

THE BEHAVIORAL DETERMINANTS OF EXERCISE: Implications for Physical Activity Interventions

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■ **Abstract** In light of the well-documented health benefits of physical activity and the fact that the majority of adult men and women are inactive, promoting regular physical activity is a public health priority. This chapter reviews current research findings regarding the determinants of exercise behavior. It also discusses the implications of this knowledge for individual and public health recommendations and intervention strategies for promoting physical activity. The discussion is predicated on the belief that physical activity is a complex, dynamic process. During their lives, individuals typically move through various phases of exercise participation that are determined by diverse factors. This chapter discusses physical activity determinants in two broad categories: individual characteristics, including motivations, self-efficacy, exercise history, skills, and other health behaviors; and environmental characteristics such as access, cost, and time barriers and social and cultural supports.

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INTRODUCTION

A physically active lifestyle has many benefits, including reduced risk of coronary heart disease, hypertension, colorectal cancer, obesity, and osteoporosis (10, 11, 14, 70). Benefits also include reduced stress and depression and increased emotional well-being, energy level, self-confidence, and satisfaction with social activity (43). Benefits of physical activity are evident at low- as well as high-intensity activity levels (19, 39, 69, 90, 91, 99). Indeed, some have argued that the greatest potential for health benefits would accrue by having sedentary adults become moderately active (17, 93, 97). Physical activity appears to confer substantial benefits at any age and regardless of prior physical activity history.

Despite the well-documented health benefits of physical activity, current estimates suggest that we are in the midst of an epidemic of sedentary behavior. Mechanization of work and of many domestic chores has, for the most part, eliminated obligatory physical activity from modern life. Voluntary physical activity, also called recreational physical activity, has thus assumed central importance in filling physical activity needs and is the focus of this chapter. Unfortunately, however, voluntary physical activity is not popular. Only 22% of adults report engaging in regular physical activity, i.e. a minimum of 30 min of moderate-to-vigorous activity on most days of the week, the activity level most recently recommended by the American College of Sports Medicine, the Centers for Disease Control and Prevention, and others (123). Some 25% of adults report that they never engage in physical activity during leisure time.

The prevalence of regular physical activity varies according to demographic characteristics. Men are more physically active than women (16). Only 40% of American women participate in any form of regular physical activity (17, 18). Participation in regular activity declines with age, with women experiencing a greater decline in older age groups than men (18). African American and Hispanic adults

are less physically active than Caucasians (17, 123). Education and income are also both positively associated with physical activity level (6, 16, 38, 56). Marital status is also related to physical activity level. Unmarried people are the most active and married women the least (123). These demographic differences suggest that barriers and preferences for physical activity likely vary across different population subgroups and are factors that need to be understood in developing programs to increase physical activity.

CHAPTER PURPOSE

In light of the well-documented health benefits of physical activity and the fact that the majority of adult men and women are inactive, promoting regular physical activity is a public health priority. The goal of the chapter is to review current research findings regarding the determinants of exercise behavior and to discuss (a) the implications of this knowledge for individual and public health recommendations and (b) intervention strategies for promoting physical activity. The discussion is predicated on the belief that physical activity is a complex, dynamic process. During their lives, individuals typically move through various phases of exercise participation that are determined by diverse factors (81, 84, 108). This chapter discusses physical activity determinants in two broad categories: individual characteristics such as motivations, skills, and other health behaviors; and environmental characteristics such as access, cost, and social and cultural supports. A recurrent theme in most recent discussions of physical activity is complexity, e.g. multiple pathways to change (5); tailoring of interventions with regard to individual, environmental, and cultural characteristics; and increasing recognition that the determinants of physical activity at initiation, maintenance, and relapse may differ (73). An attempt is made to capture this complexity in the review.

DIFFERENTIATING BETWEEN EXERCISE ADOPTION, MAINTENANCE, AND RELAPSE

Physical activity, like many other health behaviors (e.g. weight loss and smoking), is often cyclical or episodic. People begin exercise programs, participate actively for a time, and then stop, only to resume again later. In other words, each year many people begin exercising and many people stop exercising. One study estimated that in a 1-year period, 34% of women adopted moderate activities and about 5% adopted vigorous activity. Within months, however, attrition rates were about 30% and 50% for moderate and vigorous activity, respectively (107). The cyclical nature of physical activity has led to increasing interest in examining physical activity determinants during different phases of this cycle. Why people initiate programs of physical activity, what determines how long a cycle lasts, and what causes people to stop exercising are separate questions that deserve separate consideration.

PERSONAL CHARACTERISTICS ASSOCIATED WITH PHYSICAL ACTIVITY

Motivation

Central to understanding the determinants of physical activity is the question of why people spend leisure time doing physical activity when it could be spent in other ways. Health, appearance, enjoyment, social interaction, stress relief, challenge, skill development, achievement, and personal satisfaction are among the top reasons reported for engaging in regular physical activity (40,88). Motives differ by gender. Women are more likely to say that social factors and release of tension are major benefits of physical activity, whereas men tend to describe the benefits of activity in terms of fitness and health (7,118). Motivators for participation in physical activity may also influence people's activity choices. Frederick & Ryan (40) found that people who participated in individual sports were more motivated by interest and enjoyment whereas those involved in fitness activities were more motivated by physical appearance. One study reported that some people are more motivated to exercise by the desire to avoid unpleasant aspects of a sedentary lifestyle (i.e. they remind themselves of the negative consequences of not exercising and that they feel worse if they do not exercise) than they are by focusing on the enjoyable aspects of exercise (61). Relatively little information, however, is available regarding how motivation may vary by phase of exercise, particularly what motivates individuals to initiate exercise, to discontinue exercise after periods of regular physical activity, and to reinitiate exercise following a lapse in regular activity.

Cross-sectional survey research suggests that walking is the most popular form of exercise in the population as a whole (44.1%), followed by gardening or yard work (29.4%), stretching exercises (25.5%), riding a bicycle (15.4%), strength training (14.1%), stair climbing (10.8%), jogging or running (9.1%), aerobics or aerobic dancing (7.1%), and swimming (6.5%) (123). Men more commonly report gardening or yard work, strengthening exercises, jogging or running, and vigorous or contact sports. Walking and aerobics or aerobic dancing are most popular among women. Little information is available, however, regarding whether there are particular types of activities or combinations of activities that are associated with longer-term exercise maintenance. For example, is it better for individuals to participate in one form of activity consistently or to adopt an exercise program with an emphasis on cross training? Additionally, what type of activity is best to recommend for those initiating an exercise program? Walking is widely promoted as a form of physical activity for a variety of reasons, including its ease and convenience and its association with positive health outcomes, regardless of intensity (30,114). Programs often encourage walking as an activity for people who are beginning to exercise; however, this may not be the most effective strategy for all individuals. Information regarding whether physically inactive persons may be more likely to begin and maintain walking for exercise than they would other types of activity would be beneficial (114).

Self-Efficacy

Among the psychological correlates of exercise that have been examined, exercise self-efficacy is the strongest and most consistent predictor of exercise behavior. Self-efficacy predicts both exercise intention and several forms of exercise behavior (12, 20, 29, 47, 48, 75, 77, 80, 83, 95, 96, 104). Self-efficacy is an individual's belief in his/her capability of executing the courses of action necessary to satisfy situational demands. It is theorized to influence the activities that individuals choose to approach, the effort expended on such activities, and the degree of persistence demonstrated in the face of failure or aversive stimuli (4). Exercise self-efficacy is the degree of confidence an individual has in his/her ability to be physically active under a number of specific/different circumstances, or in other words, efficacy to overcome barriers to exercise (29). Self-efficacy is thought to be particularly important in the early stages of exercise (80). In the early stage of an exercise program, exercise frequency is related to one's general beliefs regarding physical abilities and one's confidence that continuing to exercise in the face of barriers will pay off. Individuals with greater self-efficacy are more likely to adhere to exercise programs with sufficient regularity to reach a point where the behavior has become, to a certain extent, habitual.

Stage of Change

The transtheoretical model and its application to a wide range of health behaviors, including physical activity, has received considerable recent attention (25, 102). The transtheoretical model is an integrative model for understanding how people progress toward adopting and maintaining health behavior change. Core features of the model are the five stages of change and the processes of change. The transtheoretical model views change as a process involving progress through a series of stages, including precontemplation, contemplation, preparation, action, and maintenance. Processes of change are the strategies people use to progress through the stages (100). Research has shown that individuals can be easily "staged" for exercise (64, 76), that exercise stage is associated with exercise level (78), and that the psychological and behavioral correlates associated with stage of change for physical activity and with transitions from one stage to another are similar to those seen in other health behaviors (76, 79). Assessing stage of change for exercise, thus, provides some useful descriptive information regarding physical activity. The predictive utility of stage of change for exercise is less clear. However, initial research examining the efficacy of stage-matched interventions suggests that this may be a promising strategy (72).

Exercise History

Prior history of physical activity should positively influence future physical activity behavior by promoting and shaping self-efficacy for exercise and by developing physical activity skills. The observed relationship between exercise history and

exercise behavior varies, however, depending on how exercise history is defined. Recent exercise history is generally predictive of future exercise behavior (27). Childhood exercise history, however, is inconsistently related to physical activity in adulthood (45, 48). Childhood physical activity experiences are also only modestly predictive of adult self-efficacy and exercise behavior (45). The perception of the exercise experience as a child may be as important as the amount of childhood exercise. One recent study found that recalling being forced and/or encouraged to exercise as a child was associated with lower levels of physical activity in adulthood (120).

Body Weight

Body weight is a strong correlate of physical activity. An abundance of cross-sectional research shows that heavier individuals are less active than lighter individuals, and prospective research indicates that changes in physical activity level are associated with changes in body weight in the direction predicted by the energy balance equation (23, 26, 37, 41, 44, 47, 62, 115, 124, 125). Exercise has also been shown to improve short- and long-term weight loss in experimental studies (62).

Clearly, body weight and physical activity are inextricably linked. The extent to which weight status is a barrier to physical activity, a consequence of physical activity, or a motivating factor for initiating activity is unclear. Heavier individuals may be more sedentary than lighter-weight individuals in part because, for heavier people, physical activity is less pleasurable and in part because of the embarrassment heavier people feel about being seen in public in exercise clothes (46). However, weight status can also be a motivator for initiating exercise. One of the most common reasons individuals give for exercising is weight control, and dieting to control weight is positively associated with frequency of participation in both high- and moderate-intensity physical activity (41).

Health Risk Profiles

Given that health risk behaviors tend to cluster together and that the health care burden multiplies with the increasing presence of risk factors, researchers have been interested in examining relationships between physical activity and other health behaviors, such as smoking, alcohol intake, and diet. Examining relationships between physical activity and other health risk behaviors has important implications for developing an understanding of the determinants of physical activity initiation, maintenance, and relapse, particularly in light of recent interest in examining whether changes in one behavioral domain may be related to changes in another (34). Across a number of health risk behaviors, the strongest correlates of physical activity are smoking and diet.

Although not all studies agree (53), data from cross-sectional studies indicate that smokers are less likely to lead physically active lifestyles than nonsmokers (9, 34, 109, 119, 121). Not only are smokers generally less likely to be physically active, smokers are also less likely to consider making positive changes in their

exercise patterns and are less likely to initiate an exercise program (46). Cigarette smoking may be thought of as a barrier to physical activity because it has a disruptive effect on physical activity performance; exercise is easier for nonsmokers than for smokers. Some researchers have begun to examine physical activity as a gateway for smoking cessation. Should smokers interested in quitting smoking be encouraged to start an exercise program? Does engaging in regular physical activity help individuals avoid smoking and/or do changes in smoking status influence changes in physical activity level? One recent study randomized women smokers to either a cognitive-behavioral smoking cessation program or the same program and a vigorous exercise program (71). Results indicated that smokers who participated in the physical activity program were approximately twice as likely to be abstinent from smoking from posttreatment through 3 months of follow-up.

Diet

Active adults generally have healthier diets than do sedentary adults. Given the energy requirements of physical activity, chronic moderate-level exercise is necessarily associated with increased energy intake (8). However, physically active adults tend to eat diets lower in fat compared with their sedentary counterparts (47, 48). In their discussion of some of the mechanisms through which eating and exercise behavior might interact with one another to positively influence health, King & Tribble (62) raised the issue that the impact of exercise on appetite and eating behavior may vary according to body weight. Exercise often is associated with a decrease in appetite (33), particularly in the short term, and some studies have demonstrated no change in food intake with exercise in heavier individuals (128). For those who have difficulty managing their weight, exercise may provide a healthy behavioral alternative to overeating. Moreover, exercise also has positive effects on mood, which may help support decreases in energy intake as well.

Stress

High levels of stress may be associated with poor health behavior patterns, including lower levels of physical activity (2). Cross-sectional research indicates that those who engage in higher levels of physical activity report lower levels of perceived stress (1). Research also suggests that physical activity has a positive impact on mood and stress level (42, 103, 116, 129). Stress levels are not static and must be considered dynamic processes that interact with individual's coping responses to produce behavioral outcomes. Stetson et al (117) conducted a prospective evaluation of the effects of stress on exercise adherence, which is a good illustration of the dynamic interaction between personal, environmental, and behavioral domains. The study examined the impact of stress on exercise behavior in a sample of female exercise maintainers. Despite the fact that the majority of women in the sample were regular exercisers, most had reported at least one exercise relapse in the past, and on average, participants omitted nearly 1 day per week of planned exercise during the study period. This finding was consistent with

other literature suggesting that even regular exercisers may stop and start bouts of regular activity and that exercise adherence may vary on a day-to-day basis. Minor stress appeared to significantly disrupt exercise adherence and exercise-related cognitions. Perceived stress had the greatest impact on exercise behavior. The authors raised the possibility that planned exercise may itself be a minor stressor during periods of ongoing stress. If this is the case, it may be misleading to recommend exercise as a stress management tool in all cases. Missing planned exercise sessions may result in frustrations and dissatisfaction and decreased exercise self-efficacy. Further understanding of the dynamic relationships between stress and exercise initiation, maintenance, relapse, and resumption would be helpful for informing interventions and developing strategies to help individuals cope with barriers to exercise that are associated with high stress levels, such as time pressure.

ENVIRONMENTAL CHARACTERISTICS ASSOCIATED WITH PHYSICAL ACTIVITY

Social Support

Social support is another robust correlate of physical activity. Individuals who engage in regular exercise report more support for activity from people in their home and work environments (47, 48, 61). Exercise starters are more likely to perceive their families as being supportive of their desire to maintain good health (46). Additionally, individuals who joined a fitness program with their spouse had higher rates of adherence at 12 months compared with those who joined without a spouse (126). In a comprehensive review, Carron et al (15) examined six major sources of social influence on physical activity, including such important others as physicians or work colleagues, family members, exercise instructors or other in-class professionals, coexercisers, and members of exercise groups. The authors concluded that social influence generally has a small-to-moderate effect. Effects that were moderate to large were found for (a) family support and attitudes about exercise, (b) task cohesion, and adherence, (c) important others and attitudes about exercise, and (d) family support and compliance behavior. It should also be recognized that the relationship between physical activity and social support is a dynamic process in which sources of social support may change over time and through the phases of adoption and maintenance of this health behavior (89). Research also suggests that there may be gender differences in the effect of social influence on physical activity (56). Troped & Saunders (122) examined gender differences in social influence on physical activity for men and women in various stages of exercise adoption. They found that women reported greater motivation than men to comply with "most people," "my regular doctor," "spouse," and "parents." Gender differences in normative beliefs and social influences were more pronounced at earlier stages of exercise adoption.

Time

Time constraints are the most frequent barriers to exercise, reported by both sedentary and active individuals (28, 61). It has been suggested that as people establish a pattern of adherence to various health-promoting behavior, less-deliberate decision making about adherence occurs and behavior becomes more habitual (68). However, scheduling efficacy remains an important and significant predictor of adherence even among regular exercisers (29). Therefore, to maintain exercise adherence, regular exercisers have to become adept at dealing with time as a barrier. The time barrier may be a particular problem for certain population subgroups. For example, Schmitz et al (112) reported that becoming a parent is associated with reductions in physical activity for mothers. Time spent caring for children may be interfering with attempts to maintain physical activity levels.

Access

Another environmental barrier that has received some attention in the determinants literature is access to exercise facilities. One way of assessing this has been to examine whether the distance between individuals' homes and exercise facilities is correlated with exercise behavior (111). It appears that there is a modest relationship between access to facilities and physical activity. Access to exercise facilities may be related to exercise levels for some individuals but not for others, depending on activity preference. For those individuals who prefer exercises such as walking or running, which can be done anywhere, access to facilities may be less relevant. Additionally, for those who exercise with home equipment, which could include stationary bikes, treadmills, and even exercise videos, access to facilities may also not affect exercise adherence. Regardless, the extent to which environments are conducive to physical activity (i.e. walking/biking paths, safe streets) likely has a strong impact on population activity levels. One recent study examining the association between neighborhood safety and sedentary behavior in a population-based sample found that there was a lower prevalence of physical activity among persons who perceive their neighborhoods as unsafe. Better measurement of environmental resources for physical activity and strategies for improving access to physical activity facilities are needed.

Another aspect of location related to exercise initiation, adherence, and relapse concerns whether activities are group based or individual. Initial advantages of group exercise, such as group support and structure provided by these options, may be outweighed by the long-term costs involved in traveling to exercise sites at specific times for physical activity involvement (54). There is some indication that individuals, regardless of current exercise status, are more likely to report a preference for physical activity that could be performed on one's own rather than with others in a group or class (61). In a population-based weight-gain-prevention trial, individuals were given opportunities to participate in both home-based and face-to-face exercise program options. One face-to-face option included a free

1-month membership to local YWCA/YMCA facilities with free childcare. Less than 1% of participants took advantage of free access to the YWCA/YMCA compared with 12% who participated in a correspondence “marathon” program, in which they were asked to complete a minimum of 26 miles of walking or running within a 4-week period on their own (113). Several studies have examined alternatives to supervised group exercise (3, 22, 31, 94). In the context of a weight-loss program, Perri and colleagues (94) compared the effects of two exercise regimens, a group-based program versus a home-based program, on exercise participation, adherence, and fitness. Their results indicated that participants in the home-based program demonstrated better adherence and exercise performance data, particularly at the 12-month follow-up. Two recent studies compared structured exercise programs to a lifestyle approach and reported that the lifestyle approach was as effective as structured exercise programs in improving physical activity and health outcomes, including body weight and cardiorespiratory fitness (3, 31). The relevance of exercise location across the phases of exercise initiation, maintenance, and relapse deserves further attention.

Attributes of Exercise Behavior

Characteristics of the exercise behavior itself (e.g. type of exercise, variety, intensity, and duration) are additional important predictors of physical activity that deserve further investigation. Although survey data show the most popular types of activity, little information is available regarding which types of activity are associated with the best maintenance rates. Individuals who engage in “higher doses” of activity and higher intensities of activity typically have personal profiles predictive of exercise behavior (i.e. their self-efficacy, motivations, and valuations of exercise are strong) (65, 105). Whether the exercise behavior itself contributes to these strong attitudes or the attitudes preceded the exercise behavior is not clear.

Variety is another attribute that could be important for promoting physical activity. Little information is available regarding whether variety in exercise behavior matters for exercise consistency. Engaging in a wider variety of exercises could promote adherence by reducing injury and boredom, and by increasing the adaptability of being able to engage in multiple activities. Alternatively, adopting a regular exercise regime and focusing primarily on one activity may reduce decision making and thus facilitate adherence. Individual differences in preference for a single activity type versus variety are also likely to exist. Preference could also vary across exercise phase (i.e. as individuals become more fit, they may be better able to enjoy new activities).

Finally, given the public health recommendation to accumulate 30 min of physical activity on most days of the week, there has been a recent focus on the health benefits of short bouts versus long bouts of activity. Generally, research suggests that significant health benefits are accrued by engaging in multiple short bouts of activity (24, 32, 51, 52, 87). It is important to note that short bouts of activity may be easier for people to incorporate into their schedules and may be particularly

suitable for those initiating physical activity. Research suggests that multiple short bouts of exercise have been effective at promoting short-term adherence (51). When compared with a home-based continuous or long-bout exercise program with a strong behavioral component, a short-bout program was comparable with regard to exercise adherence (52). Andersen et al (3) and Dunn et al (31) each compared a structured exercise program to a lifestyle exercise program that emphasized the accumulation of at least 30 min of moderate-intensity physical activity on most days of the week. Unfortunately, however, the published reports did not provide information regarding the duration and timing of the exercise bouts for each of the groups, so the effect of multiple versus continuous bouts of activity could not be assessed.

Injury

Despite the numerous health benefits that exercise confers, regular physical activity increases risk of musculoskeletal injuries. It is surprising that, with the exception of injury risk associated with running, there has been relatively little research in this area (66, 67, 92). Injury risk associated with running is quite high (35%–65%) and increases with running frequency and injury history (92). A recent study examined injury rates from a variety of moderate-intensity activities and found that injury rates associated with walking, gardening, outdoor bicycling, aerobics, and weight training are relatively low (98). We need to understand more about frequency and adverse effects of injury to better inform exercise initiators, consistent exercisers, and those who are reinitiating exercise after a relapse about injury prevention. For those who are initiating exercise programs, we need to learn more about the best way to become more physically active while preventing injury. The low injury risk associated with walking, in particular, appears to be another reason to endorse this favored form of exercise (98). We also need to learn more about the best way to remain injury free while engaging in a consistent exercise program. Although some research has addressed the issue of injury-prevention strategies such as stretching (49, 92), systematic examination of relationships between injury-prevention strategies and injury outcome in representative samples of exercisers is necessary. Possible strategies for preventing injury that successful exercise maintainers may practice are avoiding exercise burnout and injury by not overtraining, engaging in stretching, flexibility, and strength training, and cross training. Moreover, since injury is a major cause of exercise relapse (110), we need to learn more about the best strategies for avoiding reinjury when resuming exercising.

INTERACTION OF PHYSICAL ACTIVITY DETERMINANTS

Despite the fact that numerous questions remain, there is clearly an abundance of information available regarding multiple determinants of physical activity. An important next step in advancing our understanding of the etiology and maintenance

of physical activity patterns is to conduct studies that incorporate these multiple determinants and reflect the complexity of predicting exercise behavior. Specifically, we need to apply methodologies that can increase our understanding of how variables from different domains interact with one another for different individuals to influence physical activity levels. For example, King et al (59) used signal detection methodology to address this question in a study that yielded some interesting findings. Signal detection methodology allows for an understanding of how groups of variables may interact to influence the probability that a behavior will occur over time. King and colleagues applied signal detection methodology to identify the best combination of predictors of exercise adherence in a sample of sedentary adults who were participating in randomized controlled clinical trial that included four conditions: higher-intensity group-based exercise, higher-intensity home-based exercise, lower-intensity home-based exercise, and assessment only. Their results suggested that prediction of adherence may be enhanced by systematic evaluation of variables from multiple domains and in combination with one another. They were able to identify subgroups of people who showed different patterns of exercise adherence across a 2-year period, and they showed that determinants of exercise differed depending on type of exercise program. For example, moderately overweight individuals did less well in group-format programs and individuals who reported higher stress levels at baseline did less well in home-based exercise formats. Application of this methodology to the study of physical activity determinants may provide important information for matching participants to exercise interventions and for making recommendations for those who are interested in initiating physical activity programs. Further application of this and related methodologies should be used to understand the determinants of exercise behavior across the different phases of exercise initiation, maintenance, and relapse.

Summary and Implications for Physical Activity Promotion Recommendations

We have attempted to review the literature on key individual level and environmental level determinants of physical activity. Highlights of the review include the importance of (a) understanding and assessing different motivations for physical activity, (b) self-efficacy as a predictor of physical activity and a target for intervention, (c) assessing readiness for physical activity change, (d) addressing prominent barriers to physical activity such as time and access, and (e) enhancing social support for physical activity. We now discuss the implications of these results for physical activity promotion and intervention. Questions addressed include how to interest people in physical activity, how to help people find the kind of program that is right for them, and how to make the environment maximally supportive for physical activity. Although the physical activity intervention literature has been extensively reviewed elsewhere (36, 54, 55, 60), we use previous

intervention studies to help illustrate and support our recommendations where appropriate.

Motivation for Physical Activity

According to prevailing conceptualizations of physical activity, to become a regular exerciser, an individual has to adopt the belief that exercise confers enough benefits to outweigh its costs. This may be especially difficult for individuals who have been inactive for a long time or who have had negative experiences with physical activity, because the benefits of an active lifestyle are perceived as much less salient than the costs of becoming more active. One approach to promoting physical activity is to emphasize the wide range of benefits associated with a physically active lifestyle and to tailor this message for different subgroups of the population.

For example, exercise helps people manage their weight and prevent (or slow down) weight gain with age. Assistance with weight management/appearance can be an important motivation for exercise initiation and maintenance. More than two thirds of American adults are trying to lose or keep from gaining weight. The role that exercise can play in weight management needs more emphasis. At the same time, it is important to keep in mind that being overweight and discomfort with one's weight status are also barriers to becoming physically active. Therefore, physical activity promotion programs need to be modified to address the needs of overweight individuals as well. An important aspect of physical activity promotion for weight control is how much to recommend. Data from studies of successful weight-loss maintainers suggest that the optimal amount of exercise for weight control likely exceeds current public health recommendations. Indeed, it may be close to an hour of moderate-to-vigorous activity on most days of the week (63, 85). This higher level of activity may be perceived as intimidating and difficult to achieve for those who have a history of sedentary behavior and are overweight. Strategies and support for helping individuals gradually increase their physical activity level while remaining injury free are needed. The weight management component of physical activity also may be important in the exercise relapse process. Decreases in physical activity are associated with increases in weight. However, it is not clear which comes first, the exercise relapse or the weight gain. What role does weight gain play in reinitiating exercise?

Additional important motivations for physical activity may be its positive carryover effects on other aspects of health. One recent study found that smokers were more likely to successfully quit smoking if they were taking part in an exercise program (71). Exercise may also be a helpful strategy for individuals who are attempting to manage their use of other substances as well, such as alcohol or high-fat foods. Given the strong connection between physical activity and emotional well-being, more emphasis might be placed on promoting exercise as a stress management tool (57). Although physical activity is associated with positive well-being generally, more attention should be paid to designing physical

activity interventions to assist with mood management and stress levels for specific populations at risk. For example, King & Brassington (57) discuss adapting physical activity programs for adult family caregivers, a population at high risk for negative health behavior patterns and stress levels. Physical activity programs have also been shown to be an effective strategy for alleviating depression (86).

Self-Efficacy for Physical Activity

Addressing self-efficacy should figure prominently in efforts to promote physical activity, given its strong association with exercise behavior. Given that self-efficacy for exercise is such a strong predictor, McAuley et al (84) suggest that we should target exercise self-efficacy as an outcome in and of itself. More specifically, we need to figure out the optimal way to promote self-efficacy among individuals with a history of sedentary behavior. Courneya & McAuley (21) have written extensively about cognitive strategies for altering self-efficacy. They recommend targeting various “incentive-laden” aspects of physical activity, such as its health benefits, to build motivation. They note that minimizing the perception of barriers at different stages of regular physical activity involvement is important, and that developing strategies for detecting and overcoming barriers could be part of targeted intervention for altering an individual’s perceived control over, and self-efficacy for engaging in, physical activity. Research has demonstrated that relatively short, acute bouts of physical activity have been shown to enhance/boost self-efficacy (82, 84). Therefore, a vital step in enhancing exercise self-efficacy may be to actually get people to begin exercising. Once an individual begins to exercise, receiving feedback regarding exercise performance can help maintain and promote exercise self-efficacy cognitions. Health and fitness professionals who work with exercise initiates can play an important role in fostering strong beliefs in exercise capabilities. Self-monitoring can be also be used as a tool for those who exercise on their own to monitor performance and provide evidence regarding physical activity accomplishments (84, 127). Another strategy for enhancing exercise self-efficacy would be to incorporate more information about the cyclical nature of exercise behavior into physical activity promotion efforts. Few exercisers adhere perfectly to their exercise regimes. For novice and experienced exercisers, missing planned exercise sessions can result in frustrations and dissatisfaction and decreased exercise self-efficacy (117). However, if individuals are taught to reframe these experiences as “normal” adjustments to the ongoing challenge of staying committed to and overcoming barriers to physical activity, self-efficacy may be preserved.

Readiness for Physical Activity Change

The audience most difficult to reach is people who are sedentary and have no history of positive experience with physical activity. Such individuals tend to have elevated risk profiles across behavioral, psychological, and physiological domains (46) and, according to the transtheoretical model, would most likely be

classified in the “precontemplation” stage. Programs and public health messages need to be tailored for this group and marketed to attract them. An important direction has been to attempt to match physical activity intervention strategies to individuals’ stage of change for exercise. For example, it has been suggested that a major limitation of physical activity programs is that they rely too heavily on the behavioral processes of change and therefore do not reach or appeal to those in the audience who are currently sedentary and in the precontemplation stage. Given that individuals in the precontemplation stage, by definition, are not considering initiating an exercise program, messages highlighting the benefits of exercising and the costs of a sedentary lifestyle are necessary. Research examining the utility of such strategies has shown that stage-matched interventions are helpful in promoting progression through the stages of change for physical activity and increases in physical activity levels. Additionally, instead of waiting for such individuals to join exercise programs or initiate physical activity on their own, developing strategies such as using mail-based outreach approaches may be effective for reaching this population (13, 54, 58, 72, 73).

Barriers to Physical Activity: Time and Access

Problem-solving training for overcoming barriers to exercise should be incorporated into exercise intervention programs (20). Time and access are the most commonly reported barriers to physical activity. The lifestyle approach to physical activity is one way of addressing both time and access barriers and is a promising strategy for attracting sedentary individuals to exercise programs. The lifestyle approach includes promoting lower-intensity physical activities, such as walking, that can readily fit into a daily routine and incorporating multiple bouts of physical activity to achieve daily goals rather than concentrating an entire day’s commitment to a single session (51, 52). The approach reduces the need for blocks of time and special facilities. This approach may also be perceived as less intimidating to individuals who have either no experience or unpleasant prior experiences with physical activity. As noted previously, recent studies have reported that lifestyle approaches to physical activity achieve results comparable to programmed exercise initiatives. However, we need to learn more about what people actually do when they are given the lifestyle message (i.e. how they accumulate the requisite 30 min per day of activity). The lifestyle approach may not be effective for some individuals who would benefit from personalized attention and the structure imposed by an organized exercise program. It should be considered that the lifestyle approach within the context of a clinical trial, which includes contact with health professionals and/or research staff, is different from how this approach might be carried out by individuals who are on their own. Some concern has been raised about whether activity levels reported by people engaging in lifestyle exercise are of sufficient magnitude and duration to warrant enthusiastic support. Whether or not these concerns are valid, however, it would seem that the lifestyle approach may at least be used as a bridge to help people become more physically active and

potentially more likely to engage in the type and amount of vigorous activity that would be associated with the greatest health benefits.

Enhancing Social Support for Physical Activity

Research data clearly establish that both reports of social support and objective indices of support, such as exercising with a partner, predict high physical activity levels. Women, in particular, also frequently cite social interaction as a primary motivation for wanting to exercise. Implications of these findings are that people should be encouraged to exercise with others and that the social aspects of physical activity should be emphasized in physical activity programs. The choice of social support partner is a critical issue deserving further exploration. Spouses, friends, and work colleagues are all potential exercise partners; however, who the optimal support partner is may be different for different individuals. At least one study suggests that it is better to have multiple sources of support.

Environmental Strategies

A supportive environment is a prerequisite to adequate physical activity levels. People often cite access as a barrier, and both correlational and experimental data suggest that access is important (35, 50, 106). Not all attempts to enhance physical activity by reducing access barriers have been successful, but the preponderance of evidence supports the idea that public and private (e.g. work sites) support for physical activity facilities is beneficial. In addition to modifying environments to promote physical activity, attention should be paid to modifying environments to reduce access to sedentary behaviors (35). Better measurement of environmental resources for physical activity and strategies for improving access to physical activity facilities are needed. In recent years, more attention has been paid to developing environmental and policy interventions to promote physical activity (106). Prominent among the strategies suggested are developing better walking/biking paths for the purposes of both recreation and transportation to work, making work sites more conducive to physical activity by providing incentives and facilities to promote exercise (e.g. subsidizing health club memberships and providing showers/dressing rooms for those who commute to work by walking or biking).

Another way in which the environment has an impact on population physical activity levels is through its influence on social norms and knowledge regarding physical activity (106). Research examining the impact of mass media campaigns on physical activity levels has shown that these campaigns have limited effectiveness (74). More research is needed to know the most effective way to communicate public health messages regarding the importance of physical activity and strategies for incorporating exercise into one's lifestyle. Although many people know about the importance of exercise, there may be misconceptions about exercise (i.e. you have to be an athlete or engage in vigorous activity to achieve health benefits). As more research is conducted on alternative ways to obtain health benefits from physical activity, results should be communicated to the public. We need to ensure, however, that our public health messages are based on strong empirical findings.

Without modifying the environment and cultural milieu regarding physical activity, efforts targeted toward getting individuals to change behavior will be less effective.

SUMMARY AND CONCLUSION

The past century has produced dramatic changes in physical activity patterns in the United States. Machines with motors have replaced human labor in virtually every aspect of life, so that the energy expenditure now required for daily life is a fraction of what it was a generation or two ago. The consequences of this dramatic change are far reaching and only now are beginning to be carefully studied. Low levels of energy expenditure are increasingly recognized as important contributors to a variety of chronic health problems, including diabetes, heart disease, and cancer.

Understanding of the epidemic of sedentariness and of how to reverse it is just beginning. This chapter reviewed research conducted to date that has been aimed at this goal. A database characterizing the population distribution of physical activity is evolving, and consistent patterns of intrapersonal and environmental correlates of physical activity are emerging. These associations provide a basis for developing hypotheses about intervention approaches. Available data on intervention efficacy are only beginning to accumulate. We have suggested that exploring ways to increase motivation for physical activity, enhance self-efficacy for exercise, enhance social and environmental supports, and tailor interventions for different subgroups of individuals are all important for increasing population physical activity levels. We highly recommend that such strategies be evaluated using strong research designs to assess their efficacy.

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