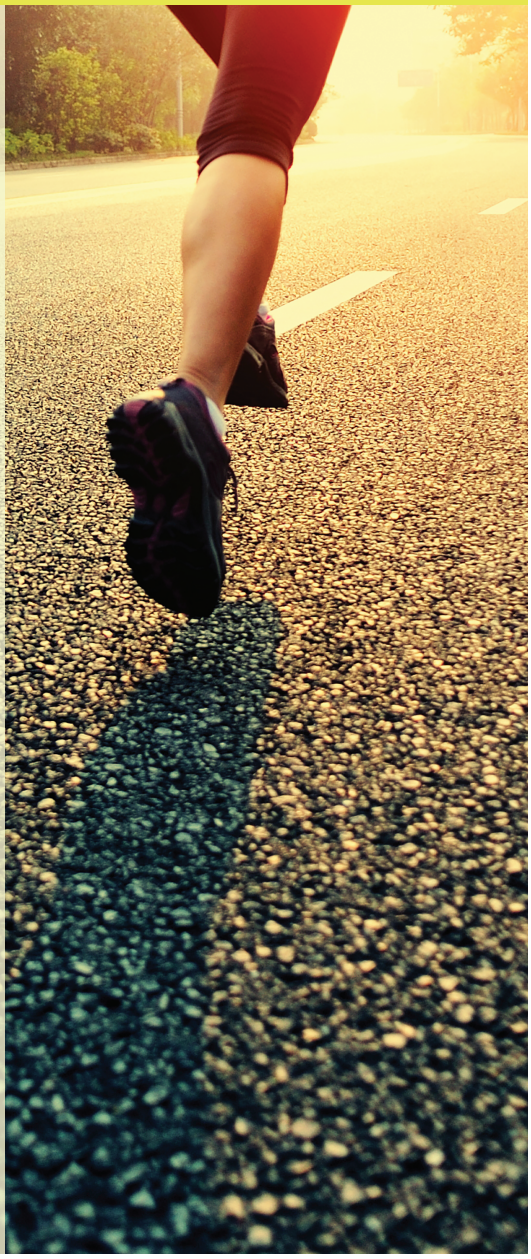
SECTION 1

Introduction to the Psychology of Exercise and Sedentary Behavior

This text is subdivided into four sections. The general purpose of Section 1 is to introduce you to the research area of the psychology of exercise and sedentary behavior. The scientific inquiry into exercise psychology is also referred to as *physical activity psychology*, *behavioral medicine*, or *fitness psychology*. In Chapter 1, we discuss physical activity from the perspective of why it is important, the degree to which people are involved in physical activity, and some of the physical activity guidelines (i.e., minimum levels) that have been developed for general as well as special populations. Also, a hallmark of effective communication is definitional clarity—it is important for you to understand some of the terms that are used throughout the text. So, in Chapter 1, definitions are provided for *exercise*, *physical activity*, and related terms such as *health*. A brief history of exercise psychology also is provided.

In Chapter 2, we discuss the psychology of sedentary behavior as a related, yet distinct, area from the psychology of physical activity. We will describe the health significance of sitting too much. We also take a closer look at the science behind the question: "Is sitting the new smoking?" In other words, is our current sedentary lifestyle more dangerous to our health than smoking? We will examine the science behind the health effects of prolonged sitting as well as the prevalence of sedentary behavior, correlates of sedentary behavior, and the emerging sedentary behavior guidelines. So let's get moving!



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CHAPTER 1

Introduction to the Psychology of Physical Activity

Runner: © lzf/Shutterstock

Vignette: Henry

My parents were by no means paragons of health. I was in elementary school the day mom came back from the doctor with a diagnosis of type 2 diabetes. The doc said it was because of all the weight she'd put on after pregnancy, as well as her diet. (Her favorite activity was watching daytime television on the couch, and if she ever did eat a vegetable it was soaked in butter and salt.) Since giving birth to me she'd developed back problems and found it painful to walk for more than 5- to 10-minute stretches at a time, so implementing the doc's recommended 30 minutes of movement a day struck her as impossible. (Needless to say, she didn't follow his advice.)

Dad had also been slapped with a diagnosis while I was still a kid. I can't remember a time where he wasn't bemoaning the blood pressure pills he had to take for his hypertension. He'd injured his ACL in college playing sports and was too afraid to get back into exercise, lest he hurt himself again. Plus, he barely had the time. He worked a demanding job as a truck driver and often went days without enough sleep.

Suffice it to say that exercise just wasn't something you went out of your way to do where I came from. Sure, some of my classmates did outdoorsy types of activities that got their blood pumping—biking, hiking, kayaking in the

LEARNING OBJECTIVES

After completing this chapter, you will be able to:

- Outline the importance of physical activity from a health perspective.
- Provide estimates of the number of people who are physically active.
- Describe the guidelines for a physically active lifestyle.
- Differentiate among the key terms used in the area known as the psychology of physical activity.
- Identify individual correlates and determinants of physical activity.
- Understand research integration via meta-analysis.

summers—but since I didn't have as much money to afford all the gear, and since I also worked at the local gas station to save up for college, I usually met up with those pals after they'd finished huffing and puffing so we could play video games at my house or drive into town for a movie.

I'll admit, too, that my more athletic peers intimidated me. I wasn't ever picked first in PE class and I never played sports because I didn't think I had it in me. I tried to stand out, instead, as someone who built up his brain instead of his body. The time I might have spent attending practice for a soccer, baseball, or basketball team I preferred to devote to studying. (If I wasn't hunched over my books, I'd just try to pick up an extra shift at the gas station.)

I got into engineering college early decision. I was thrilled to start on the path toward my degree. It's something I'd wanted to do since third grade. But once I got to campus and started classes the stress of having to work part time and meet all my academic deadlines was purely overwhelming. I didn't have an outlet to burn off the stress. It just kept mounting.

My roommate, an avid exerciser who woke up at an unfathomably early hour to squeeze in his morning runs, suggested I give jogging a try. "It'll help you relax," he kept trying to convince me, each time I turned down his invitations to drag me along. Then, one Friday afternoon, when neither of us had any plans and midterms were mostly finished, he asked if I wouldn't mind taking a walk with him to the college's fitness center. Not having anything better to do with my time, I (reluctantly) agreed.

To be honest, I was humiliated to walk into a gym not looking like anyone in there. I was already sweating at the thought of other students looking at my protruding midsection and rolling their eyes. I wasn't even sure that my shoes qualified as appropriate for the venue. I tiptoed from one machine to the other in high-top Converses with holes in the heels. Catching glimpses in the mirrors of students who could have very well been professional weightlifters for all I knew, I felt completely out of place. But my roommate urged me to just try a few machines. "You'll be better able to focus on your work," he reassured me.

So I gave the treadmill a go. He plugged in a few numbers and forward I went, walking at an incline (and trying not to fall over). The first 5 minutes were rough, but once I got into the swing of things the movement actually felt pretty good. At the 10-minute mark my roommate chided me: "Is that a smile I see?" (I couldn't deny, this wasn't so bad after all.)

After about 15 minutes of walking, he brought me over to the weight rack to show me how to do some basic bicep curls and overhead presses. ("Don't compare yourself to the other people in here," he kept telling me, when I'd look in shame at the other exercisers who were so much stronger than I was. "Everyone has to start somewhere.")

I didn't tell him then but part of why I stuck our first gym session out was the fear of becoming my parents. They'd always encouraged me to be better than them. And though it hurt me to hear in their voices a certain sense of self-defeat—of giving up on taking care of their health—I gathered that by giving exercise a shot I'd be making them proud. (While at the same time avoiding the health issues they'd faced throughout their adulthood.)

I've been regularly active ever since this date—I'm about to graduate, and I'm not sure I would have been able to make it this far without the added health boosts from my newfound love of movement.

No, I'll never be a bodybuilder. Or a marathon runner. Or even someone who can flaunt six-pack abs at the beach. But had you told me fitness didn't require any of the above—that it could be a lot simpler, entailing a 30-minute walk once or twice a day or a light jog a few times a week with some basic weight training sprinkled throughout, I probably would have started a lot sooner.

Being active isn't as hard as I thought it would be. I just never had a healthy amount of physical activity modeled for me by my parents, and the athletes in my high school, as well as the exercisers I saw in workout videos on TV, seemed to be doing things that were just way out of my range of possibility.

But I've found what works for me. It isn't an exorbitant amount of activity. Rather, it's just enough. And I think it's pretty incredible that a few weekly trips to the gym, a stroll or two around campus each day, and the occasional bike ride I now try to accomplish on weekends has improved my ability to focus on schoolwork while making me feel stronger, more energetic, and even less stressed. Even better? It's also been a boon to my confidence in approaching girls!

Introduction

Lao Tzu was a famous ancient Chinese philosopher who is quoted as saying that "the journey of a thousand miles begins with a single step." This proverb means that even the longest and most difficult ventures or journeys have a starting point. From the perspective of personal fitness, we know that the road to physical fitness and a healthy lifestyle is a lifetime journey with many obstacles. This is highlighted in Henry's personal story of becoming physically active. Unfortunately, like Henry's parents, most people are not on a physical fitness journey. In fact, it seems that participation in physical activity shows signs of a "**tomato effect**," an interesting term indeed. You might rightly ask, "What's a tomato effect?" Moreover, because it sounds mysterious, and possibly a bit dangerous, you might also be tempted to ask, "And how can this so-called tomato effect be eradicated?"

The tomato effect is a term James and Jean Goodwin (1984) used to describe a phenomenon whereby highly efficacious therapies are either ignored or rejected. Generally, the reason for this is that the therapies do not seem to make sense in light of popular beliefs or common understandings. A tomato effect, however, can also occur if people simply ignore the evidence available.

The term *tomato effect* is derived from the history of the tomato in North America. The tomato was discovered in Peru and then transported to Spain, from where it made its way to Italy, France, and most of the rest of Europe. By 1560, the tomato played a major role in the diet of most Europeans. In North America, however, tomatoes were avoided because they were considered to be poisonous. The basis for this belief was that they belong to the nightshade family of plants, and some fruits from plants in the nightshade family can cause death if eaten in sufficient quantities. Thus, throughout the 18th century, tomatoes were not grown in North America. In fact, the turning point did not occur until 1820. Apparently, in a dramatic gesture, Robert Gibbon Johnson ate a tomato on the courthouse steps in Salem, New Jersey, and survived! According to legend, he stood on the courthouse steps and ate tomatoes in front of a large, amazed crowd that had assembled to watch him do so. When he neither dropped dead nor suffered any apparent ill effects, witnesses of his "experiment" slowly began to open their minds. By the end of the decade, American gardeners were growing tomatoes for food. Subsequently, tomatoes began to be accepted as a nutritious food source. It was not until the 20th century, however, that commercial marketing of the tomato began in earnest. Today, it represents one of the largest commercial crops in North America (Goodwin & Goodwin, 1984).

So, to answer the question "Does physical activity show a tomato effect?" we need to address the following three issues:

1. Is physical activity an efficacious therapy?
2. Do people either ignore or reject physical activity?
3. Do people know the benefits of physical activity?

Physical Activity and the Tomato Effect

1. Is Physical Activity an Efficacious Therapy?

According to Goodwin and Goodwin (1984), the use of aspirin for the alleviation of pain, swelling, and stiffness of rheumatoid arthritis also is characterized by a tomato effect. They noted that high doses of aspirin only became an accepted treatment about 70 years after initial studies demonstrated that aspirin is effective in treating some of the symptoms of arthritis. What about physical activity? Is a tomato effect toward physical activity prevalent in our society?

One part of the answer to this question, of course, pertains to whether physical activity is an efficacious activity. Scientists spent a large portion of the previous

century conducting research on the physiological benefits of both **acute** and **chronic physical activity**. What their research has shown is that every system of the body benefits when a person engages in physical activity. In fact, regular physical activity is likely the single best prescription that people of all ages can take for a host of health benefits (Church & Blair, 2009). Regular exercise is one of the cornerstones of a therapeutic lifestyle change for producing optimal cardiovascular and overall health. Physical exercise, although not a drug, possesses many traits of a powerful pharmacological agent. Indeed, the saying "exercise is medicine" is supported by science. A routine of daily physical activity stimulates a number of beneficial physiological changes in the body and it can be highly effective for the prevention and treatment of many of our most prevalent chronic diseases, including coronary heart disease, hypertension, heart failure, obesity, depression, and type 2 diabetes. The bottom line is that physical activity is very good for our health.

But just how good is physical activity for our health? In terms of the skeletal system, for example, frequent physical activity leads to increased bone density in youth and an increased likelihood that bone mineral density will be retained in older adulthood (Marques, Mota, & Carvalho, 2012). How about the muscle system? Frequent physical activity results in hypertrophy, increased strength and endurance, as well as capillarization, maximization of blood flow, and enhanced metabolic capacity (e.g., Ferreira et al., 2012). How about the cardiovascular system? Along with increased cardiac mass, frequent physical activity contributes to increased stroke volume and cardiac output at rest and during physical activity and lower heart rate and blood pressure at rest and during submaximal physical activity (e.g., Cornelissen, Fagard, Cockelberghs, & Vanhees, 2011). How about the respiratory system? There is increased ventilatory-diffusion efficiency during physical activity and possible decreased work of breathing. How about the body's metabolism? Being physically active is associated with decreased triglycerides and increased high-density cholesterol, increased insulin-mediated glucose uptake, and decreased adiposity (Ekelund et al., 2012). What about psychological health? Physical activity is related to improved mood, sleep, stress reactivity, and body image, as well as a reduced likelihood of suicide later in life (Aberg et al., 2013). The end result is that people who exercise regularly have markedly lower rates of morbidity and mortality. In fact, people who are regular exercisers can expect to have a mean life expectancy that is 7 years longer than that of their physically inactive contemporaries (Chakravarty, Hubert, Lingala, & Fries, 2008). See **TABLE 1-1** for a summary of some of the health benefits of regular physical activity by age.

TABLE 1-1 Benefits of Physical Activity by Age Group

Early Years (0–4 years)	Children (5–11 years)	Youth (12–17 years)	Adults (18–64 years)	Older Adults (65+ years)
Maintain a healthy body weight.	Improve health.	Improve health.	Reduce premature death.	Less chronic disease (such as heart disease).
Improve movement skills.	Do better in school.	Do better in school.	Reduce heart disease and stroke.	Less premature death.
Increase fitness.	Improve fitness.	Improve fitness.	Reduce certain types of cancer.	Help maintain functional independence.
Build healthy hearts.	Have fun playing with friends.	Have fun playing with friends.	Reduce type 2 diabetes, osteoporosis.	Help improve mobility.
Feel happy, have fun.	Feel happier.	Feel happier.	Reduce high blood pressure.	Help improve fitness.
Develop self-confidence.	Maintain healthy body weight.	Maintain healthy body weight.	Improve strength and fitness.	Help improve/ maintain body weight.
Improve learning and attention.	Improve self-confidence.	Improve self-confidence.	Improve mental health.	Help maintain mental health and feel better.

Adapted from http://www.participaction.com/get-moving/benefits-of-physical-activity/.

These substantial physiological benefits of physical activity are no secret. Within the past 30 years, there has been an almost global endorsement of the value of physical activity. For example, the **World Health Organization (WHO)** (2009) has cited physical inactivity as one of the five leading global risk factors for mortality. The five leading global risks for mortality are high blood pressure (responsible for 13% of deaths globally), tobacco use (9%), high blood glucose (6%), physical inactivity (6%), and overweight and obesity (5%). These risks increase a person's chances of developing chronic diseases such as heart disease, diabetes, and some cancers.

In an attempt to quantify the effect of physical inactivity on coronary heart disease, type 2 diabetes, breast cancer, and colon cancer, Lee and colleagues (2012) calculated the **population-attributable fraction** to estimate risks by country as well as globally.

They found that 9.4% of deaths from any cause are attributed to physical inactivity. More specifically, physical inactivity is responsible for 5.8% of the burden of coronary heart disease worldwide, ranging from 3.2% in Southeast Asia to 11.4% in Swaziland and Saudi Arabia. The burden of type 2 diabetes attributable to physical inactivity is 7.2% worldwide, ranging from 3.9% in Southeast Asia to 9.6% in the Eastern Mediterranean. Worldwide, 10.1% of breast cancers and 10.4% of colon cancers are attributable to a lack of physical exercise. These researchers concluded that if all of the inactive people in the world were to suddenly get off the couch and become engaged in just a modest level of physical activity, the estimated gain in life expectancy would be 0.68 years.

A recent large-scale study highlights the role of physical inactivity in the rise in obesity in the United States. Ladabaum, Mannalithara, Myer, and Singh (2014) found that increases in obesity in the United States over the past 20 years may be due to sedentary lifestyles, not high caloric intake. They found that the average calorie intake of American adults has remained the same over the last two decades. However, American adults' physical activity levels have decreased significantly over the last two decades.

The study was conducted using data from the National Health and Nutrition Examination Survey (NHANES) to examine trends in obesity, physical activity, and calorie intake from 1988 to 2010 in adults. The researchers considered survey results from 17,430 participants from 1988 through 1994 and from about 5,000 participants each year from 1995 through 2010. The study results support previous findings on the growing prevalence of obesity, showing substantial increases in **body mass index (BMI)**, waist circumference, and abdominal adiposity in American adults. In fact, obesity increased, climbing from 25% to 35% in women and from 20% to 35% in men, during the study period. The study also found that Americans, on average, are consuming about the same number of calories per day as they were in 1988. However, they found a significant increase in the percentage of Americans reporting no leisure-time physical activity during this same time period.

CRITICAL THINKING ACTIVITY 1-1

What is the difference between body mass index (BMI), waist circumference, and abdominal adiposity? Which of these three measures of body composition is considered the most significant for understanding the health impact of overweight or obesity?

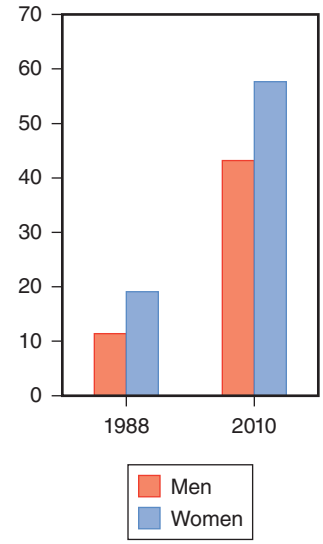

FIGURE 1-1 Percentage of American Adults Reporting No Leisure-Time Physical Activity from 1988 to 2010

Data from Ladabaum, U., Mannalithara, A., Myer, P. A., & Singh, G. (2014). Obesity, abdominal obesity, physical activity, and caloric intake in U.S. adults: 1988 to 2010. *The American Journal of Medicine, 127*, 717–727.

More specifically, the percentage of women reporting no leisure-time physical activity more than doubled from 1988 to 2010, increasing from 19.1% to 51.7%. Similarly, the percentage of men reporting no leisure-time physical activity nearly quadrupled, from 11.4% to 43.2% (see **FIGURE 1-1**). Although they were not able to see an association between daily caloric intake and increases in BMI or waist circumference, the researchers did find a relationship between decreased physical activity levels and increased BMI. The researchers concluded that the nationwide drop in exercise may be responsible for the upward trend in obesity rates.

Note that this study highlights the correlation between obesity and sedentary lifestyles, but because it is an observational study it does not address the possible causal link between inactivity and weight gain. The bottom line, however, is that physical inactivity rather than higher calorie intake could be driving the dramatic increase in obesity over the past few decades.

2. Do People Either Ignore or Reject Physical Activity?

The second part of the tomato-effect question pertains to whether people tend to ignore or reject exercise. Are people eating the tomatoes? Or, stated another way, is physical activity being embraced by a large portion of the world's population? Unfortunately, the answer is a qualified *no*. Despite the negative impact of physical inactivity, studies suggest that getting active is simply not happening (Dumith, Hallal, Reis, & Kohl, 2011).

TABLE 1-2 Adult Physical Inactivity Rates by Region

Region	Physically Inactive (%)
Southeast Asia	17.0%
Africa	27.5%
Western Pacific	33.7%
Europe	34.8%
Eastern Mediterranean	43.3%
North America	43.3%
South America	43.3%
Central America	43.3%

For example, Pedro Hallal and his colleagues (2012) examined physical activity levels for adults aged 15 years or older from 122 countries. They found that, worldwide, 31% of adults failed to meet the public health guidelines for physical activity, defined as 150 minutes of moderate physical activity per week, but that the frequency of inactivity varied across regions, with proportions ranging from 17% in Southeast Asia to about 43% in North, South, and Central America and the Eastern Mediterranean. See TABLE 1-2 for the physical inactivity rates by region.

CRITICAL THINKING ACTIVITY 1-2

What are some possible explanations for why physical activity levels vary from country to country?

Hallal and his colleagues (2012) also found that inactivity increases with age and it is higher in women than in men. They also examined worldwide data for adolescents aged 13 to 15 years from 105 countries. They found that the proportion of 13- to 15-year-olds doing fewer than 60 minutes of moderate to vigorous physical activity intensity per day is about 80%. Similar to adult populations, boys are more active than girls.

The take-home message is that relatively few individuals are physically active on a regular basis, and this situation seems to generalize across a number of nations. Dr. Harold Kohl and his colleagues (2012) have called the current worldwide low activity levels a "**pandemic** of physical inactivity." Worldwide there has been a shift from concerns about infectious diseases (e.g., tuberculosis,

measles, and influenza) undermining public health to risks posed by chronic diseases, such as coronary heart disease, obesity, and type 2 diabetes. Even in countries such as China and India and those in Latin America and Africa the burden of chronic disease has outpaced the risk of infectious diseases, and physical inactivity is a contributing factor.

3. Do People Know the Benefits of Physical Activity?

As discussed earlier, scientists, healthcare professionals, and politicians are aware of the physical, biological, and physiological benefits of physical activity. A third part of the question pertaining to whether a tomato effect toward physical activity exists in society is whether the portion of the population who are not physically active (i.e., the non-tomato-eaters) have a full understanding of the benefits of a physically active lifestyle.

Jim Morrow and his colleagues (2004) attempted to answer this question by asking American adults whether they knew which types of physical activities affect their health and how much physical activity they should be doing to achieve a health benefit. Using a national random telephone survey of 2,002 American households, they found that 94% of adults were aware of traditional physical activities that provide a health benefit, and 68% were aware of specific exercise guidelines for health. Because most adults are physically inactive, the authors concluded that physical activity knowledge alone is not sufficient to cause people to become physically active.

So, the answer to the first question of this chapter—"Does participation in physical activity show evidence of a tomato effect?"—seems to be a qualified *yes* because we have answered yes to the following three issues:

1. *Yes*, physical activity is an efficacious therapy.
2. *Yes*, people either ignore or reject physical activity.
3. *Yes*, people know the benefits of physical activity.

The second question was how we overcome the tomato effect toward physical activity (i.e., "How can this so-called tomato effect be eradicated?"). One useful approach is through science—science that focuses on the psychology of physical activity and sedentary behavior. Before we examine what exercise psychology is, we must describe an important statistical technique that is often used to review this research.

CRITICAL THINKING ACTIVITY 1-3

What other types of treatments or interventions have shown signs of a tomato effect?

What Is a Meta-Analysis?

Given the impressive list of the benefits of exercise, a strong case can be (and often is) made for increased physical activity on the basis of physical benefits alone. Historically, however, there has also been a long-standing belief that being physically active has consequences far beyond the physical. One illustration of that long-standing belief can be traced back to the following famous ancient Latin quotation ***mens sana in corpore sano***, which is often translated as "a sound mind in a sound body." As another example, Hippocrates, who is acknowledged to be the Father of Medicine, strongly urged individuals thousands of years ago suffering from mental illness to exercise. However, only recently have scientists begun to evaluate systematically the association between exercise, sedentary behavior, and mental health in empirical studies.

The implicit belief that a link exists between physical health and mental health has led many social scientists to empirically test various relationships over the past 100 years. Not all of the research has been scientifically sound. Furthermore, not all of that research showed the same pattern of results. Thus, it was difficult to draw conclusions. This point was emphasized several years ago by Christian North, Penny McCullagh, and Zung Vu Tran (1990) when they attempted to summarize the literature on the impact of physical activity on depression. In their commentary, they pointed out "given the discrepant findings … it is likely that a narrative review of literature would conclude that there is no consistent findings" (p. 383).

North and colleagues (1990) offered the solution of conducting a meta-analysis in an attempt to provide a firm conclusion from all the discrepant results. A **meta-analysis** is a statistical method of reviewing a body of research evidence that is both *systematic* and *quantitative*. A **systematic review** is a literature review focused on a particular research question that tries to identify, appraise, select, and synthesize all high-quality research evidence relevant to that question. **Quantitative research** refers to the systematic empirical investigation of a phenomena via statistical, mathematical, or numerical data or computational techniques. Fortunately, much of the research on the impact of exercise on psychological variables has been summarized through the use of meta-analysis. Thus, continually in our book we make reference to the findings of meta-analyses to illustrate the effects of exercise and sedentary behavior on various psychological outcomes. But before discussing the conclusions from these meta-analyses, an understanding of what exactly a meta-analysis is and why it is used by researchers is needed.

Research Integration Through a Meta-Analysis

Consider the following question: Is physical fitness related to anxiety? Across different studies, the operational definition of anxiety could vary markedly. For example, participants' level of anxiety might be tested with a single self-report question such as "I feel very anxious." Responses could then be obtained on a

nine-point scale containing anchor statements such as "Strongly Disagree" and "Strongly Agree." Or, it might be tested with a psychometrically sound inventory containing 20 anxiety-relevant questions to which the individual responds "True" or "False." Or, it might even be assessed using a physiological measure such as heart rate with responses indicated in beats per minute.

Across that same cross-section of studies, the **operational definition** of fitness also could vary. For example, fitness might be assessed through the self-reported amount of time spent running per week. Then, responses could be obtained in minutes and/or hours per week. Or, fitness might be defined through measures of muscular strength and responses expressed in grams or kilograms (or ounces or pounds) lifted. Finally, fitness might even be assessed using a physiological measure such as maximal oxygen uptake with responses stated in milliliter per kilogram of body weight.

Imagine carrying out a literature review focusing on the question of the relationship between fitness and anxiety. If 50 studies were located, they might vary in the operational definitions used for anxiety, the operational definitions used for fitness, the size of the samples tested, and the nature of the samples tested by, for example, age, gender, physical health status, and mental health status. Also, the 50 studies might vary in their findings relative to the question. That is, 35 studies might show that fitness is associated with reduced anxiety, 10 studies might find that fitness is unrelated to anxiety, and 5 studies might conclude that fitness is associated with increased anxiety. Any scholar attempting to summarize this body of research with a narrative review would be forced to conclude that the results were either *mixed* or *unclear*.

In 1976, Gene Glass introduced a protocol for conducting a meta-analysis whereby the magnitude of the treatment effects in individual studies were quantified and the results of several studies were averaged. As Glass, McGaw, and Smith (1981) stated, the essential characteristic of a meta-analysis is that it "is the statistical analysis of the summary findings of many empirical studies" (p. 21). In other words, in statistics a meta-analysis refers to methods focused on contrasting and combining results from different studies in the hope of identifying patterns among study results, sources of disagreement among those results, or other interesting relationships that may come to light.

In essence, the result from an individual study is converted to a standard score, which is called an **effect size**. Because effect sizes are **standard scores**, the measures (and the units used to express those measures) in the various studies are not relevant. (A percentile is another example of a standard score.) Moreover, standard scores can be added and then averaged to draw conclusions about the overall impact of a particular treatment.

Finally, and this is also important, the possible influence of what are called moderator variables should be examined. **Moderator variables** directly influence the relationship of an independent variable to a dependent variable. So, returning to our example, it would be possible to assess statistically through a meta-analysis whether age is a moderator variable in the fitness–anxiety relationship. If

increased fitness is associated with reduced anxiety, does that relationship hold across the age spectrum from adolescents to older adulthood?

Meta-analysis is particularly useful in areas of research where a large number of studies are available, not all the studies are of uniform quality, there is wide variability in the operational definition of the variables, there are differences in the nature of the subjects or differences in designs, and the results have not been completely consistent. Meta-analysis offers the opportunity to statistically average the effects from various studies in order to come to some conclusion for the population as a whole. It is also possible, of course, to subdivide the pool of studies and examine conditions that might serve to moderate the basic relationship.

Interpretation of Effect Sizes

Most of us can easily interpret quantities or amounts when commonly used measures such as inches, feet, seconds, and kilograms are used. Most of us also have a common understanding of the meaning of standard statistical scores such as a percentile (e.g., you scored in the 85th percentile on your SAT). However, interpretation of an effect size is not as intuitively obvious. Fortunately, Jacob Cohen (1992) has provided some guidelines that are useful for understanding the results from a meta-analysis. Thus, the descriptive term *small* can be used for any effect size within the range of 0.10 to 0.30. Also, the descriptive term *moderate* can be used for effect sizes in the range of 0.40 to 0.70. Finally, the descriptive term *large* can be used for any effect size that is greater than 0.80.

Another statistical way to interpret an effect size is available. Consider, for example, the differences in anxiety scores in an experimental group exposed to 16 weeks of exercise versus the improvement in anxiety scores in a control group that simply met and talked for the 16 weeks. An effect size of 0.33 for the improvement (i.e., reduction) in anxiety scores in the experimental group over that in the control group would mean that the average experimental person improved in (showed a reduction for) anxiety one-third of a standard deviation more than was the case for the average control person.

Most students find it easier to use the descriptive terms *small*, *medium*, and *large* for effect sizes of 0.20, 0.50, and 0.80, respectively. However, they sometimes ask, "Well, what about effect sizes of 0.35 or 0.75? How are these effect sizes described? They are not included in the ranges above." In response, we remind students that the descriptive terms are intended to be guidelines, not fixed criteria. So, to a large extent, the verbal descriptors used for effect sizes that are outside the ranges we have presented are a matter of personal choice. There is a parallel in academia. Universally, we might agree that someone in the 30th percentile is a poor student, someone in the 50th percentile is a good student, and someone in the 85th percentile is an excellent student. Where is the boundary between a poor and a good student and a good and an excellent student? It seems likely that there

would be wide variability in the answers given by different groups. Now let's turn our focus to introducing exercise psychology.

Exercise Psychology

If physical activity is efficacious, one important challenge facing scientists, health professionals, and governments is to help large segments of the population become more physically active. How this will be achieved is not likely to come through additional research in exercise physiology, although that discipline will undoubtedly provide answers to important questions such as how much activity is necessary to obtain the physiological benefits described earlier. As a science, exercise physiology does not concern itself with general issues associated with understanding and modifying behavior, influencing public opinion, motivating people, and changing people's attitudes. Nor is it a concern of the biomechanics, historians, or sociologists of sport and physical activity. Questions concerning human attitudes, moods, cognitions, and behavior fall directly under the mandate of psychology.

Psychology is a science devoted to gaining an understanding of human behavior. In turn, the area of science we refer to in this text as **exercise psychology** (also called *physical activity psychology* or *fitness psychology*) is devoted to gaining an understanding of (1) individual attitudes, moods, cognitions, and behaviors in the context of exercise and (2) the social and physical factors that influence those attitudes, moods, cognitions, and behaviors. In other words, exercise psychology is defined as the study of psychological issues and theories related to physical activity. Exercise psychology is a subdiscipline within the field of psychology, as well as a subdiscipline within the field of kinesiology.

Individual Correlates of Exercise

To understand, promote, and maintain exercise and decrease sedentary behavior, we need to examine determinants and correlates of these behaviors. In the case of exercise, a **correlate** is a variable that is associated with either an increase or decrease of physical activity. Correlates research assesses only statistical associations, rather than providing evidence of a causal relationship between a factor and physical activity (Bauman, Sallis, Dzewaltowski, & Owen, 2002). In comparison, when a variable has been assessed in a longitudinal observational study or an experimental design it is called a **determinant**. Thus, a determinant is a variable that has a strong causal association with physical activity. Given that the research

examining physical activity determinants has largely been generated in either cross-sectional or retrospective studies, the implicit suggestion of causation often is not appropriate (Bauman et al., 2012).

For ease of interpretation, we will use the term *correlate* in this section because most often this is the more accurate term for physical activity adherence. For example, it is well documented that as we get older we tend to be less active. It is not true, however, that advancing age causes people to be less active. All of us know older people who are very physically active and younger individuals who are sedentary. Also, there is no single variable that explains all physical activity behavior. Different variables exert different degrees of influence on different people. For example, spousal support may be important for some people to exercise, but not others. Also, the strength of spousal influence for each person may vary during different stages of their married life. Spousal support for physical activity may be relatively unimportant in early adulthood but important in older adulthood.

Another way to look at individual correlates is to ask the question "Why do some people exercise and others don't?" This is a difficult question to answer. Because physical activity is affected by diverse factors, behavioral theories and models (such as the theory of planned behavior and the transtheoretical model) are used to guide the selection of variables to study. Integration of ideas from several theories into an ecological model (including inter-relations between individuals and their social and physical environments) is now common (Sallis, Owen, & Fisher, 2008). An ecological approach uses a comprehensive framework to explain physical activity, proposing that determinants at all levels (i.e., individual, social, environmental, and policy) contribute to or influence whether someone engages in exercise. A key principle is that knowledge about all types of influence can inform development of multilevel interventions to offer the best chance of success.

FIGURE 1-2 presents a social ecological framework for physical activity (see Nigg, Rhodes, & Amato, 2013). This ecological framework highlights people's interactions with their physical and social/interpersonal environments, with individuals shaping their environments, as well as being shaped by their environments (McLeroy, Bibeau, Steckler, & Ganz, 1998). The focus of this section is on

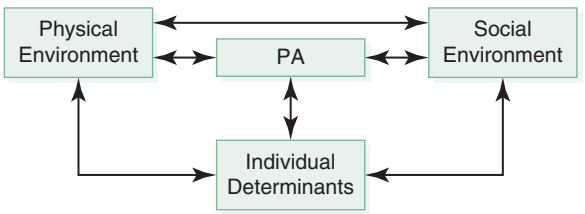

FIGURE 1-2 A Conceptualization of the Social Ecological Framework for Physical Activity (PA)

Reproduced from Nigg, C. R., Rhodes, R., & Amato, K. R. (2013). Determinants of physical activity: Research to application. In J. M. Rippe (Ed.), *Lifestyle medicine* (pp. 1435–1446). Taylor & Francis Group.

the individual correlates of physical activity. The list of physical activity correlates is long, and individual-level factors such as age, sex, health status, self-efficacy, and previous physical activity are correlated with physical activity levels (Bauman et al., 2012). TABLE 1-3 summarizes some of the main individual correlates of

TABLE 1-3 Summary of the Individual Correlates of Physical Activity

Correlate Category	Specific Correlate	Relationship with Physical Activity (PA)
Demographic	Age	Negative: PA levels continually decline as we get older.
	Ethnicity	Whites exercise more than minorities.
	Socioeconomic status	Positive: Higher socioeconomic status associated with higher PA levels.
	Gender	Male populations exercise more than female populations.
	Health status	Healthy people are more active than persons with medical and psychological conditions.
	Education level	Positive: Higher education level correlated with higher PA levels.
	Weight	Negative: Obese and overweight people exercise less than normal weight people.
	Marital status	Unrelated. No relationship with marital status and PA levels.
Behavioral	Previous PA	Positive: Previous PA is positively related to future/current PA behavior.
	Smoking	Negative: Negative relationship between cigarette smoking and PA.
Psychological	Self-efficacy	Positive: Higher self-efficacy (confidence in the ability to be physically active in specific situations) correlated with higher PA levels.
	Barriers	Negative: Negative relationship between an individual's perception that there are barriers to PA participation and that individual's actual PA behavior.
	Attitude	Positive: Attitude (overall appraisal or evaluation of PA) positively related with PA intention and behavior.
	Enjoyment	Positive: Enjoyment positively related to PA.

physical activity into categories of demographic, psychological, and behavioral (Bauman et al., 2012; Nigg et al., 2013).

Of importance, few researchers have examined the correlates of physical activity in low- and middle-income countries (Bauman et al., 2012).

Guidelines for Physical Activity

A possible reason for the high rate of physical inactivity may be a misperception that exercise-mediated health benefits can only be achieved by strenuous sustained aerobic activity such as a vigorous 45-minute run. Such perceptions were fostered by the original exercise guidelines established by the American College of Sports Medicine in 1978 (see TABLE 1-4 for a description of these 1978 guidelines). These guidelines were based on the improvement of cardiovascular fitness; however, they were often applied to general health (Haskell, 1994). These original guidelines were very specific and led to somewhat regimented thinking about how much exercise should be recommended. This caused many people to think that exercise amounts that did not meet these specific criteria would be of either limited or no value (Blair, LaMonte, & Nichaman, 2004). More recently, however, recommendations by leading authorities have significantly influenced the traditional beliefs about the amount, intensity, and frequency of exercise that is necessary to elicit physical and psychological benefits.

TABLE 1-4 Former Adult Guidelines for Physical Activity

Activity Characteristics	American College of Sports Medicine (1978)	U.S. Department of Health and Human Services (1996)
Frequency	3–5 times per week	Most (preferably all) days of the week
Intensity	Vigorous	Moderate
Duration	20–45 minutes	Accumulation of ≥ 30 minutes of daily activity in bouts of at least 10 minutes
Type	Aerobic activity	Any activity that can be performed at an intensity similar to that of brisk walking

How much physical activity do we need to achieve its health-related benefits? The next guidelines established by the American College of Sports Medicine and the Centers for Disease Control in 1996 stated that adults should accumulate a minimum of 30 minutes of moderate-intensity physical activity on most, if not all, days of the week (U.S. Department of Health and Human Services, 1996; see Table 1-4). Moderate-intensity physical activity, for example, could include brisk walking at a pace of 3 to 4 miles per hour, climbing stairs, and doing heavy housework. The accumulation of physical activity indicates that people can engage in shorter bouts of activity spread out over the course of the day. For example, a person could go for a 10-minute brisk walk in the morning, afternoon, and evening to reach the daily goal of 30 minutes. The suggestion that physical activity can be accumulated over the course of the day, rather than performed continuously in a single session, was motivated by the difficulties reported by numerous individuals in trying to find a block of 30 minutes per day for physical activity. A main goal of these guidelines was to show people that they do indeed have the time to exercise.

These U.S. Department of Health and Human Services (USDHHS, 1996) physical activity guidelines emphasize moderate-intensity levels for a duration of 30 minutes. Does this mean that people do not need to engage in physical activity at vigorous-intensity levels or for durations greater than 30 minutes to achieve the health-related benefits? The answer to this question is an emphatic *no*! It is important to note that the benefits of physical activity are related to the effort that one devotes (USDHHS, 1996). Thus, additional health and fitness advantages are gained from physical activities that are undertaken for longer durations or at more strenuous intensity levels, or both (USDHHS, 1996).

In 2012, the WHO developed the "Global Recommendations on Physical Activity for Health," with the overall goal of providing guidance on the dose–response relationship between the frequency, duration, intensity, type, and total amount of physical activity needed for the prevention of **noncommunicable diseases** (e.g., cardiovascular diseases, cancers, respiratory diseases). Many countries have adopted similar physical activity recommendations and guidelines (e.g., Canadian Society for Exercise Physiology, 2011; USDHHS, 2010).

The WHO guidelines for the general adult population (18 to 64 years) recommend at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity. The aerobic activity bouts must be at least 10 minutes in duration to count toward the weekly total. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity.

These guidelines also suggest that larger doses of exercise may be necessary in some groups. Those with or at risk for coronary heart disease are recommended to do 30 to 60 minutes of exercise daily. Adults trying to prevent the transition to either overweight or obesity are encouraged to exercise 45 to 60 minutes per day.

And it is recommended that formerly obese individuals trying to prevent weight regain should exercise 60 to 90 minutes per day.

For older adults (aged 65 years and older), the guidelines are identical to adults but with the following two caveats. First, when older adults cannot do the recommended amounts of physical activity due to health conditions, they should be as physically active as their abilities and conditions allow. Second, older adults with poor mobility should perform physical activity to improve their balance and prevent falls on three or more days per week. See **TABLE 1-5** for an outline of the physical activity guidelines for youth, adults, and older adults.

Most recently, Australia developed new guidelines on physical activity that double the levels previously recommended as a "wake-up call" for Australians (Australian Government Department of Health, 2014). The new Australian physical activity guidelines recommend that adults complete between 150 and 300 minutes of physical activity per week, twice the amount of the previous government

TABLE 1-5 World Health Organization Physical Activity (PA) Guidelines

Activity Characteristics	Children (5–17 years)	Adults (18–64 years)	Older adults (65+ years)
Frequency	Daily	Weekly accumulation of minutes as opposed to a frequency per week	Weekly accumulation of minutes as opposed to a frequency per week
Intensity	Moderate to vigorous	Moderate and/or vigorous	Moderate and/or vigorous
Duration	60 minutes per day Most PA should be aerobic	150 minutes of moderate PA a week *or* 75 minutes of vigorous PA *or* a combination of moderate and vigorous PA Aerobic activity bouts at least 10 minutes	150 minutes of moderate PA a week *or* 75 minutes of vigorous PA *or* a combination of moderate and vigorous PA Aerobic activity bouts at least 10 minutes
Muscle training	Three or more times per week	Two or more days a week	Two or more days a week

Data from: World Health Organization. (2012). *Recommended levels of physical activity for adults aged 18–64 years* [Electronic Version]. Retrieved December 20, 2012, from http://www.who.int/dietphysicalactivity/factsheet_adults/en/index.html.

TABLE 1-6 The 2012 Australian Physical Activity Guidelines

Criteria
Doing any physical activity is better than doing none. If you currently do no physical activity, start by doing some, and gradually build up to the recommended amount.
Be active on most, preferably all, days every week.
Accumulate 150 to 300 minutes (2.5 to 5 hours) of moderate-intensity physical activity or 75 to 150 minutes (1.25 to 2.5 hours) of vigorous-intensity physical activity, or an equivalent combination of both moderate and vigorous activities, each week.
Do muscle strengthening activities on at least two days each week.

Data from: Australian Government Department of Health. (2014). Physical activity and sedentary behavior guidelines. Retrieved March 2014 from http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-phys-act-guidelines/%24File/Brochures_PAG_Adults18-64yrs.PDF.

recommendations. The guidelines draw on research that suggests while the previous recommendation of 150 minutes per week of moderate activity was sufficient for general health benefits, a higher level is needed to prevent weight gain and some cancers. To successfully limit weight gain, Australian adults need to aim for that upper recommendation of 300 minutes per week. For those who are currently inactive, one of the main messages of the new Australian guidelines is that some activity is always better than none. See TABLE 1-6 for more information on the Australian physical activity guidelines.

Recent research findings are challenging the guidelines that physical activity bouts must be at least 10 minutes in duration to achieve health benefits—or at least weight loss benefits. Jessie Fan and colleagues (2013) examined if moderate to vigorous physical activity in less than the recommended 10-minute bouts was related to weight loss in a random national sample of 4,511 American adults between the ages 18 to 64 years. The adults had clinically measured BMI and accelerometer data that measured their minute-by-minute physical activity. The researchers found that higher-intensity physical activity of both short bouts (less than 10 minutes) and high bouts (longer than 10 minutes) were related to lower BMI and risk of being either overweight or obese. In comparison, neither lower-intensity short bouts nor lower-intensity long bouts were related to BMI or risk of overweight or obesity. The researchers concluded that for weight gain prevention, accumulated higher-intensity physical activity bouts of fewer than 10 minutes are highly beneficial, supporting the public health promotion message "every minute counts."

Upper Limit to Physical Activity Guidelines?

The physical activity guidelines state the minimal amount of exercise needed to achieve health-related benefits; however, they offer no information regarding the

maximal amount of exercise needed. In other words, when is exercise too much of a good thing? Is it possible for people to exercise too much, resulting in negative health effects? Preliminary research suggests that high amounts of exercise may have some negative physical and mental health outcomes.

British researchers examined the heart health of a group of very fit older men (Wilson et al., 2011). They recruited men who had been part of a British national or Olympic team in either distance running or rowing, as well as members of the **100 Marathon Club**, which admits runners who, not surprisingly, have completed at least 100 marathons. All of the men had trained and competed throughout their adult lives and continued to engage in strenuous exercise. For comparison purposes, the researchers also recruited 20 healthy older men who were not endurance athletes. All the men underwent a type of magnetic resonance imaging of their hearts that identifies early signs of fibrosis, or scarring, within the heart muscle. Fibrosis, if it becomes severe, can lead to either stiffening or thickening of portions of the heart, which can eventually contribute to irregular heart function and heart failure.

The researchers found that none of the younger athletes or the older nonathletes had fibrosis in their hearts. However, half of the older athletes showed some heart muscle scarring. The affected men were those who had trained the longest and hardest. In other words, spending more years exercising strenuously or running more marathons was associated with a greater likelihood of heart damage.

Another study quantified the amount of weekly exercise that promotes mental health and found that, while too little is not healthy, neither is too much (Kim et al., 2012). The researchers used self-reported data on physical activity and mental health symptoms from 7,674 American adults. They measured participants' mental health using a self-report questionnaire that assessed their psychological distress, depression, and anxiety levels over the past 30 days. The participants also answered questions about the frequency and duration of physical activities that caused an increase in breathing. Not surprisingly, mental health was better in people who reported some physical activity compared to sedentary people. Moreover, as shown in **FIGURE 1-3**, there were improvements in mental health with just a little physical activity, supporting the fact that the biggest gains from exercise often come from going from a couch potato to slightly active.

After about 2 hours per week of physical activity, however, there was no significant continued gain in mental health for the adults. And then, after about 7.5 hours of physical activity, the gains in mental health plateaued, and then started to reverse. That reversal in health benefits was ever so slight at first, as weekly physical activity climbed to 10 hours. But with more and more activity,

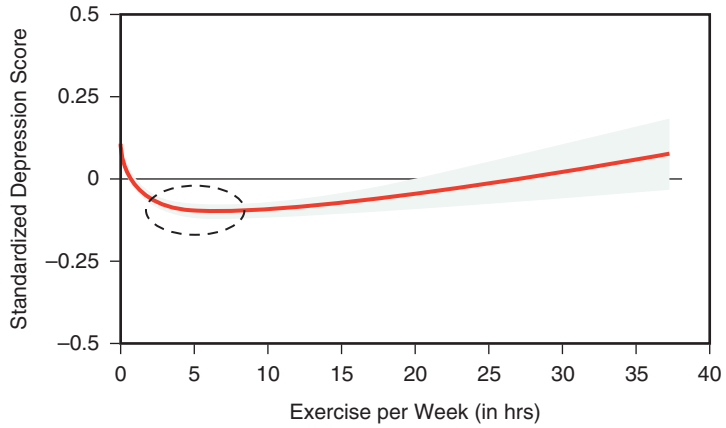

FIGURE 1-3 Relationship Between Exercise (in Hours) and Depression

According to one study, the optimal range for the best mental health is between 2.5 and 7.5 hours of exercise per week, which is illustrated in the oval area.

Reprinted from Kim, Y. S. et al. (2012). Relationship between physical activity and general mental health. *Preventive Medicine*, *55*, 458–463. With permission from Elsevier.

the mental-health benefits of exercise declined significantly. Nearing 25 hours a week, reported mental health was no better than in slightly active people.

The researchers concluded that the optimal amount of exercise for improved mental health might be between 2.5 to 7.5 hours per week, because people who exercised beyond 7.5 hours per week had poorer mental health. While excess exercise is related with diminished mental health, without further evidence, it is not clear from this study that excessive exercise is the cause. People who have a propensity to poor mental health may be inclined to exercise excessively. Furthermore, excessive exercise may also be at the expense of other activities that contribute to psychological well-being, such as relationships, sleep, proper nutrition, and rest.

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Similar results have been found in an adolescent population. Arnaud Merglen and his colleagues (2014) examined weekly sport practice on 1,245 Swiss adolescents (aged 16 to 20 years). Weekly sport practice was categorized into four groups: low (less than 3.5 hours), average (about the recommended 7 hours), high (about 14 hours), and very high (greater than 17.5 hours). They found that compared with adolescents in the average group, those in the very high group and the low group had a higher risk of poor well-being. In contrast, those in the high group had

a lower risk of poor well-being than those in the average group. In other words, the best well-being was found with the adolescents who participated in about 14 hours of sport training. In contrast, the lowest well-being was found with adolescents who engaged in less than 2.5 hours or more than 17.5 hours per week of training. The researchers concluded that there was an inverted, U-shaped relationship between weekly sport practice duration and well-being among adolescents.

In summary, the science is clear that exercise in general is very good for your overall health. But the emerging science does suggest that there may be a threshold of distance, intensity, or duration beyond which exercise can have undesirable physical and mental health effects. Unfortunately, it remains impossible, at the moment, to predict just what that threshold is for any given person, and which people might be most vulnerable as a result of excessive exercise.

Historical Developments

The first exercise psychology (as well as first social psychology and sport psychology) research study was conducted by Norman Triplett in 1898. Triplett noticed that cyclists tended to have faster times when riding against another person compared to when cyclists rode alone. He then demonstrated this effect in a controlled, laboratory experiment, and he concluded that people perform a simple lab task faster in pairs than when performing it alone.

For example, in one research design, Triplett had children play a game that involved turning a small fishing reel as quickly as possible. He found that the children who played the game in pairs turned the reel faster than those who were alone. These findings were termed **social facilitation**, which is the tendency for people to do better on simple tasks when in the presence of other people. This implies that whenever people are being watched by others they will do well on things that they are already good at doing.

Rejeski and Thompson (1993) noted that although interest has been directed toward the psychology of physical activity since Triplett's (1898) social facilitation studies, most of the research has appeared since the early 1970s. Several reasons were advanced by Rejeski and Thompson for the relatively slow development of the psychology of physical activity as a science. First, the popularity of sport preceded the popularity of exercise within the general population. Thus, scientists inevitably gravitated toward sport to ask and attempt to answer sport-related research questions. Second, the importance of physical activity for disease prevention and the maintenance of general health has long been suspected but not fully known until relatively recently. Consequently, understanding the psychological

dimensions of involvement in physical activity was not perceived to be a pressing priority. Finally, throughout history, the use of a **biomedical model** has been the traditional approach to understanding health and disease. The biomedical model of illness excludes psychological and social factors and includes only biological factors in an attempt to understand a person's medical illness or disease. The dominant concern of the biomedical model is with the treatment of disease as opposed to its prevention. It has only been relatively recent that the importance of a biopsychosocial approach to disease prevention has been acknowledged. The **biopsychosocial model** acknowledges that the mind and the body together determine health and illness. As its name implies, the biopsychosocial model's fundamental assumption is that health and illness are the consequences of the interplay of biological, psychological, and social factors.

Topics of Interest

When research into the psychological aspects of involvement in physical activity increased in the 1970s, it tended to focus on the first portion of the definition outlined above; namely, gaining an understanding of human attitudes, moods, cognitions, and behaviors in the context of physical activity. More recently, Ryan Rhodes and Gabriella Nasuti (2011) examined trends and changes in psychology of physical activity research across 20 years (i.e., 1990–2008) by auditing leading journals where exercise psychology research is often published. They found that the volume of exercise psychology research tripled between the 1990s and 2000s. While these results clearly support a growth in research volume, a critical question for the evolution of exercise psychology is whether the quality of the research has evolved over time. For this assessment, the researchers considered the methods employed, the stage of research, and the use of various theoretical approaches to guide exercise interventions. They found evidence that the domain has shifted from measurement studies to descriptive research, but experimental intervention research is still relatively scant. Further, methodological characteristics such as physical activity measurement, sampling, designs, and intervention characteristics have changed little in the last two decades. By contrast, there has been a major theoretical shift to environmental models of physical activity, but many studies still lack the inclusion of any theoretical frame. The most common exercise psychology research topics investigated are outlined in TABLE 1-7 (Rejeski & Thompson, 1993; Rhodes & Nasuti, 2011).

Related Terms

A variety of related terms have been the focus of research under the umbrella term *exercise psychology*. Researchers and practitioners, operating under the assumption that definitional clarity is essential for effective communication, have taken care to draw a distinction among terms. Though people often use physical activity and

TABLE 1-7 Common Exercise Psychology Research Topics

Topic	Description
Mental health	Influence of acute and chronic physical activity on mental health parameters such as anxiety and depression
Body image and self-esteem	Influence of acute and chronic physical activity on self-perceptions and self-esteem
Psychophysiological reactivity	Influence of acute and chronic physical activity on modulating psychological and physiological responses to social stressors
Perceived exertion	Subjective perceptions of physical functioning during acute bouts of physical activity
Adherence	Identifying correlates and determinants of involvement in chronic physical activity
Sleep	Impact of acute and chronic physical activity on quantity and quality of sleep
Cognition	Influence of acute and chronic physical activity on mental acuity
Interventions	Interventions to increase physical activity behavior
Exercise dependence	Nature and consequences of obsessive involvement in physical activity
Social support	Comparing the influence of peers versus parents for children's physical activity
Leadership and cohesion	Role played by the exercise leader in sustaining involvement in physical activity programs
Environment	Identifying aspects of the environment (aesthetics, structural characteristics, safety) related to physical activity
Theories of behavior change	Developing and testing theory-based physical activity interventions

exercise interchangeably, the terms have different definitions. **Physical activity** is an umbrella term used to describe any body movement produced by skeletal muscles that requires energy expenditure. In other words, physical activity refers to any body movement that burns calories, whether it is for work or play, daily chores, engaging in a competitive sport, or a daily commute. **Exercise**, a subcategory of physical activity, refers to planned, structured, and repetitive activities aimed at improving physical fitness and health (Caspersen, Powell, & Christenson, 1985). A characteristic that helps to define exercise is that the person must

TABLE 1-8 The FITT Principle Defined

Principle	Definition	Example
Frequency	How often you exercise	Five times per week
Intensity	How hard you work during exercise	Moderate intensity
Type	The type of activity you're doing	Brisk walk
Time	How long you exercise	30 minutes

conform to a recommended frequency, intensity, type, and time (often called the FITT principle; see TABLE 1-8 for a description) to achieve the specific purpose desired. Researchers sometimes use the terms *leisure-time physical activity* or *recreational physical activity* as synonyms for exercise. Other subcategories of physical activity include sport, occupational physical activity, household physical activity, self-care physical activity, and transportation physical activity (see FIGURE 1-4).

Exercise psychology has also been referred to as a component of **behavioral medicine**. Behavioral medicine is an interdisciplinary field of medicine concerned with the development and integration of knowledge in the biological, behavioral,

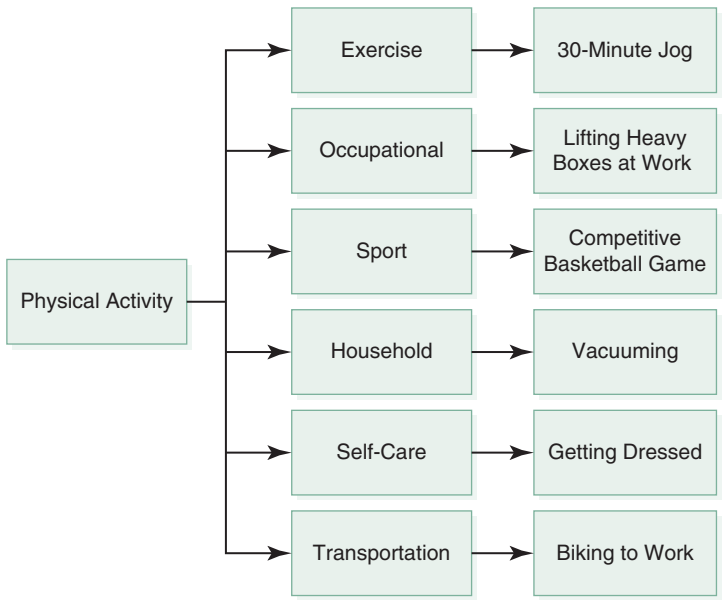
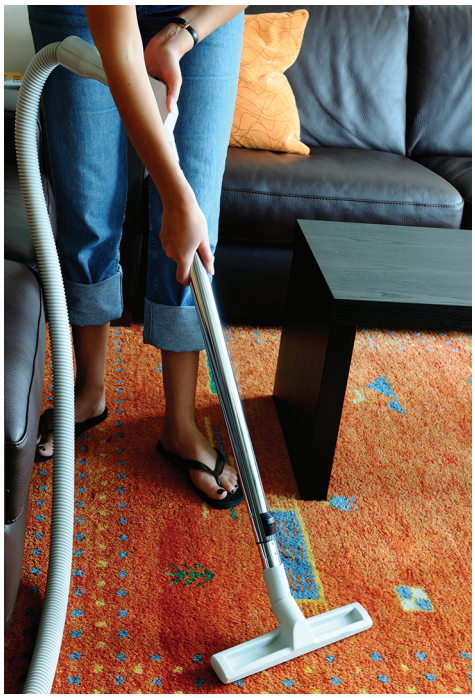


FIGURE 1-4 Related Terms

psychological, and social sciences relevant to health and illness. The practice of behavioral medicine also includes applied psychophysiological therapies such as biofeedback, hypnosis, and biobehavioral therapy of physical disorders, aspects of occupational therapy, rehabilitation medicine, and psychiatry, as well as preventive medicine.



Health may be viewed as a human condition with physical, social, and psychological dimensions, each characterized by a continuum varying from positive to negative poles. As defined by the WHO over a half century ago (1946), health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. Both physical activity and exercise, along with a number of other activities, such as maintaining a proper diet and refraining from smoking, contribute to the development and maintenance of health on the positive end of the continuum. Although every health behavior is important in its own right, this textbook concentrates on physical activity, exercise, and sedentary behavior.

Health psychology is the study of the psychological and behavioral processes in health, illness, and health care (Johnston, 1994). It is concerned with understanding how psychological, behavioral, and cultural factors are involved in physical health and illness, in addition to the biological causes that are well understood by medical science. Health psychologists take a biopsychosocial approach; that is, they understand health to be the product not only of biological processes (e.g., a virus, tumor), but also of psychological processes (e.g., stress, thoughts and beliefs, behaviors such as smoking and exercise) and social processes (e.g., socioeconomic status, culture, and ethnicity). The term *health psychology* is often used interchangeably, and incorrectly, with *exercise psychology*.

CRITICAL THINKING ACTIVITY 1-4

How has the biopsychosocial model shaped the field of exercise psychology?

Finally, *sport psychology* is the study of the how psychological factors affect athletes' performance and well-being. Some sport psychologists work with professional athletes and coaches to improve the performance and increase the motivation of athletes. Although sport psychology is commonly referred to as *sport and exercise psychology*, it is important to understand the important distinction between these two related fields.

Summary

Is there a tomato effect—a tendency for people to avoid efficacious activities—insofar as physical activity is concerned? A large number of benefits are associated with involvement in physical activity. Furthermore, it is reasonable to suggest that physical activity is considered to be health producing and beneficial by large portions of the population. Physical inactivity has been identified as the fourth leading risk factor for global mortality, causing an estimated 3.2 million deaths globally each year. Despite the known risks of inactivity, in general, throughout the world physical inactivity levels are still unacceptably high. Changes in exercise behaviors and attitudes are necessary. Both of these fall within the domain of psychology as a science. This textbook focuses on the area of science referred to as the psychology of physical activity and sedentary behavior.

A variety of diverse behaviors have been the focus of research under the umbrella term *psychology of physical activity*. These were defined. Physical activity represents bodily movements produced by skeletal muscles that lead to substantial increases in energy expenditure. Exercise is considered to be a specific form of physical activity that the individual engages in to improve fitness, physical performance, and/or health. Health is a condition that is composed of physical, social, and psychological dimensions, each of which exists along a continuum that ranges from positive to negative.

This textbook centers on physical activity, not other areas, such as rehabilitation psychology, sport psychology, or health psychology. What this means, essentially, is that this text incorporates information from research where physical activity or sedentary behavior was the dependent (outcome) variable.

KEY TERMS

acute physical activity
behavioral medicine
biomedical model
biopsychosocial model
body mass index (BMI)
chronic physical activity
correlate
determinant
effect size
exercise
exercise psychology
health
health psychology
meta-analysis
mens sana in corpore sano
moderator variables
noncommunicable diseases
100 Marathon Club
operational definition
pandemic
physical activity
population-attributable fraction
quantitative research
social facilitation
standard score
systematic review
tomato effect
World Health Organization (WHO)

REVIEW QUESTIONS

1. Does physical activity show a tomato effect? (Hint: Use the three issues to justify your answer.)
2. What is the difference between a correlate and a determinant of physical activity? List five individual demographic correlates of physical activity, and describe how these correlates are related to physical activity.
3. What are the current physical activity guidelines for adults?
4. Describe what social facilitation is and how it is historically linked to the psychology of physical activity.
5. List six topics of interest for the psychology of physical activity.
6. How do the American College of Sports Medicine's (1978) physical activity guidelines differ from the U.S. Department of Health and Human Services's (1996) physical activity guidelines?
7. Define *meta-analysis*. How can a meta-analysis help us understand a body of literature?
8. What is a moderator variable? Provide an example.

APPLYING THE CONCEPTS

1. How did the lifestyle of Henry's parents illustrate the tomato effect?
2. What factors help explain why Henry was able to change into a more active individual?
3. How do Henry's new exercise habits measure up to the current guidelines for physical activity?

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