs. The results can be remarkably robust with very comparable outcomes with smoking, for example, with adolescents and older smokers, Hispanic and African-American smokers, and smokers with mental illness (Velicer, Redding, Sun, & Prochaska, 2007).

Similar interventions have been found to be just as effective when we treat populations for three or four behaviors at the same time (Prochaska, Velicer, Prochaska, Deluschi, & Hall, 2006). Individuals working on one behavior are just as effective as those working on two who are just as effective as those working on three. But, very few people are taking action on more than one behavior at a time because they are not ready. So, they can be progressing through early stages on two behaviors, for example, while they are working to maintain action on another single behavior. Over time, the outcome will have much greater impact on populations with multiple health risk behaviors who have the highest risks for morbidity, disability, mortality, lost productivity, and increased health care costs.

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Trauma, Early Life

► Stress, Early Life

Traumatic Brain Injury

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Synonyms

Brain damage; Brain injury; Brain trauma; Concussion; Head injury

Definition

Traumatic brain injury (TBI) is an acquired brain injury resulting in diffuse brain damage. Injury is caused by the direct impact of an external force or whiplash, which results in a rapid acceleration or deceleration of the brain against the skull. The rapid movement causes neurons to shear and tear, and the impact of the brain against the skull can result in bruising and bleeding. The trauma can cause secondary complications such as ischemia, increased blood pressure, or ruptured blood vessels. The impairments caused by TBI depend on its severity. Due to the diffuse nature of the injury, a variety of cognitive, emotional, and behavioral changes are often seen.

Description

Epidemiology of Traumatic Brain Injury

The CDC estimates that 1.5–2 million people suffer a traumatic brain injury (TBI) every year in the United States (Faul, Xu, Wald, & Coronado, 2010). Of those, an estimated 80% are mild in severity, 10% are moderate, and the remaining 10% have severe injuries (Kraus, McArthur, Silverman, & Jayaraman, 1996). A small proportion (estimated 275,000) are hospitalized, whereas 1.4 million are treated and released (Faul et al., 2010). This is likely to be an underestimate of incidence as many do not go to the emergency room, and it is estimated that 1.6–3.8 million sports-related TBIs occur each year, of which many are treated on the field and do not seek emergency room assistance (Brain Trauma Foundation, 2011). Approximately 2% of the US population currently live with disabilities from TBI and represent a significant public health challenge (Brain Trauma Foundation, 2011).

The majority of TBIs are caused by falls (35.2%), motor vehicle accidents (17.3%), striking or being struck by or against an object (16.5%), and assaults (10%) (Faul et al., 2010). Another common cause for military personnel is blast-related injury. Approximately 52,000 deaths each year are due to traumatic brain injury with motor vehicle accidents resulting in the largest number of fatalities (31.8%) (Faul et al., 2010).

TBI is the leading cause of death and disability for children and adults under the age of 44 (Brain Trauma Foundation, 2011). Those most vulnerable to TBI are children, ages 0–4; older adolescents, ages 15–19; and adults over 65 years old. However, the number of emergency room visits for ages 0–14 is twice as many as those for adults over 65 years of age (Faul et al., 2010). Across all age groups, men sustain at least twice as many head injuries as women (Faul et al., 2010), and males, ages 0–4, have the highest rates of TBI-related emergency visits, hospitalizations, and deaths.

TBI also has a strong economic impact. In a 1998 consensus report from NIH, an estimated $9–10 billion were spent on new TBI cases each year ("Consensus Conference," 1999). Financially, the lifelong care for a person with a TBI is estimated to be between $600,000 and $1.9 million (Elias & Saucier, 2006). The NIH acknowledges that these are likely underestimates of the actual cost, as these numbers do not reflect the lost earnings, costs to social services systems, and the value of time and forgone earnings of family members who care for persons with TBI (Elias & Saucier, 2006). Further complications to care include insurance coverage, access to care, ability to navigate the health system, and available family and community support ("Consensus Conference," 1999).

Mechanism of Injury

Traumatic brain injury results either from object penetration or from rapid acceleration or deceleration of the brain resulting in the classifications of open head and closed head injuries.

Open or Penetrating Head Injury

In an open or penetrating head injury, the skull and the covering of the brain, or meninges, are ruptured. These injuries occur when an object (e.g., bullet, knife, bone fragment) lodges or passes through the brain. Because the brain is exposed, infection is a concern. Also, because penetrating head injuries may create more focal damage than in a closed head injury, the pattern of behavioral deficits is dependent on location of injury. Aftereffects of the initial injury, including swelling and bleeding, may cause more global, though usually time-limited, effects due to intracranial pressure or inflammatory response.

Closed Head Injury

The majority of head injuries are closed head injuries. These injuries occur by either direct impact or whiplash and may be caused by, for example, motor vehicle accidents, sports-related concussions, falls, and war-related blast injuries. The brain undergoes a rapid acceleration or deceleration or both but without skull penetration.

Contusions and/or hematomas may be seen at the location of impact (i.e., coup) and the opposite side of the brain (i.e., contre-coup) owing to the acceleration and deceleration of the brain against the skull. Despite the location of impact, a pattern of diffuse injury is likely to occur, impacting the frontal lobes and temporal poles because of the jagged surface of the tentorial plates that hold those brain structures in place. The physical forces may shear, tear, and rupture neurons, blood vessels, and the meninges, or covering, of the brain.

Diffuse axonal injury (DAI) may occur with shearing or tearing of neurons, often as a result of head rotation or rapid deceleration. Consequently, the axon damage can result in fewer axonal connections and/or less efficient transmission from one axon to another (Lux, 2007). The neurons most vulnerable to this type of strain are those with long axons, usually white-matter tracts that connect distant brain regions. DAI produces two types of cell death, necrosis and apoptosis, which are the leading contributors to brain damage in closed head injuries. Both impede axonal transport, induce atypical metabolic changes, and cause the axon to swell. In DAI, the damage is widespread, regional, multifocal, and at times global, and the course of damage may change over time. The swelling leads to detachment downstream from other neurons. This pattern of deafferentation is considered to affect more neurons than those identified as originally damaged. Although the brain's plasticity does allow for new axonal growth in living neurons, spurious growth can cause additional complications by forming undesirable connections leading to behavioral disturbances.

Consequences of Traumatic Brain Injury

The neuropsychological and behavioral consequences of TBI are related to injury characteristics and severity. The injury characteristics of importance in the acute phase are length of loss of consciousness (LOC) and length of emergence into consciousness with accompanying degree of posttraumatic amnesia (PTA), characterized by confusion and disorientation. For example, LOC ranges from none to brief LOC in concussion and mild traumatic brain injury (MTBI) to weeks in severe head injury. Emergence into consciousness ranges from minutes to hours in MTBI to weeks to days in severe head injury. Corresponding recovery of neuropsychological functioning can range from days to years.

LOC and coma are directly associated with an injury to those areas of the brain, typically the lower brain stem and reticular activating system (RAS), that are involved in maintaining consciousness and arousal. Coma falls along a continuum related to depth of responsiveness and is typically assessed at regular intervals after an injury via the Glasgow Coma Scale (GCS) (Teasdale & Jennett, 1974). The GCS assesses best motor, verbal, and eye opening response at one point in time. Scores range from 15 (can obey motor commands, is oriented, and eyes are open)

to 3 (flaccid motor response, no verbal response, and no eye opening). Medically, coma is defined as a score of 3–8, which typically corresponds to a severe brain injury. Greater mortality is typically associated with scores below 7. Although initial severity of GCS is an important prognostic indicator for survival, other indicators, such as number of days to reach a GCS of 15, and length of PTA are added predictors for long-term neuropsychological outcome. Duration of PTA and education appear to be two of the best predictors of long-term functional outcome. On measures of global functioning and disability, those who had less education preinjury or a longer period of PTA had poorer outcomes 10 years after the injury (Ponsford, Draper, & Schonberger, 2008).

The recovery from coma is a process of "emergence" in which greater awareness of environmental stimuli occurs. Characteristic of traumatic brain injury is a loss of recall for the actual impact event. Since the injured person does not recall the event, he or she cannot usually give a reliable account of the length of LOC. This period of PTA is characterized by confusion and disorientation and typically includes both retrograde and anterograde amnesia. Retrograde amnesia is the impairment in the retrieval of information for events preceding the injury. Conversely, anterograde amnesia is impairment in encoding new memories after the injury.

The difference in diagnosis between mild, moderate and severe head injuries relates both to immediate injury severity as rated by the GCS and time related to resolution of symptoms. For example, MTBI is characterized by a GCS score of 13–15 and a fairly rapid resolution of LOC (less than 30 min) and PTA (less than 24 h). Moderate-level brain injuries are characterized by a GCS of 9–12, LOC between 30 min and 24 h, and PTA between 1 and 7 days. Severe head injuries are those with a GCS of 3–8, LOC longer than a day, and PTA longer than 7 days.

Neuropsychological Consequences of TBI

The neuropsychological consequences of TBI may include a number of deficits. However, those deficits that correspond to frontal and temporal injuries, as well as diffuse axonal injuries are most common. Specifically, these include difficulties in attention, memory, and language functions, executive dysfunction, and emotionality.

Regardless of injury severity, attentional deficits are common after TBI. Reports include a feeling of mental slowness, difficulty following conversations, losing a train of thought, and trouble with multitasking (Gronwall, 1987; Van Zomeren & Brouwer, 1994). The most universal consequence is a reduced ability to process information (McCullagh & Feinstein, 2005). Therefore, when tasks become more complex, reaction time becomes slower. As a result, a TBI sufferer may not appear cognitively impaired in simpler routine assessments, but the deficits may become more evident in the multicomponent tasks of daily life (Granacher, 2008; Lux, 2007). Deficits are seen across all types of attention processing, including selective, sustained, and divided attention with particular problems on tasks that require controlled rather than automatic processing (Park, Moscovitch, & Robertson, 1999).

In addition to attention and working memory difficulties, a deficit in episodic memory is a hallmark feature of TBI (Richardson, 2000). Memory impairment is one of the most frequent (Arcia & Gualtieri, 1993; King, Crawford, Wenden, Moss, & Wade, 1995) and long-lasting complaints with significant deficits found in many people 10 years postinjury (Zec et al., 2001) and poor employment prognosis 7 years postinjury (Brooks, McKinlay, Symington, Beattie, & Campsie, 1987). Furthermore, TBI patients tend to have impairments in prospective memory, or remembering to perform an intended action, which may lead to forgetting appointments, payment of bills, and medication taking (Kinsella et al., 1996). Adding further difficulty, patients tend to be less aware of their memory difficulties than those around them (McCullagh & Feinstein, 2005).

Those with TBI may also experience language and communication difficulties. Speech tends to be less productive and efficient, with less content in longer discourse, and with greater fragmentation (Hartley & Jensen, 1991). Additionally,

language difficulties may include trouble naming objects and, to a lesser extent, comprehension of complex commands (Levin, Grossman, & Kelly, 1976; Sarno, Buonaguro, & Levita, 1986).

Deficits in executive functioning influence functional, emotional, and social outcomes after TBI. The term "executive functioning" refers to higher-order capabilities that include goal setting, planning, initiating, sequencing, reasoning abilities, decision making, inhibiting responses, self-monitoring, and self-regulation (Stuss & Levine, 2002). Since these processes underlie many daily and social skills, such as impulse control, judgment, creativity, emotional regulation, and moral judgment, routine testing might not detect the degree of impairment evident in these areas (Zillmer, Spiers, & Culbertson, 2008). Verbal fluency tests, as a measure of executive dysfunction, however, consistently show impairment for TBI patients because they require organization of verbal retrieval and recall, self-monitoring aspects of cognition, and effortful self-initiation and inhibition of responses. (Henry & Crawford, 2004)

Emotional and behavioral complications are common after TBI and often lead to depressed and anxious mood, impulsivity, agitation, and amotivation (Vaishnavi, Rao, & Fann, 2009). Mood disturbances are considered the most common psychiatric complication of TBI and are often the most difficult adjustment for those who care for the TBI patient (Rosenthal, Christensen, & Ross, 1998). Approximately 10–60% of patients are depressed, reporting feelings of hopelessness, worthlessness, and anhedonia (Hurley & Taber, 2002). Also, they display somatic symptoms, such as sleep disturbances, reduced initiation, fatigue, and changes in appetite. TBI patients have reduced participation in leisure activities and have difficulty engaging in new hobbies (Rosenthal et al., 1998). Mood disturbances can cause significant emotional distress in patients with TBI, contributing to the disruption of social relationships.

In sum, while a pattern of neuropsychological deficits in TBI may show common features, the evaluation of any particular individual should include a consideration of the unique injury location and severity features in a context of previous levels of education, work, and social history.

Cross-References

- ▶ Brain Damage
- ▶ Brain, Injury
- ▶ Neuropsychology

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Treatment Group

▶ Experimental Group

Treatment of Fatigue

▶ Fatigue

Trier Social Stress Test

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Synonyms

Laboratory stress protocol; Psychosocial stress; TSST

Definition

The Trier Social Stress Test (TSST) is a procedure for induction of moderate psychosocial stress under laboratory conditions. It was introduced in 1993 by Kirschbaum, Pirke, and Hellhammer.

Description

Stress is one of the presumably most significant health problems of the twenty-first century (World Health Organization, 2001). Thus it has been of growing importance to gain insight into its underlying components using standardized methods, which reliably induce self-reported, behavioral, and biological stress responses in laboratory settings.

Two major biological systems significantly drive stress responses in mammals: the sympathetic-adrenal-medullary (SAM) axis and the hypothalamic-pituitary-adrenal (HPA) axis. Adequate methods and protocols are needed for reliable stimulation of biomarkers for these systems, to allow for investigations of psychosocial stress effects on the brain and peripheral tissues. While already an effort-driven response suffices for a sufficiently large SAM response, effective HPA psychological stressors, however, need to exert significant social-evaluative threat and uncontrollability upon the tested individual (Dickerson & Kemeny, 2004).

With the development of the Trier Social Stress Test (TSST; Kirschbaum, Pirke, & Hellhammer, 1993), a laboratory protocol with social-evaluative threat, uncontrollability, and effort components became available for rapid and reliable activation of SAM, HPA axis, and other biological stress pathways. Over the past two decades, the TSST has been employed in many laboratories around the globe in stress research of healthy subjects and various clinical samples.

The TSST is a motivated performance task protocol being disguised as a job interview, which consists of a brief preparation period followed by two 5-min test periods during which a subject has to perform a free speech and solve an arithmetic problem, respectively. Upon arrival the subject is informed that he/she is supposed to take over the role of a job applicant who is invited for a personal interview with a selection committee. After ensuring that the subject fully understood the instructions, he/she is guided into a separate room where the selection committee is already seated at a desk upon entrance of the subject. The committee members (male and female confederates) wear white lab coats and are specially trained to withhold any positive or negative feedback during the whole procedure. Furthermore, the room is equipped with a separate desk and chair, a video camera, and a microphone being located approximately 2 m in front of the selection committee. After the initial 3-min preparation phase, during which the subject has the opportunity to structure the upcoming free speech on personal job-relevant traits, the committee asks the subject to step in front of the microphone and begin with the presentation. Most test subjects finish their talk after about 2–3 min of speech time and are encouraged to continue with their speech by one member of the committee. Upon the second speech interruption, the committee silently focuses their gaze on the subject for 20 s, before they begin to ask standard personal questions. After exactly 5 min the subject is asked to stop the speech and continue with the second task, which comprises continuous serial subtractions. The subject is told that upon each error, the committee would ask to start anew from the initial number. After another 5 min, the subject is asked to return to the experimenter who is already waiting outside the testing room to continue with study protocol and the assessment of relevant biomarkers.

With proper completion of the TSST about 70–85% (Kudielka, Hellhammer, & Kirschbaum, 2007) of all subjects reveal an increase in HPA activity as indicated by corticotropin-releasing hormone, adrenocorticotropic hormone (ACTH), serum, and salivary cortisol (Kirschbaum et al., 1993). While ACTH levels peak at or shortly after stress cessation, cortisol levels reach maximum values between 10 and 20 min thereafter. The TSST also activates the SAM, with significant responses in norepinephrine, epinephrine, salivary amylase, heart rate, blood pressure levels, and electrodermal activity. In addition, hemoconcentration, blood coagulation indicators, and transcription factor activation is seen after the TSST (Kudielka et al., 2007). Evaluation of

perceived stress level changes as measured with self-report scales also supports the validity of the protocol.

The methodological advantages of the TSST have led to its widespread use in psychoneuroendocrinological research and stimulated the development of adaptions for children (TSST-C; Buske-Kirschbaum et al., 1997), retirees (Kudielka et al., 1998), psychiatric patients (Brenner et al., 2009), and groups (TSST-G; von Dawans, Kirschbaum, & Heinrichs, 2011). Furthermore, a TSST-like placebo protocol has been developed, which is especially useful in studies with control group designs (Het, Rohleder, Schoofs, Kirschbaum, & Wolf, 2009). Apart from these, variations of the TSST have been employed with mixed results (i.e., insufficient/unreliable stress responses; Gold, Zakowski, Valdimarsdottir, & Bovbjerg, 2004; Gunnar, Frenn, Wewerka, & Van Ryzin, 2009; Kelly, Matheson, Martinez, Merali, & Anisman, 2007; Simoens et al., 2007).

Even with complete adherence to the standard TSST protocol, there is considerable intra- and interindividual variation in the stress response patterns. Certain demographic, biological, and psychological variables can change the magnitude and course of the biomarkers. Among other variables, chronic and acute nicotine or alcohol consumption, dietary status, pregnancy, lactation, physical exercise, or personality traits can lead to differences in HPA activation by the TSST. For a detailed review on potential confounds, Foley and Kirschbaum (2010) recently summarized the TSST literature with a special focus on genetic factors.

In within-subject experimental designs, the TSST may be used repeatedly. Although prior knowledge about the protocol, as well as repeated exposure with days, weeks, or months between sessions can lead to HPA response habituation (Kirschbaum et al., 1995), these effects can be bypassed by changing setting variables, i.e., the selection committee, and the test location with each session. For the assessment of SAM activity with repeated TSST exposure such adaptations are not necessary, since SAM biomarkers show comparable activation patterns even with five identical TSST repetitions. The same seems to apply to cytokines, blood coagulation indices, and parameters of hemoconcentration (Kudielka et al., 2007).

While the TSST has become a research tool frequently employed in many different areas of basic science and clinical research, a powerful stress protocol for use in imaging studies is still missing. Although an adapted version of a computer-based stress task, the "Montreal Imaging Stress Task" (Dedovic et al., 2005) was created for this purpose, numerous subjects show only small HPA responses or no significant cortisol rises at all with this protocol. A scanner-adapted version of the TSST may therefore prove useful to advance our understanding how stress affects the brain and peripheral tissues.

Cross-References

- ▶ Biomarkers
- ▶ Cortisol
- ▶ Imaging
- ▶ Stress
- ▶ Stress Responses
- ▶ Stressor

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Triglyceride

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Synonyms

Lipid

Definition

Triglycerides are a type of lipid (fat) which consist of glycerol and three molecules of fatty acid and are found in blood plasma and fat tissue. They are derived from fats and carbohydrates that are consumed. When calories are consumed, the body converts any calories not immediately used by tissues into triglycerides and transports them into fat cells for storage. Hormones regulate the release of triglycerides from fat tissues in order to provide energy for the body between meals. If the body uses fewer calories than are consumed in a day, then the surplus of calories can cause elevated levels of triglycerides (Welson, 2006).

According to the American Heart Association, the normal level of triglycerides is less than 150 mg/dL and the optimal level of triglycerides is 100 mg/dL or lower. Borderline high levels range from 150 to 199 mg/dL; high levels range from 200 to 499 mg/dL; very high levels range from 500 mg/dL and above. Elevated levels of triglycerides are often the result of being overweight, physically inactive, smoking, excessive consumption of alcohol, and diets high in fat and carbohydrates. High levels of triglycerides have been linked to atherosclerosis (hardening of the arteries) and increased risk of heart disease, stroke, metabolic syndrome (Triglycerides, 2010; What Your Cholesterol Levels Mean, 2011), and Alzheimer's disease (Altman & Rutledge, 2010). Interventions to lower triglycerides typically involve changes in lifestyle such as losing weight, adopting a more heart-healthy diet consisting of less fats and foods with added

sugars, engaging in regular exercise, quitting smoking, and reducing alcohol consumption (Haffner et al., 2005; Graves & Miller, 2003; Triglycerides, 2010). Omega-3 fatty acids can also help reduce triglyceride levels and reduce the risk of cardiovascular diseases and possibly even strokes (Kris-Etherton, Harris, & Appel, 2002).

Cross-References

- ▶ Cardiovascular Disease
- ▶ Cardiovascular Disease Prevention
- ▶ Cholesterol

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tRNA

- ▶ RNA

TSST

- ▶ Trier Social Stress Test

Tumor Necrosis Factor-Alpha (TNF-Alpha)

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Synonyms

Cachectin

Definition

Tumor necrosis factor-alpha (TNF-alpha) belongs to the group of pro-inflammatory cytokines. Cytokines are chemical messenger molecules of the immune system, and the group of pro-inflammatory cytokines characterizes molecules that are secreted in response to inflammatory stimuli, and further promote inflammatory responses in target cells. The cytokine now known as tumor necrosis factor-alpha was first discovered as a molecule that appeared to be essential in the wasting syndrome associated with bacterial infection, and therefore initially referred to as cachectin. At the same time, another molecule was discovered that induced pronounced necrosis of certain tumors in organisms infected by gram-negative bacteria. This molecule turned out to be identical to cachectin, and both were then called tumor necrosis factor-alpha (Beutler & Cerami, 1989; Pennica et al., 1984).

TNF-alpha is one of the major products secreted by macrophages that are activated by inflammatory stimuli, and it acts through a family of different receptors that have some structural similarities and are present as

transmembrane proteins on a variety of target cells. There are two different categories of receptors, based on their effect on the target cell. The first category is characterized by intracellular signals preceding programmed cell death; these are most likely the receptors that mediate the tumor necrotic effects of TNF. The second category induces pro-inflammatory effects, for example, by stimulation of proliferation or transcription of further inflammatory mediators. On a systemic level, TNF-alpha plays a notable role in sepsis and in the induction of septic shock. Similar to the interleukins (IL)-6 and -18, TNF-alpha does also act on nonimmune tissues such as endothelial cells, adipocytes, muscle cells, the liver, and the gastrointestinal tract (Beutler & Bazzoni, 1998; Hehlgans & Pfeffer, 2005).

Of note, along with IL-1, TNF-alpha is an important mediator of CNS effects of peripheral inflammation. TNF-signaling into the CNS has been shown to activate the hypothalamus-pituitary-adrenal axis, to induce hyperalgesia, to reduce food intake, and to contribute to the well-described sickness behavior response (e.g., Besedovsky et al., 1991; Watkins, Goehler, Relton, Brewer, & Maier, 1995). This immune-to-CNS signaling function of TNF-alpha and other inflammatory cytokines plays an essential role in the control of peripheral inflammation during infectious and inflammatory diseases, and disruption of this loop leads to death in animal models of inflammatory diseases (Sternberg, 2006).

TNF-alpha and other inflammatory cytokines are further important as targets of CNS-to-immune signaling, and serve as a link between CNS states with disease-relevant pathophysiological factors. Inflammatory cytokine production is modulated by the sympathetic nervous system and the hypothalamus-pituitary-adrenal axis, and pro-inflammatory cytokines in blood are sensitive to acute and chronic stress, and found increased in depression and posttraumatic stress disorder (e.g., Rohleder, Marin, Ma, & Miller, 2009; Rohleder, Wolf, & Wolf, 2010; Steptoe, Hamer, & Chida, 2007). Inflammatory cytokines also increase with age and have been found to predict later life morbidity and mortality (e.g., Bruunsgaard et al., 2003).

Cross-References

- ▶ Depression
- ▶ Inflammation
- ▶ Posttraumatic Stress Disorder
- ▶ Psychoneuroimmunology
- ▶ Stress

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Twin Studies

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Definition

The classic twin study builds on the fact that there are two kinds of twins that provide contrasting degrees of genetic relationship in siblings of the same age and family circumstances. Monozygotic (MZ) twins, or identical twins, have identical copies of all their genes. In contrast, dizygotic (DZ) twins, or fraternal twins, share, on average, only half of their genes by descent, as do ordinary siblings.

If there are genetic influences on the phenotype of interest, the MZ correlation will exceed that for the DZ twins. The greater the influence of the genes in determining individual differences in the phenotype, i.e., the greater the proportion of phenotypic variance attributable to genetic differences, the greater the difference between the MZ and DZ correlations will be. With some simplification of assumptions, twice the difference between the MZ and DZ correlations can be taken as an estimate of the heritability of the trait.

If genetic influences are the only cause of familial aggregation, if there is no nonadditive genetic variation, and if mating is random with respect to the characteristic under study, the correlation for DZ twins would be expected to be half that for MZ twins. However, if there are significant nonadditive genetic influences or there is significant competition between the twins or other contrast effects that accentuate the genetic differences of siblings, the DZ correlation may be less than half the MZ correlation. Conversely, assortative mating (like marrying like) or imitative or cooperative effects within the sibship, e.g., cooperative involvement in smoking or drinking behavior, may cause the DZ correlation to exceed half the MZ correlation.

Environmental influences on the phenotype of interest have two distinct characteristic consequences. First, if there are environmental influences that are shared by siblings growing up in the same home, e.g., socioeconomic status or parenting style, the MZ and DZ correlations will reflect this source of familial aggregation to the same extent. In the absence of genetic influences, these shared environmental influences would lead to equal MZ and DZ correlations. If there are genetic influences present, the shared environment will raise the DZ correlation relative to the MZ correlation. Another point to consider is individual environmental influences. If there are significant environmental influences that are unique to individuals, e.g., significant personal life events, familial aggregation will be attenuated and the MZ and DZ correlations will be reduced, although their relative magnitudes will continue to reflect the importance of genetic versus shared environmental causes of familial aggregation.

Historically, the twin study design has been a key tool for understanding behavioral genetics, but the use of twins has expanded to facilitate our understanding of the genetic contribution to a number of complex traits and diseases.

Cross-References

▶ Dizygotic Twins
▶ Monozygotic Twins

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Type 1 Diabetes

► Insulin-Dependent Diabetes Mellitus (IDDM)

Type 1 Diabetes Mellitus

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Synonyms

Autoimmune diabetes mellitus; Insulin-dependent diabetes mellitus (IDDM); Juvenile diabetes

Definition

Type 1 diabetes (T1DM) is an elevation in blood glucose due to insufficient production of insulin thought to result from cell-mediated autoimmune destruction of insulin-producing pancreatic beta cells. Autoimmunity is manifested by mononuclear cell invasion of islets (insulitis) and the production of islet-specific antibodies, such as GAD (Glutamic Acid Decarboxylase), IA-2 autoantibodies and ICA (Islet Cell Antibodies), detectable in ~85% of newly diagnosed patients. Genetic, environmental, and possibly other unknown factors contribute to disease susceptibility, which is most commonly manifested in the teenage years (hence the former designation of juvenile diabetes).

If not replaced, absolute insulin deficiency in T1DM results in severe hyperglycemia and diabetic ketoacidosis (DKA), which if left untreated can prove fatal (hence the designation insulin-dependent diabetes mellitus). Insulin replacement ideally takes the form of basal/bolus insulin therapy, delivered either via multiple daily insulin injections or an insulin pump infusion. Poorly controlled type 1 diabetes can lead to, among other complications, nephropathy (kidney damage manifested by excess protein in the urine) and end-stage kidney failure, retinopathy potentially leading to decreased visual acuity, and neuropathy and the risk of diabetic foot infections or ulcerations. Long-standing diabetes is also associated with increased risk for heart disease, stroke, and peripheral vascular disease. Maintaining good glycemic control, as reflected by an HbA1c of less than 7%, will prevent many of the chronic complications of the disease.

Cross-References

► Diabetes

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Type 2 Diabetes

► Type 2 Diabetes Mellitus

Type 2 Diabetes Mellitus

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Synonyms

Non-insulin-dependent diabetes mellitus; Type 2 diabetes

Definition

In type 2 diabetes mellitus (T2D), high blood glucose (or hyperglycemia) is the result of the

pancreas producing insufficient quantities of insulin due to beta-cell dysfunction, as well as insulin resistance. Peripheral insulin resistance, in which cells resist the action of insulin at the receptor level, occurs early in the disease course. Initially this is compensated for by increased production of insulin, or hyperinsulinemia. Over time, however, insulin secretion declines, and hyperglycemia results. There is no single cause of T2D, although it is generally accepted to be the result of genetic, physiologic, and lifestyle factors, including obesity and physical inactivity.

Most cases of diabetes worldwide are due to T2D. Obesity and family history are well-known correlates of T2D, with over 85% of individuals being either overweight or obese at diagnosis, and most having a positive family history of T2D. The incidence of T2D is increasing dramatically, particularly among children and youth, most likely attributable to the increase in obesity among youth. This increasing incidence is expected to continue in the future unless significant prevention efforts are successfully implemented at the population level.

T2D is generally managed by prescription of oral medications such as Metformin to help reduce blood glucose, but insulin is also used in the treatment of T2D. Because of the association of obesity with insulin resistance, weight loss is another important goal of treatment, achieved through lifestyle modification of dietary habits and physical activity. The health complications associated with poorly controlled diabetes, whether from type 1 or T2D, include cardiovascular disease, renal disease, blindness, and limb amputations. Thus, management of T2D constitutes an important public health issue. In the past, T2D was referred to as non-insulin-dependent diabetes or adult onset diabetes. However, now that T2D is diagnosed at earlier ages in the life course and treatment often does utilize insulin, T2D is the accepted term.

Cross-References

► Insulin Resistance
► Type 1 Diabetes

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Type 2 Diabetes Prevention

► Diabetes Prevention Program

Type A Behavior

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Definition

The type A behavior pattern is a personality type which is a risk factor for coronary artery disease. It was described by Friedman and Rosenman in 1959. The type A behavior pattern is defined as a complex set of action and emotion including floating hostility, sense of time urgency, impatience, intense achievement drive, and a desire for recognition and advancement. It has been reported that the type A behavior pattern associates with inadequacy and low self-esteem.

The association between type A behavior pattern and coronary artery disease has been examined for more than a few decades and strong epidemiological evidences in this association have appeared. However, successive studies have failed to find the association between type A behavior pattern and coronary artery disease. From these findings, hostility has been supposed to be the main psychosocial predictor of coronary artery disease instead of global type A behavior

pattern (Razzini et al., 2008; Trigo, Silva, & Rocha, 2005).

The type A behavior pattern is originally assessed by the structured interview. The interviewer must have training to be able to ask the question in an interview format before administering the structured interview. Also, some self-report questionnaires have been developed. For example, the Bortner Rating Scale and Framingham Type A Scale assess the type A behavior pattern. Although self-report questionnaires have been used widely, Friedman (1996) pointed out that inconsistencies of the association between type A behavior pattern and coronary artery disease were caused by the assessment method including the such as self-report questionnaires and the structured interview. Friedman proposed the type A videotaped clinical examination (VCE), which can detect the physical signs of type A behavior pattern and was valid for diagnosis of type A behavior pattern. The VCE method has predictive validity for myocardial infarctions.

The modification of type A behavior pattern has been proposed and summarized by Friedman (1996). The modification of type A behavior pattern consist of some components including the enhancement of self-esteem and the modification of floating hostility and sense of time urgency. Friedman et al. (1986) conducted a large randomized clinical trial to examine the effect of type A modification group therapy for myocardial infarction male patients. Their results showed that the coronary artery disease recurrence rate in treatment group was lower than that of control group.

Cross-References

- ▶ Behavioral Medicine
- ▶ Coronary Artery Disease
- ▶ Coronary Heart Disease
- ▶ Health Psychology
- ▶ Hostility, Cynical
- ▶ Personality
- ▶ Trait Anger

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Type A Behavior Pattern (TABP)

▶ Heart Disease and Type A Behavior

Type D Personality

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Synonyms

Distressed personality type

Definition

The Type D (distressed) personality refers to *a general propensity to psychological distress* (Denollet, Schiffer, & Spek, 2010) *that is defined by elevated scores on two broad personality traits*, *negative affectivity* (NA), and *social inhibition* (SI). NA refers to the tendency to experience negative emotions across time and

situations, and SI to the tendency to inhibit the expression of emotions and behaviors in social interaction (Denollet, 2005).

Description

Individuals with a Type D personality are more likely to report *feelings of dysphoria, tension, and worry* (Denollet, 2005). On an interpersonal level, Type D individuals tend to feel *insecure and inhibited* in the company of others, fearing rejection and disapproval (Denollet). Although these individuals may experience emotional difficulties, this may not be acknowledged by others given their inhibited behavior. Type D individuals are less likely to express their true thoughts and feelings and may keep other people at a distance.

A number of studies have reported that Type D was associated with an increased risk of *mortality and other adverse events in cardiac patients*, even after statistical adjustment for measures of depression or anxiety. In 1996, a paper published in the Lancet was one of the first reports on Type D personality as an independent predictor of mortality in patients with heart disease (Denollet et al., 1996). A meta-analytic review that summarized the findings from Type D studies that were published over a 15-year period (1995–2009) concluded that this personality profile may be related to adverse health outcomes in patients with a cardiovascular condition (Denollet et al., 2010). Another independent meta-analytic review confirmed that Type D was associated with adverse health outcomes among patients with cardiovascular disorder (O'Dell, Masters, Spielmans, & Maisto, 2011). There are also null studies that found no effect of Type D personality on mortality in patients with heart failure (Coyne et al., 2011; Pelle et al., 2010) or other cardiac conditions (Grande et al., 2011). However, depression or anxiety also failed to predict prognosis in these null studies.

The *prevalence* of Type D among patients with cardiovascular disease largely ranges between 25% and 35%. Type D personality and its two components, NA and SI, can be reliably assessed with the *DS14 self-report scale* (Denollet, 2005). The 14 items of the DS14 are rated on a five-point Likert scale, ranging from 0 (false) to 4 (true) and are divided into NA and SI subscales. The seven NA items cover the tendency to experience feelings of dysphoria, anxiety, and irritability. The seven SI items cover social discomfort, reticence, and lack of social poise. These personality measures have good internal consistency and are stable over time. Due to its brevity and the simplicity of the items, completing the DS14 takes only a few minutes and comprises little burden to patients. The DS14 has been validated in multiple languages, making it widely applicable. In the International HeartQoL study of 6,222 patients with ischemic heart disease, cross-cultural measurement equivalence was demonstrated for the Type D scale in 21 countries (Kupper et al., 2012).

Type D research is based on the notion that (a) research should examine *the way traits combine* in the determination of disease, and that (b) the *delineation of subtypes* may help to identify groups of patients who share a set of relevant characteristics in terms of clinical course. Only those individuals scoring positive on both NA and SI are classified as "Type D." Type D caseness is determined by a cutoff score $\geq$10 on both the NA and SI subscales. Some have argued that Type D personality is more accurately represented as a *dimensional* rather than as a *categorical* construct (Ferguson et al., 2009). The Type D construct does not infer a true taxon that is defined by discontinuity between groups on an underlying dimension; rather, individuals belong only probabilistically to Type D and non-Type D subgroups (Denollet et al., 2010). Therefore, dimensional and categorical approaches to Type D personality do not need to be mutually exclusive, but rather represent two different ways of capturing psychological tendencies of individuals (Chapman, Duberstein, & Lyness, 2007).

General distress, shared across anger, depression, and anxiety, partly accounts for the link between mind and heart (Denollet & Pedersen, 2009). The Type D personality profile identifies

individuals who are particularly vulnerable to this adverse effect of general distress. Hence, Type D personality is not a concurrent of standard psychological risk factors such depression, anxiety, or stress, but rather aims at the early identification of individuals who are inclined to experience these manifestations of distress over a longer period of time. At first glance, depression and Type D personality may appear quite similar, but there are some clear differences. While depression reflects psychopathology, Type D represents a normal personality construct. Accordingly, a narrative review of 29 studies showed that Type D personality and depression are distinct manifestations of psychological distress, with different and independent cardiovascular effects (Denollet et al., 2010). It is not surprising that there is some overlap between Type D and the neuroticism and extraversion traits of the Five Factor Model of personality. However, Type D still predicts health outcomes after controlling for these traits (Denollet et al.), and both the Five Factor and Type D models are related to health outcomes in primary care patients (Chapman et al., 2007).

Several biological and behavioral pathways may *explain the link* between Type D and health outcomes. Potential *biological pathways* associated with Type D personality include elevated levels of the stress hormone cortisol (Molloy et al., 2008), elevated biomarkers of inflammation (Conraads et al., 2006; Einvik et al., 2011), decreased capacity to repair vascular damage (Van Craenenbroeck et al., 2009), and reduced heart rate recovery after exercise (von Känel et al., 2009). Type D has also been related to cardiovascular effects during experimental stress, including higher cardiac output (Williams, O'Carroll, & O'Connor, 2009) and blood pressure (Habra, Linden, Anderson, & Weinberg, 2003), and lower heart rate variability (Martin et al., 2010).

Behavioral pathways may also mediate the relationship between Type D personality and adverse health outcomes (Williams et al., 2008). In the International HeartQoL study of cardiac patients from 21 different countries, Type D was associated with a higher prevalence of hypertension, smoking, and a sedentary lifestyle (Kupper et al., 2012). In the general population, Type D has also been linked to unhealthy behaviors such as smoking and physical inactivity (Einvik et al., 2011; Hausteiner et al., 2010). Type D individuals may show reluctance to consult clinical staff for cardiovascular symptoms (Schiffer, Denollet, Widdershoven, Hendriks, & Smith, 2007), and are not likely to seek care for their mental problems (Williams et al., 2008). In the medical care for patients with chronic condition, *adherence to treatment* may be of particular importance. Type D has been associated with poor adherence to treatment in patients with cardiac (Williams, O'Connor, Grubb, & O'Carroll, 2011) and sleep (Broström et al., 2007) disorders.

Type D personality has been mainly studied in cardiovascular patients, but there is evidence to suggest that Type D personality can also provide relevant information in *other populations* as well. Type D has been related to poor patient-reported health outcomes in patients with *other conditions*. In cancer survivors, for example, Type D personality has been associated with impaired quality of life and poor mental health (Mols, Thong, de Poll-Franse, Roukema, & Denollet, 2012). In the *general population*, Type D individuals have been shown to have an increased risk for clinically significant depression, panic disorder, and alcohol abuse (Michal, Wiltink, Grande, Beutel, & Brähler, 2011). In this study, Type D was also robustly associated with major stressors such as traumatic events and social isolation. These authors concluded that Type D as a frequent disposition is of high relevance for health care (Michal et al., 2011). In other studies of individuals without cardiovascular disease, Type D personality was related to unhealthy behaviors such as smoking and low physical activity (Einvik et al., 2011; Hausteiner et al., 2010).

The evidence so far seems to indicate that patients with a Type D personality profile are at increased risk of for a multitude of adverse health outcomes, particularly in the context of cardiac disease. However, there still are a number of unresolved issues. Evidence suggests that social inhibition modulates the adverse effect of

negative emotions on cardiac prognosis (Denollet et al., 2006) but more research is needed to test this model. Although to date the optimal treatment and the applicability of counseling options for Type D individuals are still unknown, screening may identify these high-risk patients. Overall, the findings of Type D research support the simultaneous use of specific and general measures of distress in cardiovascular research and practice. In this context, *screening for Type D personality with the DS14* (Denollet, 2005) may be useful to improve clinical research and practice in the context of cardiovascular disease and other chronic conditions.

Cross-References

- ▶ Negative Affectivity
- ▶ Social Inhibition

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