

# EXERCISE PSYCHOLOGY

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# Theories of Behavior Change

**T**hroughout the centuries philosophers, and more recently psychologists, have tried to understand why people behave the way they do. Many attempts have been made to organize information about people and the world around them that can be used to explain and predict human behavior. However, countless individual and contextual variables interact in patterns to influence behavior, and these patterns change over time. This complex abundance of information has been reduced and made more manageable through the application of theories.

Exercise psychology has applied several theories from the social, psychological, and biological literatures to explain and predict the effects of physical activity on mental health. Various theories have also been applied to explain and predict the adoption and maintenance of an active lifestyle. In chapter 15 on interventions, you will see how various theoretical perspectives that are used to reach the same goal can result in different treatments and different interpretations about what influenced the outcome. This chapter focuses on the major theories that have guided exercise psychology research. We discuss basic definitions and core concepts and provide examples of how the theories have been applied.

A theory is a type of model (see table 14.1). Models are generalized, simplified representations that are used to organize vast amounts of information. Models guide our thoughts and actions by defining which of myriad variables to focus on and which to ignore in a given situation. They help us explain and predict the world around us. Models allow us to interpret information in similar ways. Even the novice computer user knows that the small picture of a printer on the computer screen can be used to control the printer's functions. The picture of a printer is an

iconic model. **Iconic models** are models with two or three dimensions that look like what they represent but are smaller or larger. **Analogue models**, such as graphs and maps, use a set of properties to represent the actual set of properties of the idea or event using transformational rules (e.g., 1 in. = 1.5 miles [2.4 km]). Conceptual models are diagrams of proposed causal linkages among a set of concepts that are believed to be related to a particular research question or are the focus of an intervention. Conceptual models are informed by theories and empirical findings, and can include elements from multiple theories conceptualized at multiple levels. Sometimes components are included that are not part of the established theory (e.g., personality) but represent empirical findings or the experience of professionals.

**Theories** are symbolic models that are used to guide the design, execution, and interpretation of research. A theory is the formulation of underlying principles of certain observed phenomena that have been verified to some degree. Theories of human behavior provide assumptions about behavior and specify relationships among key variables that are necessary for explaining and predicting behavior. Theories allow us to predict what will occur beyond empirical evidence; they allow us to go beyond what we already know. For example, the theory of behaviorism emphasizes antecedents and consequences of a target behavior to predict the frequency of that behavior. If we know that Jeff likes to spend time with Mary, we can predict that he will run more if he runs with Mary, who exercises regularly.

Theories of behavior change are models that represent human behavior. Over the years, several theories have been developed to order all the things that could influence what people do

**Table 14.1** Types of Models

| Model type | Description                                                                                                                                                                                                                                                                                                                                                                                      |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Iconic     | A two- or three-dimensional model that looks like what it represents, but is larger or smaller. Examples include photographs and sculptures.                                                                                                                                                                                                                                                     |
| Analogue   | An actual set of properties of an idea or event represented in two or three dimensions using transformational rules that can represent change or a process. Examples include maps and graphs. For example, attendance in an aerobics class over 12 weeks can be presented in a graph, with the time in weeks on the x-axis and the percentage of participants attending each week on the y-axis. |
| Conceptual | A graphic or pictorial representation of constructs and their relationships to represent a specific hypothesis, context, relationship, problem, or topic. Examples include a visual representation of a theory (see figure 14.3) and a framework for organizing and integrating information (see figure 2.1).                                                                                    |
| Symbolic   | Intrinsically meaningless symbols that represent ideas, events, or things and are not at all like what they represent. Examples include scripts and mathematical models. Theories are linguistic or mathematical models that guide the design, execution, and interpretation of research. The exercise and self-esteem model in figure 12.3 has been tested in several research studies.         |
| Mixed      | A combination of models that represent large and complex amounts of information. Examples include websites and books. The 2008 Physical Activity Guidelines for Americans can be viewed on a website at <a href="http://www.health.gov/paguidelines">www.health.gov/paguidelines</a> .                                                                                                           |

and why they do it. These theories represent various **ontological** assumptions (about what things are made of) and **cosmological** assumptions (about how things are organized and how they change). For example, behaviorism is based on a **materialistic** perspective on the nature of reality that reduces the mind to the functioning of the nervous system and biochemical and electrical processes. Behavior is described through linear chains of cause-and-effect relationships in which a stimulus and response are linked through learning. Cognitive psychologies stem from **idealism**, in which reality is seen as the expression or embodiment of the mind. What we do, how we feel, and how things affect us are presumed to be influenced by learned

associations among thoughts, affects, actions, and contexts. Thus, theories influence the ideas we accept and the actions we perform. They enable us to interpret and organize information in a logical and consistent format. Theories also spur research to support or refute that they are correct in the way they view behavior.

## BEHAVIORISM

In the early part of the 20th century, John B. Watson (1919) wrote *Psychology From the Standpoint of a Behaviorist*, in which he asserted that psychology should be a science of behavior and not of the mind. Watson was followed by B.F. Skinner, whose first important book, *The Behavior of Organisms*, was published in 1938. Skinner and his colleagues conducted numerous carefully controlled laboratory experiments over the next 40 years in their search for observable facts that affect learning. They developed empirically derived principles of behavior that include a central role for environmental determinants. Behaviorism, also known as learning theory, is based on the assumptions that psychology is

Theories are principles and assumptions that are used to explain and predict; theories of behavior change are models of human behavior.

about behavior and that a true account of behavior should not consider mental states, which are not open to direct observation and cannot be measured independently. Personality is seen as the sum of an individual's observed responses to the external world.

Using behaviorism as a theoretical foundation involves focusing on the quantitative relationships between **independent** (cause, stimulus) and **dependent** (effect, response) **variables**. Key variables and predictions center on the relationships among stimulus, response, and consequences. As already mentioned, the emphasis is on looking at linear chains of cause-and-effect relationships in which the stimulus and response are linked through learning. Empirical research, which assumes that encounters with objects and events yield objective knowledge, provides the foundation for approaching the explanation and prediction of behavior. Change or learning is assumed to work the same way for all people.

**Key variables in behaviorism to explain and predict behavior are the observable antecedents and consequences of the behavior.**

**Classical conditioning** and **operant conditioning** provide the framework for understanding and modifying behavior through associative learning. Classical conditioning entails learning to associate two stimuli and is based on the work of Ivan Pavlov, whose ideas played an important role in the development of behaviorism. An **unconditioned** (or reinforcing) **stimulus** that is capable of eliciting a reflexive response is paired with a neutral stimulus. You may be familiar with the example of the pairing of food, which elicits salivation in the dog, with the ringing of a bell. Eventually, the dog salivates when the bell rings even though no food is present. The bell has become a **conditioned stimulus** and will continue to elicit the salivation in the dog (now a conditioned response) unless the bell is never paired with the food again. In this case, the salivation response will diminish and eventually disappear, a process called extinction.

## Behaviorism

Stimulus → Learning → Response → Consequences

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graph LR
    Stimulus --> Learning
    Learning --> Response
    Response --> Consequences
    Consequences --> Learning
  
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Operant conditioning involves pairing a reinforcing or punishing event with a voluntary response to change the rate of responding. In this case, the respondent learns to associate a response with its consequences. To enhance the response rate, a **reinforcing stimulus** (e.g., a reward) should occur in the presence of another stimulus when a specific response occurs. The rat that got a food pellet when it pressed the bar received a reinforcer (food) when the voluntary behavior of pressing the bar occurred. Eventually, the response (operant behavior) may be emitted in the presence of the other stimulus, or in this case, when the rat encounters the bar. A **discriminative stimulus**, or prompt, is an environmental cue about the nature of a behavioral consequence. Cheese bubbling on a pizza (discriminative stimulus) indicates a very good chance that eating the pizza (behavior) will result in a burned mouth (behavioral consequence).

Obviously, stimuli and the reinforcing events are critical variables for understanding and predicting behavior when one uses behaviorism as a theoretical foundation. Events and situations coming before (**antecedents**, stimulus, cues) and after (**consequences**, **reinforcement**, rewards, punishments) a specific behavior are identified to explain the behavior. Consequences that will explain the behavior should be related directly, either concretely or symbolically, to that behavior. Changes in the consequences will increase or decrease the frequency of the behavior. For example, feeling relaxed and in a good mood after jogging will increase the frequency of this behavior. If jogging, now a conditioned behavior, no longer results in reinforcement (e.g., hot weather makes the jogging stressful), the behavior tends to occur less often and will eventually be extinguished if consequences continue to be unpleasant.

## Antecedents and Consequences

*Concrete antecedent:* dog barking until you take her out for a walk

*Concrete consequence:* fatigue after a vigorous exercise session

*Symbolic antecedent:* coupon for a free aerobics class

*Symbolic consequence:* certificate for completing an exercise program

Behavior theory has been useful in conceptualizing the types of antecedents and consequences that can influence exercise adoption and maintenance (see table 14.2). **Latency**, the amount of time that passes between the stimulus and the response, can be used to identify antecedents and consequences as **proximal** (close in time to the target behavior) or **distal** (occurring long before or after the target behavior). For example, a notice that the swimming pool will be closed in two weeks is a distal antecedent to attending aerobics classes or jogging while the pool is closed. Clear and cool weather when a jogger wakes up can be a proximal antecedent for running that morning. Being late for class after completing an additional two sets of strengthening exercises is a proximal consequence of that exercise session. Losing or

maintaining weight is a distal consequence of regular exercise.

Many earlier research studies on exercise adherence were based on the principles of behaviorism and used reinforcement control and stimulus control to increase physical activity. It was presumed that behavioral patterns are sustained because they are cued and reinforced. Thus, exercise was viewed as a behavior that can be modified (acquired and maintained) by changing the antecedents, the behavior itself (skill development, shaping), and the consequences (rewards, reinforcement) of the behavior. For example, several studies reported using contingency contracting, in which subjects received specific rewards after meeting predetermined criteria for exercise frequency and duration. Little or no attention was given to cognitive processes, affect, or motivation.

## COGNITIVE BEHAVIORISM

The early work of Donald Meichenbaum, one of the founders of the "cognitive revolution" in psychotherapy, laid the groundwork for extending behavior modification to include cognitions and thus for developing cognitive behaviorism. In one study, the behavior of impulsive first- and second-grade children was altered by training them to talk to themselves first overtly and then covertly to increase self-control (Meichenbaum and Goodman 1971). Subsequent research in clinical populations indicated that traditional behavior modification strategies supplemented

**Table 14.2 Types of Antecedents and Consequences Predicted to Influence Exercise Behavior**

| Type          | Examples                                                                                |
|---------------|-----------------------------------------------------------------------------------------|
| Environmental | Weather, commercials, media, air quality, access to facilities, safety, time            |
| Social        | Modeling (in media and face-to-face), friends, family                                   |
| Cognitive     | Thoughts, attitudes, beliefs, values; emotions; self-efficacy, self-concept; motivation |
| Physiological | Health, fitness, ability                                                                |
| Personal      | Exercise history, health history, education, income, personality, traits                |
| Perceptual    | Fatigue, pain, vigor                                                                    |

with self-instructional training resulted in better and more sustained outcomes (Meichenbaum and Cameron 1994). This led to the conclusion that what the person says to him- or herself, rather than environmental consequences of behavior, is of primary importance in modifying maladaptive behaviors.

**Cognitive behaviorism** is a theoretical perspective that shares some assumptions with behaviorism. The stimulus and the response are central to explaining behavior, but a significant difference from behaviorism is that cognition is defined as the critical mediating variable. Whereas behaviorism contends that matter is the only reality and that reality is understood through the physical sciences, cognitive behaviorism is based on an interactive dualistic perspective. This perspective in turn is based on the assumption that we are made up of both material and non-material phenomena (dualism). The nonmaterial phenomena include sensations, perceptions, thoughts, and feelings that interact with and influence the material self.

A wide range of dysfunctional or maladaptive behavior results from faulty cognitions and beliefs that have an effect on behavior through the resulting emotional response. Learning or insight can restructure, augment, or replace faulty thoughts with behaviorally effective beliefs and cognitive skills. Simply put, cognitions cause behavior, and cognitions can be changed. Thus, the key to changing behavior is to change thoughts. A popular strategy based on this model is **cognitive restructuring**. Cognitions are identified that limit the likelihood of positive action by eliciting a negative emotional response, such as a sense of futility ("I can never stick with an exercise program"). The faulty statement is reframed to be more realistic and supportive of the potential for change ("I have not been able to maintain regular exercise yet"). A number of strategies that have emerged from cognitive

behaviorism, such as self-monitoring and goal setting, have been used frequently in exercise behavior change interventions (see chapter 15).

## SOCIAL COGNITIVE THEORY

**Social cognitive theory** evolved from social learning theory, which proposes that the majority of behaviors are learned through social interaction. Social cognitive theory was formalized in the mid-1980s through the work of Albert Bandura. Walter Mischel is a contemporary of Bandura's who emphasized cognitive and situational variables in understanding human behavior, and contended that intra-individual cognition was an important influence on behavior. Bandura built on the idea of intra-individual cognition and extended his own work on observational learning and self-regulation. Bandura's *Social Foundations of Thought and Action: A Social Cognitive Theory* (1986) describes the conceptual framework of this theory.

Social cognitive theory uses cognitions in the context of social interactions and behavior to explain human action, motivation, and emotion. Important concepts in social cognitive theories are described in table 14.3. Basic assumptions of social cognitive theory are that behavior is founded in cognitive activity, is purposeful action, and is under the direct control of the individual—that is, individuals are capable of self-reflection and self-regulation. **Self-reflection** refers to an ability to symbolize and thus anticipate and plan for future events. Something that a person anticipates will occur in the future becomes a mental formulation in the present time and can motivate current behavior. Behavior is thus controlled and regulated in anticipation of symbolized future events.

Another assumption within social cognitive theory is that self-regulating processes mediate the effects of most environmental influences. Cognitive mechanisms that support **self-regulation** (e.g., how people modify their own behavior) include personal goal setting, efficacy expectations, outcome expectations, and outcome values. The ability to symbolize and conceptualize a future helps to guide the development of goals, which are devised according

**C**ognitive behaviorism holds that cognitions determine behavior and that cognitions can be changed.

**Table 14.3 Key Variables in Social Cognitive Theory**

| Variable                 | Explanation                                                                                                                                                                                                                                                                                              |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Outcome expectancies     | Outcomes are what is expected to happen externally and to oneself as the result of a behavior. Benefits (desired outcomes) and costs (undesired outcomes) can have various influences depending on their relationship to the behavior (proximal or distal) and the individual's perceived vulnerability. |
| Outcome value            | The outcome can have varying degrees of reinforcement value or incentive value, and can be something one wishes to obtain or to avoid.                                                                                                                                                                   |
| Intention                | Intention is the strength of readiness to perform a behavior.                                                                                                                                                                                                                                            |
| Self-efficacy expectancy | Self-efficacy is a cognition. It is a belief in one's ability to engage successfully in a specific behavior with a known outcome.                                                                                                                                                                        |

### Assumptions of Social Cognitive Theory

1. People have symbolizing capabilities.
2. Behavior is purposive or goal directed and is guided by forethought. This is dependent on the capability to symbolize.
3. People are self-reflective; they can analyze and evaluate their own thoughts and experiences.
4. People are capable of self-regulation. They can alter their own behavior and their environment, and they adopt personal standards for their behavior and use those standards to guide behavior and motivate themselves.
5. Environmental events, inner personal factors (cognition, emotion, and biological events), and behavior are mutually interacting influences (triadic reciprocity).

to standards whose achievement will elicit positive self-evaluation. Goals are set that represent valued and desired objectives and point out a discrepancy between *actual* behavior and the *target* behavior. The discrepancy provides negative feedback that stimulates the direction and intensity of actions to reduce the incongruity.

For example, Joe believes that running a 5K road race (target behavior) will demonstrate that he is a good runner, and he values this self-concept. However, Joe can run only 3K without stopping (actual behavior). The discrepancy between how far he *wants* to run and how far he *can* run helps to direct his training program. Thus, goals provide direction and motivation in support of self-regulation.

Self-efficacy is the degree to which people believe they can successfully engage in specific behaviors in particular situations with known outcomes. Self-efficacy is a learned belief that is developed through experiences and modeling. It includes three domains: strength, generality, and level. Strength refers to the perceived ability to overcome common barriers to engaging in a behavior (*Can I make time during lunch to go for a walk?*). Generality is the ability to generalize the behavior to other similar behaviors (*If I can play tennis, can I also play racquetball?*). Level is the degree to which a behavior can be engaged in successfully (*If I can run 3 miles with friends, can I run in a 5K race? Can I train for and run in a 10K race?*). The significance of self-efficacy in behavior change is further developed in Bandura's self-efficacy theory.

**Outcome expectation** is the perception that a given behavior will lead to a certain outcome. Outcomes are what one expects to happen to oneself and to the external situation as a result of a behavior. The influence of benefits (desired outcomes) and costs (undesired outcomes) on the behavior depends on a variety of factors, such as whether they are proximal or distal to

According to social cognitive theory, behavior is the outcome of social learning, and characteristics of the person, environment, and behavior itself interact to influence behavior.

the behavior. For example, if Sue walks for an hour after work 5 days a week, she believes she will lose weight (distal desired outcome), but she will have less time to spend with her family (proximal undesired outcome).

**Outcome value** refers to the incentive value or reinforcement value of the outcome. Value is determined in part by the extent to which the outcome will affect the person's sense of welfare and self-esteem. Thus, the outcome can be something one wants to obtain or avoid, and the strength of the value will influence effort and persistence. For example, Brad entered a new high school in the fall, and the boys in his class had been lifting weights for several years. Brad started working out with weights every day after school. Increasing muscular strength and size is very important to Brad because he wants to be more like his new friends and fit in.

A central assumption of social cognitive theory is that people also influence the environment, and this influence is bidirectional (e.g., reciprocal determinism). It is proposed that behavior change operates through mutually interactive effects among aspects of the person, the environment, and the behavior itself. This concept of a dynamic reciprocal interaction, called **triadic reciprocity**, was applied in chapter 13 to frame the relationships among physical activity correlates. Exercise correlates have been organized into three categories—person, environment, and behavior—but research to test the dynamic interactions among them has been limited.

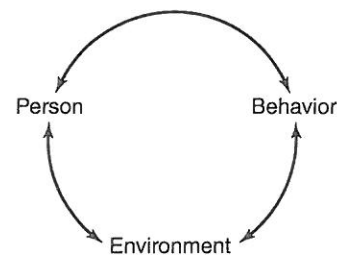
## BANDURA'S SELF-EFFICACY THEORY

Bandura's self-efficacy theory is a competency-based theory that has been applied extensively

### Triadic Reciprocity (Example)

The likelihood that a young woman will participate in vigorous exercise depends on what benefits she expects from exercising and the value she places on that outcome (person variables), access to a safe place to exercise and peer influences (environmental variables), and the level of intensity and type of exercise (characteristics of the behavior). Having a safe place to play basketball could influence the perceived benefits of someone who knows she will need an athletic scholarship to attend college, but a peer making fun of the way she dribbles can affect her perception of benefits versus costs, the intensity of her practice, or both.

*Triadic reciprocity*



*Assumption: environmental events, inner personal factors (cognition, emotion, and biological events), and behavior are mutually interacting influences.*

to exercise behavior in healthy adults (Ashford, Edmunds, and French 2010), children and adolescents (Lubans, Foster, and Biddle 2008), older adults (Netz et al. 2005), and clinical populations (Artinian et al. 2010). An assumption of this theory is that the primary mediator of all behavior change is the cognitive mechanism called self-efficacy, which has been described as an important variable in social cognitive theory and in the transtheoretical model of behavior change. According to Bandura's self-efficacy theory, self-efficacy expectancy, outcome expectancy, and outcome value are three basic cognitive mediating processes that determine behavior (see

Cognitive Mediating Processes That Determine Behavior). Adoption and persistence in behaviors are determined by expectations about one's skills and capabilities to engage successfully in the specific target behavior in particular situations, as well as expectations about the outcomes and the value placed on those outcomes.

The higher the self-efficacy, the higher the goals one sets and the more persistence one exhibits toward reaching those goals. People dissatisfied with their current exercise or fitness

### Cognitive Mediating Processes That Determine Behavior

- *Self-efficacy expectancy:* Beliefs and expectations about how capable one is to perform the necessary behaviors to achieve an outcome. Self-efficacy is specific to a situation and behavior, but it can generalize to other similar situations and behavioral demands. High self-efficacy for following an aerobics routine increases the likelihood someone will enroll in an aerobics class, but might not generalize to confidence in beginning weight training.
- *Outcome expectancy:* The estimation of the probability that a behavior will produce a specific outcome or result. Desired outcomes can be extrinsic (tangible) or intrinsic (self-respect or self-satisfaction). The outcome expected is related to the efficacy for a specific behavior. For example, one might believe that swimming is one of the best modes for achieving overall fitness but have low confidence about swimming enough on a regular basis to increase fitness.
- *Outcome value:* The reinforcement value or incentive value of the desired outcome. If increased fitness is highly valued, the effort and persistence to follow a fitness regimen are greater than if fitness is not valued.

### Self-Efficacy Expectations (Example)

At his medical exam, Matt weighed 10 pounds (4.5 kg) more than his target weight. This information motivates him to seek strategies to achieve his goal weight. Self-efficacy expectations will determine his choice of goals, strategies, effort, and persistence and the affective responses he has to his level of performance. If Matt is confident that he can fit a walking program into his schedule but has always had problems sticking with any diet, he will be more likely to control his weight by exercising than by changing his eating habits unless his expectations about diet change. The adoption of a behavior follows from self-initiated reactions that are stimulated by a discrepancy between personal goals or standards and knowledge of personal achievement.

levels who adopt challenging goals and are confident (i.e., have high self-efficacy) that they can attain their goals will presumably have optimal motivation for maintaining exercise (Dzewaltowski 1994). People with high self-efficacy who fail often will attribute the failure to insufficient effort and are likely to persist. Those with low self-efficacy may attribute failure to low ability and be more likely to give up.

Self-efficacy expectations are developed from performance accomplishments (i.e., mastery experiences), vicarious experiences (i.e., modeling or observing others), verbal persuasion (i.e., encouragement or positive feedback), and the interpretation of physiological or psychological arousal (e.g., anxiety, perceived exertion). Performance accomplishments provide the most potent influence on efficacy expectations. Self-efficacy increases when one masters difficult or previously feared tasks. Skills are developed and refined and coping mechanisms are developed through personal experiences. Vicarious experiences are experiences in which people learn by

observing events or people. Observing someone similar to oneself succeeding through effort and being rewarded increases one's efficacy to also perform that behavior. Verbal persuasion can take the form of self-talk or encouragement from significant others. High physiological arousal during the performance of a task can impair performance and decrease efficacy expectations. Strategies to change behavior based on self-efficacy theory focus on manipulating these sources of efficacy information to increase exercise self-efficacy.

## THEORY OF PLANNED BEHAVIOR

The theory of planned behavior (TPB) evolved from the theory of reasoned action (TRA), which was developed by Fishbein and Ajzen to explain and predict social behavior in specific contexts (e.g., Ajzen and Fishbein 1974). A basic assumption

is that people make rational decisions about their behavior based on information and beliefs about the behavior and its consequences, what they expect, and the value they place on the outcome. These beliefs and attitudes are influenced by individual and environmental factors, such as personality, education, past behavior, and cultural factors. However, the most important predictor of behavior is the intention, or readiness, to perform or not perform the behavior (see figure 14.1).

**Intention** is a person's estimate of the likelihood he or she will perform a specific behavior. It is a function of the attitude toward the behavior, the attitude toward the social norms regarding the behavior, and **perceived behavioral control**. The attitude toward the behavior is a function of the beliefs about the consequences of engaging in the behavior and an evaluation of those consequences (cost-benefit analysis). People can have many beliefs about a behavior and evaluations of the consequences related

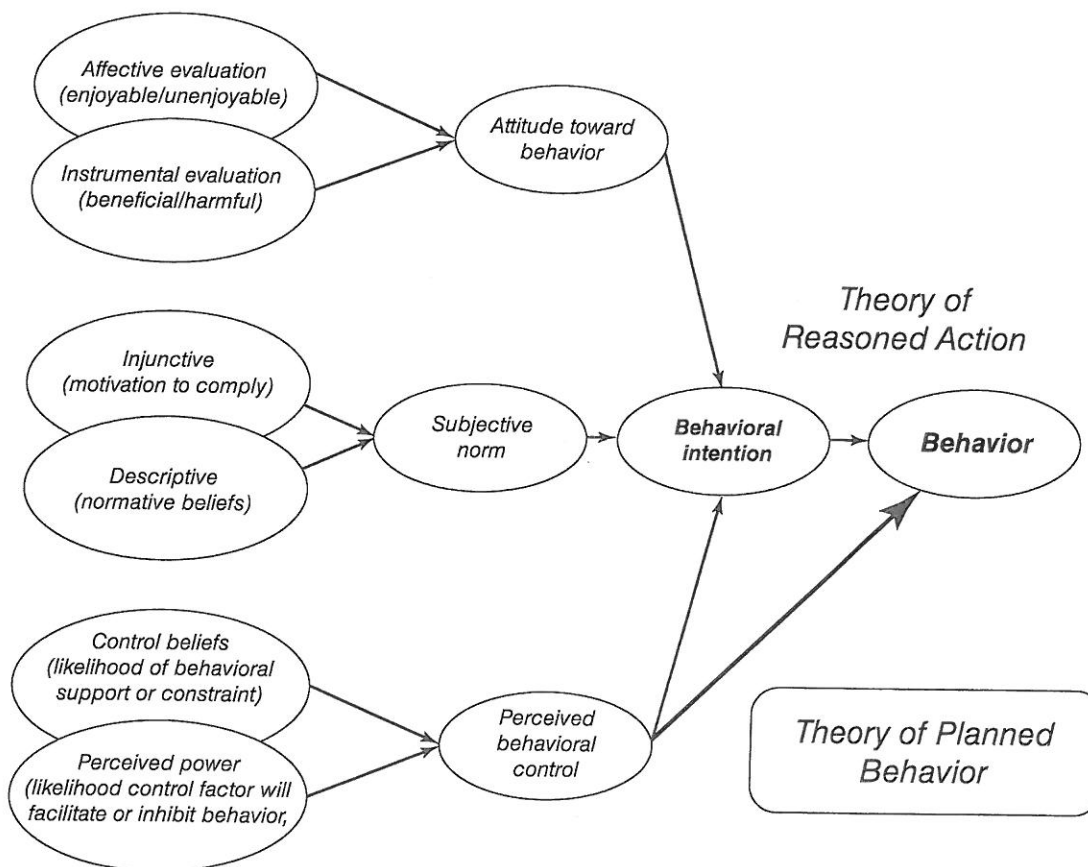


Figure 14.1 The theory of reasoned action and the theory of planned behavior.

to each belief—that is, the overall evaluations of performing the behavior. For example, Jim may believe that exercise can help him lower his serum cholesterol, but maintaining a regular exercise program will take time away from writing his dissertation. Subjective norms (i.e., perceived social pressure to perform the behavior) consist of perceptions of what other people think about the behavior (Jim's best friend Bob enjoys competing in triathlons) and the person's motivation to comply with others' expectations (Bob wants Jim to bike with him this weekend, and Jim wants to spend time with Bob). Perceived behavioral control is the perception of how easy or difficult the behavior will be based on an evaluation of the barriers and resources. Perceived behavioral control can influence the target behavior directly and can also be mediated by intention.

More than 200 exercise studies have been published using TPB, and consistent strong associations have been found between intentions and level of physical activity, as well as between exercise intention and perceived behavioral control, and between exercise intention and attitude (Rhodes and Nigg 2011). Perceived behavioral control can influence behavior directly (see figure 14.2) to the extent that perceptions of control include actual behavioral influences, such as the skills necessary for carrying out the behavior, opportunities, and resources (e.g., Rhodes and Courneya 2003). However, associations between subjective norms and exercise intentions typically have been weak (Fishbein 2008; Rhodes and Nigg 2011). In addition, this model gives a static profile of beliefs and attitudes and does not account for changes in cognitions over time.

Applications of TPB to exercise behavior research have typically involved measures that are specific to the behavior, context, and goal in question (e.g., Hausenblas, Carron, and Mack 1997; Kimiecik 1992). Fishbein (2008) emphasizes the importance of defining a target behavior in terms of action in a specific context directed at a target at a certain point in time. This is valuable when helping someone come up with a clear plan to exercise, and when measuring intentions and behavior. For example, a scale to measure exercise intentions could include the statement *I intended to do strength training*

**S**elf-determination theory is based on assumptions that people are motivated to engage in behaviors to meet three basic human needs and that motivation varies in the degree of self-regulation on a continuum.

*every other day for the next two weeks* rated on a 7-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*). This specificity in measurement is a major strength of TPB given the wide variety of exercise behaviors and settings.

## SELF-DETERMINATION THEORY

Historically, researchers have examined motivation in terms of volume or amount, but in the 1980s, Edward Deci and Richard Ryan proposed that the type and quality of motivation would be more important in predicting behavior, and they developed the self-determination theory (SDT) of human motivation. SDT is a broad theory that addresses personality development; self-regulation; psychological needs; life goals and aspirations; energy and vitality; nonconscious processes; relations of culture to motivation; and the impact of the social environment on motivation, affect, behavior, and well-being (Deci and Ryan 2008). The four subcomponents that constitute SDT are the basic needs theory, cognitive evaluation theory, organismic integration theory, and causality orientation theory (see Ryan and Deci 2002).

The assumption that autonomy, competence, and relatedness are basic psychological needs is a key aspect of SDT. The degree to which these needs are fulfilled or thwarted is the basis for individual differences in motivation. Exercise psychologists can thus analyze a behavioral strategy or environmental factors with respect to its effect on meeting these needs. For example, running alone at a time you choose satisfies autonomy needs, but running a challenging course with a good friend can satisfy the needs for competency and relatedness. If we can set

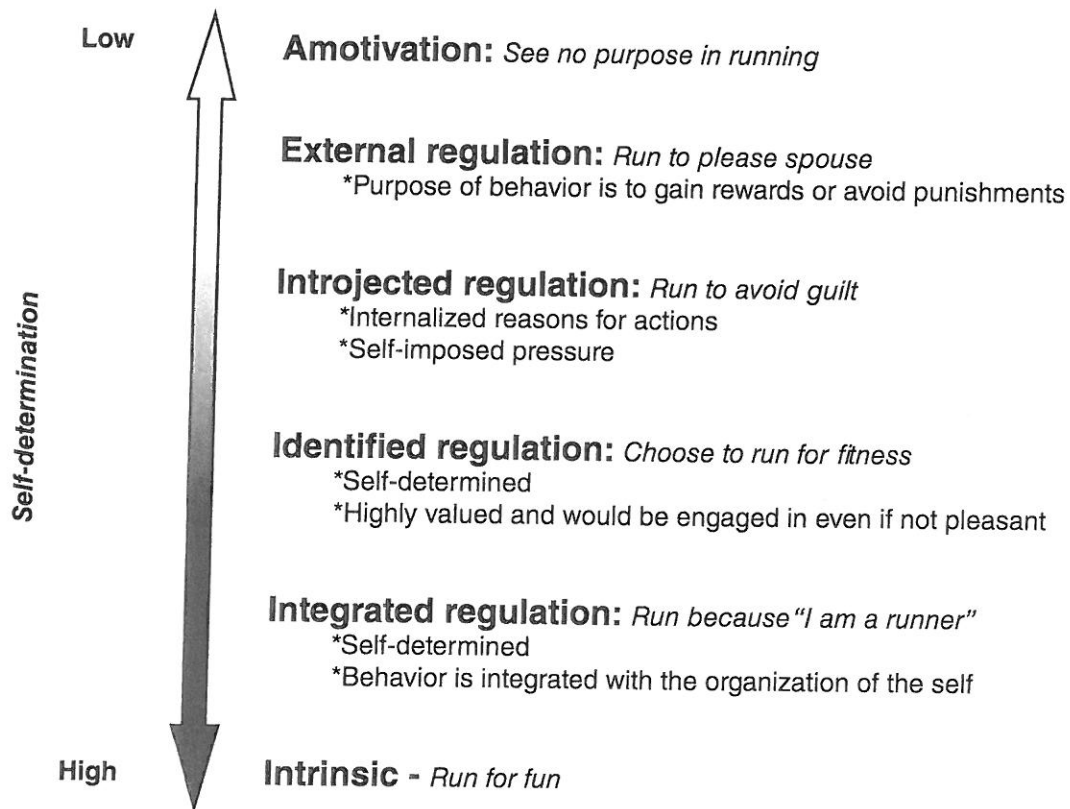


Figure 14.2 Self-determination continuum.

up a situation in which exercise addresses these basic needs, motivation will be stronger and adherence will be more likely. In fact, several physical activity interventions based on SDT have used strategies that foster a sense of control over the exercise routine, offer mastery experiences, and promote social support (see chapter 15).

Motivation has been classified as intrinsic (e.g., exercise for enjoyment) or extrinsic (e.g., exercise for reward or to avoid negative consequences separate from behavior) based on goals or reasons for the behavior. Generally, when the purpose of exercise is more intrinsic, it is more likely to be sustained. Often, exercise for extrinsic reasons (e.g., to lose weight) is discontinued when the external goal is met because exercise was just a means to an end. SDT extends the idea of motivation and describes a continuum of motivation based on level of autonomy from autonomous (intrinsic) to controlled (extrinsic) motivation (Deci and Ryan 2008; see figure 14.2).

Autonomous motivation is developed through the ongoing satisfaction of basic needs and involves choice or a self-endorsement of one's

action. Autonomous motivation has the highest level of self-determination and is associated with intrinsic motivation. Valuing or enjoying the activity underpins intrinsic motivation and is contrasted with engaging in the activity because of self-imposed pressure or the promise of rewards separable from the behavior itself (extrinsic motivation). More extrinsic regulatory styles involve external and internalized regulations of behavior that arise from external rewards or punishments, or from internal pressures (e.g., Mark bicycles to class because it is better for the environment than driving a short distance, even though he would really rather drive). External regulations of motivation can foster contingent self-esteem, approval motives, and avoidance of feelings of guilt and shame. For example, Mary exercises only because she wants to lose weight, and she feels good about herself when she follows her weekly exercise plan. If she misses a day of exercise, she feels guilty.

In general, autonomous motivation leads to better psychological health and long-term persistence in the motivated behavior (Deci

and Ryan 2008). Studies have also shown associations between more intrinsic regulation of exercise behavior and psychological well-being. Cross-sectional studies have found that different types of motivation are associated with different levels of exercise; that is, people who have more intrinsic motivation for exercise also exercise more than those with more externally regulated motivation (e.g., Edmunds, Ntoumanis, and Duda 2006). Moreover, longitudinal studies indicate corresponding changes in level of exercise and more intrinsic motivations (Rodgers et al. 2010). Researchers have also examined the role of goal content (what) and motives (why) and found that more intrinsic goal content is associated with more sustained exercise (Wilson, Mack, and Grattan 2008). However, it is important to address both goal content and motives because, for example, someone can exercise to be healthy (an intrinsic goal) and be motivated to do so out of guilt (introjected regulation), whereas someone else can walk to lose weight (an extrinsic goal) because he enjoys walking (intrinsic regulation). The application of SDT in interventions, such as applying strategies to enhance autonomy, competence, and relatedness, is covered in chapter 15.

Some researchers are beginning to study the pattern and process of motivational regulation development in respect to exercise, which is important in the development and application of SDT. Rodgers and colleagues (2010) examined results from six studies that measured motivational regulations (external, introjected, identified, and intrinsic motivation; see figure 14.2) and exercise. Two studies were cross-sectional assessments of adults reporting regular exercise ( $n = 202$ ;  $n = 1,054$ ), and four were intervention studies ( $n$  range = 38-160) that lasted from 10 to 24 weeks. Although participants at the end of the interventions became more autonomous in their motivation to exercise, they were still lower on all types of self-regulation compared to regular exercisers in the cross-sectional samples. More controlled (extrinsic) regulation did not change much after the interventions. However, identified regulation changed faster than intrinsic motivation, which implies that although exercise may not be inherently enjoyable for many people, it can be valued. From

this, the researchers speculated that substantial changes toward self-regulated motivation can occur early in an exercise program, but levels for these exercisers are still not as high as those for regular exercisers even after six months of training. Rodgers and colleagues (2010) propose that self-determined forms of motivation are not well developed enough after six months of regular exercise to sustain behavior, calling to question the six-month marker proposed in some research and theory (e.g., the transtheoretical model described later).

## STAGE THEORIES

The general paradigm for predicting behavior in the early development of behavior change theories was based on order, stability, and equilibrium. Theories of causality, such as behaviorism, evolved from a mechanistic view in which fixed-sequence pathways were said to link events in patterns of cause-and-effect relationships. The view was that the elements necessary for change and their interactions were not modified by their relationships or history, and that change was predictable and controllable.

The influence of **field theory** led to a broadening of the concept of change to include the proposition that events are a function of the nature and organization of *all* conditions in which they are embedded. Most of the theories presented so far have conceptualized behavior change as an event that is influenced by a number of variables in a linear pattern. People are placed on a continuum of probability of change according to their scores on multiple predictor variables. Newer models have been influenced formally and informally by quantum theory, nonlinear thermodynamics, and chaos theory to consider the contributions of instability, diversity, multiple dimensions and levels of effect, nonlinear relationships, and temporality in explaining change. The latter concept—that

Stage models of behavior reflect the dynamic, nonlinear process of behavior change.

of a temporal dimension—has been included in some of the newer and more promising stage models of behavior change.

Stage theories assign each individual to one of a limited number of categories, or stages. Those in the same stage are similar to each other with respect to specific characteristics, such as level of physical activity, and those in different stages demonstrate substantial differences in these characteristics. Stage theories may also include parameters for how long people stay in a particular stage and for the usual sequence of movement from stage to stage. People typically spend a certain amount of time or accomplish specific tasks in stage A before they are ready to move to stage B. However, movement through the stages of health behavior change is not inevitable or progressive. For many people, behavior change does not follow an orderly, predictable pattern. Often, people trying to change a health behavior get stuck in a stage or cycle through stages out of sequence or at varied rates of progression. Stage models allow for the process to go forward, go backward, cycle, or stop, providing a context for describing relapse and readoption.

In addition to the concept of irregular progression, stage theories define barriers to change that are similar among people in specific stages and are important for progression to the next stage. Because there are different barriers in each stage and specific tasks that must be accomplished to move to the next stage, stage models imply stage-specific interventions. For example, the health action process approach developed by Schwarzer (1992) distinguishes between motivational (decisional) and volitional (action) phases

of health behavior change. People develop an intention to act in the motivational stage based on self-efficacy, perception of risk, and the pros and cons of action. Strategies to help people decide to start regular exercise could involve enhancing task self-efficacy, identifying the risks of inactivity, and pointing out the benefits of an active lifestyle. In the volitional stage, action planning is necessary for fostering the initiation of the goal behavior by specifying when, where, and how to act (e.g., after supper, go to the gym and walk around the track for 30 min), whereas coping planning involves identifying situations that put engaging in the behavior at risk and developing suitable coping responses (e.g., when there is an evening PTA meeting, get up 45 minutes earlier and walk before breakfast).

The **transtheoretical model of behavior change (TTM)**, also known as the stages of change model, is a general model of intentional behavior change that includes a temporal component as a critical factor in describing and predicting behavior. It is the stage model most frequently applied to exercise (see table 14.4). In the late 1970s, Prochaska and DiClemente, observing smokers trying to quit without professional intervention, found that these self-changers passed through specific stages as they tried to decrease or eliminate this health-related behavior. Prochaska and DiClemente developed transtheoretical therapy in the late 1970s and early 1980s based on this research and a transtheoretical analysis of 18 leading systems of psychotherapy (see Prochaska 1979; Prochaska and DiClemente 1982, 1983). The principles and mechanisms of transtheoretical therapy were

**Table 14.4** The process of adopting and maintaining regular exercise is described through specific stages of behavior change.

| Stage            | Intention to exercise | Exercise                             |
|------------------|-----------------------|--------------------------------------|
| Precontemplation | No                    | None                                 |
| Contemplation    | Yes (within 6 mo)     | None                                 |
| Preparation      | Yes (within 30 d)     | Irregular < criterion amount*        |
| Action           | Yes                   | Regular ≥ criterion amount for <6 mo |
| Maintenance      | Yes                   | Regular ≥ criterion amount for >6 mo |

\*Usually >20 min on 3 or more days/wk, at least moderate intensity.

## Stage Theories: Stages and Possible Patterns of Behavior Change

### Stages of Behavior Change

- A (not engaging in the target behavior)
- B (not engaging in the target behavior but having strong intentions to do so)
- C (recent adoption of the target behavior)
- D (established participation in the target behavior)

### Examples of Possible Patterns of Change

Progressive order: A → B → C → D

Backward: A → B → C → B → A

Cycle: A → B → A → B → A

then used to construct the transtheoretical model of behavior change.

The transtheoretical model describes health behavior adoption and maintenance as a process that occurs through a series of behaviorally and motivationally defined stages (see figure 14.3). Although the model was developed to describe changes in addictive behavior, it was expanded to include the adoption of preventive health behaviors and the use of medical services. Dishman in 1982, Sonstroem in 1988, and Sallis and Hovell in 1990 promoted the concept of a dynamic model of exercise behavior that included stages, and in the early 1990s, Marcus and others applied the transtheoretical model to exercise behavior (e.g., Marcus et al. 1992; Marcus and Simkin 1993). Since then, more than 100 studies have applied the transtheoretical model to exercise and physical activity.

The transtheoretical model includes three levels: stage of change, constructs hypothesized to influence behavior change, and level of change. Level of change has not been addressed in the exercise literature, and many studies applying or testing the transtheoretical model with exercise use only the first level of this model—that is, stage of change. Stage is the temporal dimension

in which change unfolds. Empirical analysis has established five distinct stages that are relatively stable but open to change. A six-month time period is typically used to define stages, assuming that six months is about as far in the future as people can anticipate making changes. A sixth stage, *termination*, represents a point at which there is 100% confidence in the ability to maintain the behavior change and there is no risk of a relapse to previous stages, although this last stage is not often used in exercise studies and is likely more appropriate for cessation of an unhealthy behavior.

The number and descriptions of exercise stages of change have been varied. For example, some researchers do not include a time frame for the intention to begin exercise (e.g., within 30 days) as a criterion for classification in the preparation stage. Others have divided preparation into two stages, characterized by some exercise but distinguished by the intention to adopt regular exercise. Physical activity stages of change have also been applied in research studies and interventions that address the U.S. Centers for Disease Control and Prevention and the American College of Sports Medicine's recommendations for daily physical activity.

The second level of the transtheoretical model includes three constructs that are hypothesized to influence behavior change. They are self-efficacy to overcome barriers, incorporated from social cognitive theory (see the discussion earlier in this chapter); **decisional balance**, which is the evaluation of the pros and cons of the target behavior; and **processes of change**, which are the strategies used for changing behavior. Several studies have examined exercise stage and self-efficacy for exercise; and in general, self-efficacy is lowest in the early stages (e.g., precontemplation) and higher in each adjacent stage, with the highest exercise self-efficacy seen in the maintenance stage. There is some longitudinal evidence that exercise self-efficacy increases as one moves from an established sedentary lifestyle to long-term maintenance of regular exercise (Dishman, Vandenberg, Motl, and Nigg 2010; Marcus et al. 1994; Plotnikoff et al. 2001). However, these data cannot tell us whether people are more active because they have higher self-efficacy, or if they have higher self-efficacy because of past success

## Exercise Stages (Example)

- *Precontemplation stage:* People are inactive and have no intention to start exercising. They are not seriously thinking about changing their level of exercise within the next six months, or they deny the need to change.
- *Contemplation stage:* People are also inactive, but they intend to start regular exercise within the next six months.
- *Preparation stage:* People are active below a criterion level (typically defined as at least 3 times per week for 20 min or longer), but intend to become more active in the near future (within the next 30 days).
- *Action stage:* People have engaged in regular exercise at the criterion level for less than six months. Motivation and investment in behavior change are sufficient at this stage, and the perceived benefits are greater than the perceived cost. However, this is the least stable stage. People in the action stage are at the greatest risk of a relapse.
- *Maintenance stage:* People have been exercising regularly for more than six months. Exercise behavior is more established than in the other stages, and the risk of a relapse is low.

with exercise so that their experience is the true determinant of their current behavior.

Decisional balance is another construct from the transtheoretical model that is believed to influence exercise behavior. Based on the decision theory of Janis and Mann (1977), perceived costs and benefits to oneself and significant others are considered important influences on behavior change. There is good evidence that two constructs (i.e., pros and cons) are adequate for exercise. The relationship between the pros and cons of exercise and exercise stage typically

shows that pros increase and cons decrease with movement to each subsequent stage. Most of the evidence for exercise also indicates that the crossover between pros and cons occurs during the contemplation or preparation stage; this is consistent with several other health behaviors.

The processes of change are strategies associated with movement along the stages and are divided into cognitive/experiential and behavioral. Cognitive/experiential processes are defined as the set of processes through which people gather relevant information on the basis of their own actions or experiences. An example of a cognitive process is self-reevaluation, in which people reappraise their values regarding inactivity. Behavioral processes are the set of processes in which the information is generated by environmental events and behaviors, such as stimulus control and reinforcement control.

Temptation is a factor in the TTM that is applicable to cessation behaviors. Temptation represents the urge to engage in an unhealthy behavior (e.g., smoking) in challenging situations and should decrease as one progresses through the stages (Prochaska and Velicer 1997). Although not applied to exercise as frequently as other TTM constructs, the temptation to refrain from exercise is associated with an affective component and the perception of competing demands. However, affect and competing demands were weakly related to physical activity levels measured repeatedly across two years (e.g., Dishman, Vandenberg, Motl, and Nigg 2010).

The level of change dimension is the context in which the problem behavior occurs. These levels include symptom/situational, maladaptive cognitions, current interpersonal conflicts, family/systems conflicts, and intrapersonal conflicts. Although not typically applied in exercise research, identifying the level of the problem could be used to guide interventions. For example, the level of change for someone who wants to begin strength training but does not have access to a fitness center would be situational. Setting up a home exercise program would have more efficacy for this person than targeting her cognitions.

Despite its appeal as a model for exercise behavior change and its application in several intervention studies, some uncertainty remains

about whether the stages and processes of the transtheoretical model are applicable to understanding exercise behavior change, as Bandura argued in 1997. Recall that theories of behavioral change should be considered provisional, subject to change, improvement, and eventual replacement. Thus, scholars continue to test the application of the transtheoretical model to exercise behavior.

Longitudinal studies support earlier cross-sectional findings that people appear to use both cognitive/experiential and behavioral processes when they attempt to increase or maintain their levels of physical activity. Both cognitive and behavioral processes of change predicted 12-month physical activity status in a randomized controlled trial to promote physical activity, although processes of change assessed at 6 months did not predict the adoption or maintenance measured at 12 months (Williams, Dunsiger, Ciccolo, et al. 2008).

In a multi-ethnic cohort of 500 adults living in Hawaii who were observed at six-month intervals three or more times for two years, people who maintained or attained the Healthy People 2010 physical activity guidelines were more likely to retain higher scores on self-efficacy and both experiential and behavioral processes of change across the two years of observation (Dishman, Vandenberg, Motl, and Nigg 2010). However, the stages were not useful for predicting change in physical activity (Dishman, Thom, Rooks, et al. 2009). Stage was more likely to falsely classify people as meeting the guideline than to falsely classify them as not meeting it. Probabilities of predicting six-month transitions were about 50% for the stable class of meeting the guideline each time and just 25% for transitions between meeting and not meeting the guideline, which was worse than a chance prediction.

The TTM assumption that interventions matched to the person's stage would be more effective than those that were not has also been examined in a few studies with mixed results. For example, a stage-matched intervention group was more successful than a mismatched and control group after 16 weeks of a physical activity intervention, but was not more effective than standard care (Blissmer and McAuley 2002) and control groups.

## OTHER THEORIES APPLIED TO EXERCISE AND PHYSICAL ACTIVITY

The theories reviewed so far are the prominent models in exercise behavior research, but several other models have also been applied to exercise, with varying success.

### Health Belief Model

The health belief model was developed by Rosenstock and others in the 1950s to explain poor compliance with immunization and tuberculosis screenings. The health belief model explains health behavior at the level of individual decision making regarding the adoption or cessation of behaviors related to risk or control of a disease. The model centers on perceptions of how much of a personal threat the disease is and how effective the behavior change will be in reducing the threat. The likelihood of taking action is influenced by a cue to action (internal or external) and demographic and sociocultural variables. The readiness to adopt a health behavior depends on motivation, an evaluation of the threat of illness resulting from not changing behavior, and the perception that the behavior in question will reduce the threat. Modifying factors include demographics, structural factors (cost, complexity), attitudes, interaction factors (between patient and care provider), and enabling factors (social pressure, past experiences). Social support and self-efficacy have been added to the original model, which should enhance its predictive utility.

The health belief model appears more useful for preventive health behaviors and compliance

The word *ecology* stems from the Greek *oikos* ("household") and *logos* ("knowledge"). The term was first used by Ernst Haeckel in 1866 to describe "the comprehensive science of the relationships of the organism to the environment."

### Health Belief Model: Beliefs That Influence Exercise Behavior

- Perceived susceptibility to developing health problems because of inactivity (e.g., coronary heart disease, obesity)
- Perceived impact of the health problems on quality of life (perceived severity)
- Belief that adopting an active lifestyle will be beneficial
- Extent to which the benefits of exercising exceed the cost of exercising (perceived cost-benefit ratio)

with medical regimens, and less useful when applied to exercise. It is, essentially, an illness avoidance model. In fact, some studies indicated that perceived susceptibility was inversely associated with exercise adherence. It may be that physical activity and exercise are not perceived by some as health behaviors. People exercise for social interaction, enjoyment, mastery, and competition, as well as to enhance health; and motivation for exercise can change.

### Social Ecological Models

Social ecological models have evolved from the seminal work of Kurt Lewin, the father of modern social psychology, whose field theory (1935) formally introduced the idea that behavior is a function of both the individual and the environment. The "field" contains the person and his or her dynamic psychological environment (e.g., perceptions), and behavior was proposed to depend on the current field rather than past or future environments. Subsequent scholars expanded on the nature of the environment and the relationship among the person, the behavior, and the environment (Sallis, Owen, and Fisher 2008). For example, in 1968 Roger Barker introduced the idea of a "behavioral setting," consisting of social and physical situations in which behavior occurs. In the late 1970s and early

Social ecological models are grounded in Lewin's equation:

$$B = \rightarrow (P, E)$$

where B = behavior, P = person,  
and E = environment.

1980s, Rudolf Moos and Urie Bronfenbrenner categorized environmental factors and influences to explain behavior, drawing attention to natural and built environments, organizational settings, sociocultural characteristics, and social climate (e.g., Moos 1979) and various levels of systems: micro (interactions among family and work groups), meso (e.g., family, school work settings), and exo (economics, culture, politics) environments (e.g., Bronfenbrenner 1979).

Ecological models contrast with other theories discussed in this chapter, which focus on the individual (e.g., attitudes, beliefs, cognitions, behavioral skills, and experiences) and more local social influences such as family and friends. Social ecological models consider the broader community, organizations, culture, and policies, as well as the constructed and natural environments, to explain behavior and guide interventions. One assumption is the interdependence among people, their behavior, and the environment, with multiple levels of influence that affect the adoption and maintenance of behavior. Intrapersonal, interpersonal, community, environmental, and organizational resources are thus considered when designing behavior change interventions, and multilevel modeling (see chapter 2) is applied to analyze intervention effects. Another assumption common to social ecological models is that effects across and between levels interact, and at each level of analysis specific resources are identified that can be "leverage points" that can have a greater impact on behavior (see figure 14.3). According to Sallis, Owen, and Fisher (2008), the basic principles of ecological perspectives are that (1) multiple levels of factors influence behavior, (2) influences interact across levels, (3) multilevel interventions should be most effective, and (4)

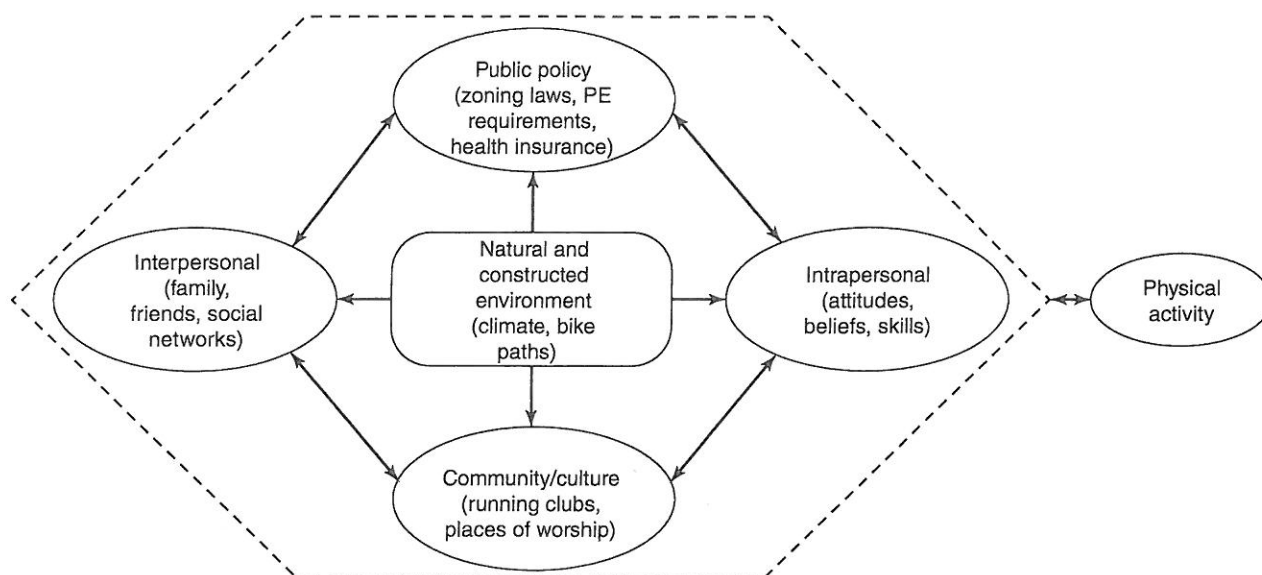


Figure 14.3 Interrelationships among social ecological components.

models are most effective when they are behavior specific.

Fleury and Lee (2006) conducted a descriptive review from a social ecological perspective of 23 studies on correlates of physical activity in African-American women that illustrates the range of factors considered with this model. Results were organized into intrapersonal, interpersonal, community and environment, and organizational influences. Low motivation (e.g., perceived lack of willpower, low self-efficacy) was an important intrapersonal barrier to physical activity. Moderate intrapersonal correlates were functional ability (fatigue from exercise, the perception that exercise is "hard work," health concerns, and comorbidities), socioeconomic status, and education. A low association was found for employment. Interpersonal factors were particularly important for African-American women, especially social support through encouragement and the opportunity to spend time with family and friends, as well as instrumental support such as aid with caregiving to free up time to be active. Observing others being active (a reflection of social norms) and participating in organized religious activities were also consistently associated with more physical activity. The community and environment factors that were barriers included a lack of safe places to exercise, culturally specific physical activities, sidewalks, and streetlights.

Increased activity was associated with community coalitions that incorporated the development of leadership skills and resources. Although few studies examined the role of organizational and policy resources, Fleury and Lee (2006) found that African-American women identified strong and supportive community organizations and partnerships as important for fostering increased physical activity.

## Relapse Prevention Model

Most of the theories described in this chapter can be applied to the adoption and maintenance of behavior change. The **relapse prevention** model, which was derived from social learning theory, focuses on the maintenance of voluntary self-control efforts and the cyclical nature of long-term behavior change. The goal in the application of the model is to help people who are attempting to modify their behavior cope effectively with situations that could tempt them to return to the old, undesired behavior pattern. Marlatt and Gordon (1985) originally designed the model to enhance maintaining abstinence from a high-frequency, undesired behavior—that is, addictive behavior. Maintenance of behavior change is described in the context of the person's ability to cope with relapses cognitively and behaviorally.

Relapse begins with a **high-risk situation**, which is a situation that challenges one's confidence in adhering to a desired health behavior. For exercise, high-risk situations can include boredom, bad weather, negative mood, social situations, and lack of time. An adequate coping response to a high-risk situation leads to increased self-efficacy and a decreased probability of relapse. Inadequate coping or no coping leads to decreased self-efficacy and possibly positive expectations of what will happen if the desired health behavior is skipped (e.g., "I can go to the football game if I don't go to the gym today"). The more rigid the rule for meeting the target behavior, the more likely the deviation will be perceived as a slip. For example, if the "rule" is to exercise at the gym on Saturdays at 1:15 p.m. for 35 minutes, going to the game instead can be a slip (an acute, isolated missed exercise session), but starting 10 minutes late can also be perceived as a slip. A perception of slipping may lead to the abstinence violation effect, or in the case of exercise, the *adherence* violation effect. One of the characteristics of this effect is the experience of cognitive dissonance—an incongruity between thoughts or feelings and behavior. For example, the slip behavior (i.e., missing one exercise class or not meeting a specific rigid exercise plan) does not match the self-concept of being in control of exercise behavior. Another cognitive component of the abstinence or adherence violation effect is all-or-nothing thinking, such as defining oneself as either a success or a failure, which is also a risk for increased mental stress (see chapter 4). The emotional components of an abstinence or adherence violation include a sense of failure, self-blame, lowered self-esteem, guilt, and perceived loss of control, which can set the stage for relapse.

A lifestyle imbalance in which "shoulds" exceed "wants" also predisposes a person to relapse. People who spend more time doing what they *should* do at the expense of doing what they *want* to do feel deprived, and the

desire for indulgence or self-gratification increases. For example, Bill has been exercising each weekend since his blood pressure was found to be elevated at his last physical. He has missed several fishing trips because of his exercise program, and he feels frustrated and left out when his friends talk about how much fun they had. Positive expectations of not adhering to the behavior change make relapse more attractive, as well. If he skipped his workout this weekend, Bill could try out his new fishing rod on a trip to the coast with his friends.

Conceptually, the relapse prevention model seems useful for exercise adherence, given that ~50% of those who begin a regular exercise program drop out within the first six months, most within the first three months. However, the model was developed for maintaining the cessation of high-frequency undesired behaviors, and in the case of exercise, the goal is to maintain a low-frequency, desired behavior that requires considerable repeated effort. It is clear when someone relapses from smoking cessation, but it is hard to identify when a lapse from regular exercise becomes a relapse. Some researchers have defined a lapse as no exercise for a week, but it may be difficult for exercisers to identify a lapse for themselves or to deal with a lapse in time to forestall relapse.

One component of relapse prevention training that may not be effective with exercise is a planned relapse, in which the person voluntarily returns to the undesired behavior, in this case inactivity, for a short period of time under controlled conditions. Planned relapse may not be a good strategy for acquisition behaviors in general, particularly in the early stages of behavior change (Marcus and Stanton 1993).

Other strategies for relapse prevention, such as identifying high-risk situations and planning for them, and setting flexible goals (rules), have been applied to exercise with some success. In one study, acute high-risk situations, components of the relapse prevention model relevant to slips, and exercise outcomes at three-month follow-ups were examined in 59 adults participating in regular exercise for an average of five years (Stetson et al. 2005). The average number of high-risk situations over the measurement periods was 3.5; the most common were bad weather,

**H**igh-risk situations and rigid rules increase the risk of relapse.

inconvenient time of day, being alone, negative mood, and being physically tired. Exercising in spite of a high-risk situation was associated with positive cognitive coping strategies, such as task-oriented problem solving and positive reappraisal, although there were no reports of using social support as a coping strategy. Women were twice as likely as men to miss an exercise session in response to a high-risk situation, but this might have reflected a greater tendency for women to report slips. Although there are limitations in relying on retrospective recall, this study illustrates that high risk-situations do not guarantee slips and relapse, as well as the importance of the way exercisers cope with a challenging situation in fostering adherence.

## Habit Theory

A habit is defined as a goal-directed behavior that has been performed repeatedly and has become automatic. It is thus performed without conscious thought or decision in which at least one other course of action is considered. A habit is a thing done often, and thus, according to habit theory, easily (Ronis, Yates, and Kirscht 1989). Habit theory proposes that automatic cognitive processes are set in motion by situational cues, so conscious thought is not required. Situational consistency contributes to habit formation; therefore, vivid, numerous, and consistent cues support behavior change maintenance. Another supposition of habit theory is that the simpler and more discrete the behavior, the more likely it will be to become habitual and be elicited by situational cues. Thus, components of an exercise routine can be examined, and parts of the routine can be identified as potential habits. For example, putting running clothes out the night before, driving to the gym after work, and stopping work at noon to walk with friends are behavioral candidates for control by automatic cognitive processes.

Aarts, Paulussen, and Schaalma (1997) developed a model of physical exercise and habit formation to describe the process by which exercise habits are formed. This model contains several of the components of habit formation just discussed. The development of a physical activity habit begins with an initial contemplative

decision process in which the need to exercise is evaluated based on perceptions of desirability, social pressure, and behavioral control. A positive evaluation leads to intentions and the actual exercise behavior. If the consequences of the behavior are pleasant, the recurrence of exercise depends on the opportunity to perform the behavior under similar circumstances. Over time, the contemplative decision process becomes less complex. As the behavior is repeated, it is automatically activated by the situational features that precede exercise. Exercise becomes a habit that no longer needs reasoned consideration. The development of lifelong exercise habits depends on overcoming several obstacles, such as a lack of positive immediate consequences and difficulty in repeating the same behavior in similar circumstances (i.e., disruptions in exercise routines as a result of changes in work schedules, social obligations), which impedes the repetition that is important in habit formation.

Strength of habit (subjective experiences of repetition and automaticity) has been measured with the Self-Report Habit Index (Verplanken and Orbell 2003), and the strength of exercise habits has been associated with level of exercise in several studies. For example, Rhodes and colleagues (Rhodes, de Bruijn, and Matheson 2010) tested the role of habit in predicting physical activity within the theory of planned behavior in 153 college students and found that habit accounted for an additional 7% of variance in physical activity beyond intention. However, a strong exercise habit even along with an intention to exercise is not a guarantee that someone will be physically active (e.g., de Bruijn 2011).

## Physical Activity Maintenance Model

The physical activity maintenance model (PAM) developed by Nigg, Borrelli, Maddock, and Dishman (2008) assumes that predictors of adoption are different from predictors of maintenance. This model adds to our understanding of exercise behavior by incorporating triggers for physical activity relapse, integrating individual and environmental variables important for maintenance, and conceptualizing physical activity maintenance as an active process. This model is multi-

level and considers intrapersonal factors, but also social environment and community structures, proposing a reciprocal relationship between the environment and the person, as does the social ecological model (see figure 14.4).

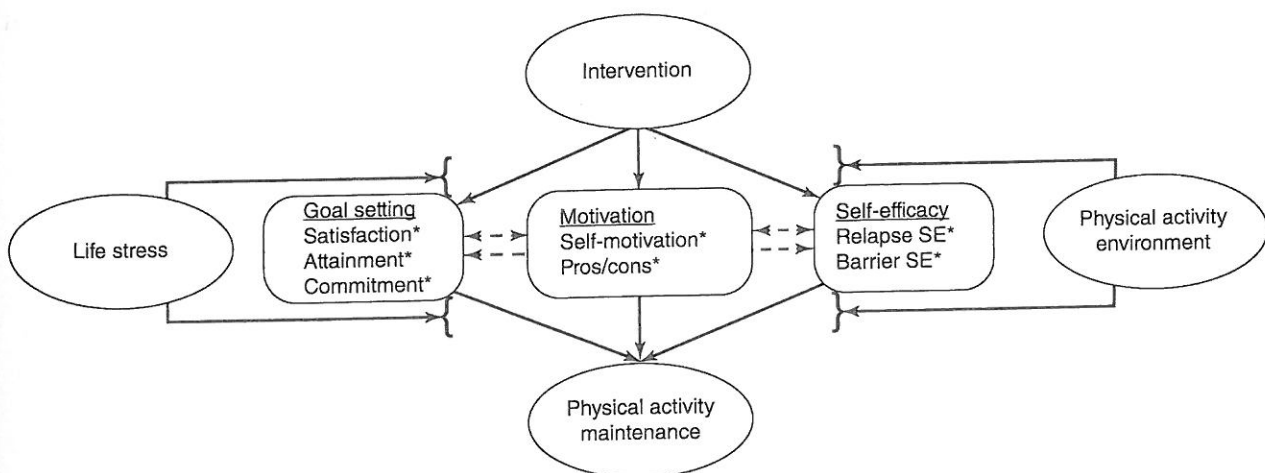
PAM mediators include goal setting, self-efficacy, and motivation. Goal setting operates through commitment and achievement and influences the direction, regulation, and persistence of effort. Goal setting serves as a mechanism to build mastery experiences through goal attainment and influences self-efficacy. Barrier and relapse self-efficacy are most relevant to this model, in which self-efficacy is proposed to have direct and indirect effects on behavior through motivation and goal setting. Motivation is considered from an intrinsic perspective, that of self-motivation, which is a disposition to persist independently of context-specific beliefs and extrinsic expectations of the pros and cons of maintaining regular physical activity. Goal setting, self-efficacy, and motivation are interrelated and integral and have reciprocal influences in this model. For example, motivation to keep running during a long, hot summer can lead to goal modification, and achieving these new goals can enhance self-efficacy to maintain exercise.

The environment and life stress are considered contextual influences on PAM mediators. These contextual influences can be opportunities and affordances that are filtered by perceptions, cog-

nitions, and motivation, and they are moderated by existing conditions. An important contribution of this model is the inclusion of life stress as a critical contextual element to explain patterns of physical activity—specifically as a potential trigger of relapse. Life stress affects behavioral maintenance because stress decreases and redirects personal resources away from physical activity; distracts from setting goals; increases negative affect, depression, and anxiety; and thus decreases motivation for physical activity. In addition, chronic stress can compromise the immune system, leading to increased fatigue and physical weakness.

## ISSUES IN THE APPLICATION OF THEORIES OF EXERCISE BEHAVIOR

Just as there is no single determinant of exercise and physical activity, no single theory seems to be adequate for describing and predicting exercise behavior. The theories we have presented are all reasonable models of human behavior and contain many of the variables related to exercise behavior that research on exercise correlates has revealed. The three most popular theories in exercise psychology are social cognitive theory or self-efficacy theory, the theory of planned behavior, and the transtheoretical model (Biddle



\*Constructs specific to maintenance of PA, which may be correlated to each other.

**Figure 14.4** Physical activity maintenance model.

Reprinted, by permission, from C.R. Nigg et al., 2008, "A theory of physical activity maintenance," *Applied Psychology* 57(4): 544-560

and Fuchs 2009; Rhodes and Nigg 2011). The self-determination theory and social ecological approaches are being applied with greater frequency, and in European research, the health action process approach (HAPA; Schwarzer 2008) has figured prominently. However, many of these theories have been applied to exercise incompletely, and more studies are needed that empirically test the application of specific theories to exercise behavior and address exercise maintenance explicitly (e.g., the physical activity maintenance model).

In a review of exercise behavior change interventions in 1998, Baranowski, Anderson, and Carmack argued that interventions work through mediating variables, but that current theoretical models used to select mediating variables often do not account for substantial amounts of variability in the targeted outcome. The authors recommended more basic behavioral and social science research to understand physical activity behavior, which would include the examination of theoretical constructs. Meeting this charge would help to clarify the role of personal, environmental, and behavioral variables and their relationships in predicting and explaining patterns of physical activity.

More researchers are taking on this challenge to address the insufficient body of literature on the accuracy of individual theories to explain and predict physical activity. Those who should consider the research issues addressed in chapter 2, such as the measurement of psychosocial constructs. Theory testing in physical activity

behavior has been limited by cross-sectional or short-term (e.g., two weeks) prospective studies. Temporal sequencing is critical to test theoretical constructs and requires experimental or natural longitudinal research. Data analysis to verify the theoretical constructs and their interrelationships requires multivariate statistical techniques. These points can be incorporated into the criteria for applying theory to physical activity behavior research (see table 14.5) proposed by Nigg and Paxton (2008), who also called for guidelines such as the CONSORT statement (see chapter 15) for reporting the theoretical foundations of behavioral interventions.

Certainly, the design, implementation, and interpretation of research on exercise behavior must be based on theory. In addition to the theories described in this chapter, many other theories of human behavior are available that can be used to understand and predict exercise behavior. The selection of a theory should be guided by the evidence for its application to the unique characteristics of exercise and the relationships between theoretical constructs and exercise behavior. Some researchers have addressed this issue by developing theories specific to exercise (e.g., Aarts, Paulussen, and Schaalma 1997; Nigg et al. 2008), whereas others have advocated integrating theories across multiple domains of the social, behavioral, and biomedical sciences (Epstein 1998) or adding specific components to existing theories to increase the amount of variance in physical activity that can be explained.

**Table 14.5 Criteria for the Appropriate Application of Theory to Physical Activity Behavior Research**

|                                                                   |
|-------------------------------------------------------------------|
| 1. Theory identification                                          |
| 2. Entire theory description                                      |
| 3. Translating all of the theory components into the intervention |
| 4. Implementing all of the intervention components                |
| 5. Assessing all of the theory components                         |
| 6. Ensuring congruency between theoretical variables and outcome  |
| 7. Ensuring fidelity of the intervention protocol                 |
| 8. Appropriately assessing change in outcome                      |

Adapted from Nigg and Paxton 2008.

## SUMMARY

Behaviorism considers behavior change to be the result of modifications in antecedents and consequences and their cuing and reinforcing strength. Cognitive behaviorism defines intra-individual factors as the key to behavior change. The application of social learning-based theories to exercise behavior involves describing exercise and physical activity as volitional behavior influenced by conscious decision making, and emphasizes the roles of self-efficacy, attitudes, beliefs, motivation, and intentions to varying degrees. Although attitude models in general account for no more than 35% of the variance in exercise behavior, these models are primarily concerned with decision making, which is a predisposing factor in terms of actual behavior change. Enabling factors (accessibility, the availability of resources, environmental factors) and reinforcing factors (rewards and incentives) add to the explanation of exercise adoption and maintenance, and should be considered in a comprehensive model of exercise behavior that includes a biological component.

Psychosocial, physiological, and environmental factors change over time, and thus their contributions to exercise behavior are dynamic. The inclusion of a temporal dimension in a model of exercise behavior, such as that described by stage and relapse prevention models, expands our ability to understand how people change and has implications for improving the effectiveness of interventions. Although some argue for developing new theories, we have yet to establish a sufficient body of literature from studies that used theories appropriately and mapped theoretical mediators to behavior change strategies and approaches.

## WEBSITES

[www.bf Skinner.org/BFSkinner/Home.html](http://www.bf Skinner.org/BFSkinner/Home.html)

[www.nacbt.org](http://www.nacbt.org)

[www.des.emory.edu/mfp/bandurabio.html](http://www.des.emory.edu/mfp/bandurabio.html)

[www.uri.edu/research/cprc/TTM/detailedoverview.htm](http://www.uri.edu/research/cprc/TTM/detailedoverview.htm)

[www.psych.rochester.edu/SDT](http://www.psych.rochester.edu/SDT)