CHAPTER 6
UNDERSTANDING AND PROMOTING PHYSICAL ACTIVITY

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CHAPTER 6
UNDERSTANDING AND PROMOTING PHYSICAL ACTIVITY

Introduction

As the benefits of moderate, regular physical activity have become more widely recognized, the need has increased for interventions that can promote this healthful behavior. Because theories and models of human behavior can guide the development and refinement of intervention efforts, this chapter first briefly examines elements of behavioral and social science theories and models that have been used to guide much of the research on physical activity. First for adults, then for children and adolescents, the chapter reviews factors influencing physical activity and describes interventions that have sought to improve participation in regular physical activity among these two age groups. To put in perspective the problem of increasing individual participation in physical activity, the chapter next examines societal barriers to engaging in physical activity and describes existing resources that can increase opportunities for activity. The chapter concludes with a summary of what is known about determinant and intervention research on physical activity and makes recommendations for research and practice.

Theories and Models Used in Behavioral and Social Science Research on Physical Activity

Numerous theories and models have been used in behavioral and social science research on physical activity. These approaches vary in their applicability to physical activity research. Some models and theories were designed primarily as guides to understanding behavior, not as guides for designing interventions. Others were specifically constructed with a view toward developing interventions, and some of these have been applied extensively in intervention research as well. Because most were developed to explain the behavior of individuals and to guide individual and small-group intervention programs, these models and theories may have only limited application to understanding the behavior of populations or designing communitywide interventions. Key elements most frequently used in the behavioral and social science research on physical activity are described below and summarized in Table 6-1.

Learning Theories

Learning theories emphasize that learning a new, complex pattern of behavior, like changing from a sedentary to an active lifestyle, normally requires modifying many of the small behaviors that compose an overall complex behavior (Skinner 1953). Principles of behavior modification suggest that a complex-pattern behavior, such as walking continuously for 30 minutes daily, can be learned by first breaking it down into smaller segments (e.g., walking for 10 minutes daily). Behaviors that are steps toward a final goal need to be reinforced and established first, with rewards given for partial accomplishment if necessary. Incremental increases, such as adding 5 minutes to the daily walking each week, are then made as the complex pattern of behaviors is "shaped" toward the targeted goal. A further complication to the change process is that new patterns of physical activity behavior must replace or compete with former patterns of inactive behaviors that are often satisfying (e.g., watching television), habitual behaviors (e.g., parking close to the door), or behaviors cued by the environment (e.g., the presence of an elevator).

Reinforcement describes the consequences that motivate individuals either to continue or discontinue a behavior (Skinner 1953; Bandura 1986).

Table 6-1. Summary of theories and models used in physical activity research

Theory/model	Level	Key concepts
Classic learning theories	Individual	Reinforcement Cues Shaping
Health belief model	Individual	Perceived susceptibility Perceived severity Perceived benefits Perceived barriers Cues to action Self-efficacy
Transtheoretical model	Individual	Precontemplation Contemplation Preparation Action Maintenance
Relapse prevention	Individual	Skills training Cognitive reframing Lifestyle rebalancing
Social cognitive theory	Interpersonal	Reciprocal determinism Behavioral capability Self-efficacy Outcome expectations Observational learning Reinforcement

Theory of planned behavior	Interpersonal	Attitude toward the behavior
		  Outcome expectations
		  Value of outcome expectations
		Subjective norm
		  Beliefs of others
		  Motive to comply with others
		Perceived behavioral control

Social support	Interpersonal	Instrumental support Informational support Emotional support Appraisal support

Ecological perspective	Environmental	Multiple levels of influence
		  Intrapersonal
		  Interpersonal
		  Institutional
		  Community
		  Public policy

Source: Adapted from Glanz K and Rimer BK. *Theory at-a-glance: a guide for health promotion practice,* U.S. Department of Health and Human Services, 1995.

Most behaviors, including physical activity, are learned and maintained under fairly complex schedules of reinforcement and anticipated future rewards. Future rewards or incentives may include physical consequences (e.g., looking better), extrinsic rewards (e.g., receiving praise and encouragement from others, receiving a T-shirt), and intrinsic rewards (e.g., experiencing a feeling of accomplishment or gratification from attaining a personal milestone). It is important to note that although providing praise, encouragement, and other extrinsic rewards may help people adopt positive lifestyle behaviors, such external reinforcement may not be reliable in sustaining long-term change (Glanz and Rimer 1995).

Health Belief Model

The health belief model stipulates that a person's health-related behavior depends on the person's perception of four critical areas: the severity of a potential illness, the person's susceptibility to that illness, the benefits of taking a preventive action, and the barriers to taking that action (Hochbaum 1958; Rosenstock 1960, 1966). The model also incorporates cues to action (e.g., leaving a written reminder to oneself to walk) as important elements in eliciting or maintaining patterns of behavior (Becker 1974). The construct of self-efficacy, or a person's confidence in his or her ability to successfully perform an action (discussed in more detail later in this chapter), has been added to the model (Rosenstock 1990), perhaps allowing it to better account for habitual behaviors, such as a physically active lifestyle.

Transtheoretical Model

In this model, behavior change has been conceptualized as a five-stage process or continuum related to a person's readiness to change: precontemplation, contemplation, preparation, action, and maintenance (Prochaska and DiClemente 1982, 1984). People are thought to progress through these stages at varying rates, often moving back and forth along the continuum a number of times before attaining the goal of maintenance. Therefore, the stages of change are better described as spiraling or cyclical rather than linear (Prochaska, DiClemente, Norcross 1992). In this model, people use different processes of change as they move from one stage of change to another. Efficient self-change thus depends on doing the right thing (processes) at the right time (stages) (Prochaska, DiClemente, Norcross 1992). According to this theory, tailoring interventions to match a person's readiness or stage of change is essential (Marcus and Owen 1992). For example, for people who are not yet contemplating becoming more active, encouraging a step-by-step movement along the continuum of change may be more effective than encouraging them to move directly into action (Marcus, Banspach, et al. 1992).

Relapse Prevention Model

Some researchers have used concepts of relapse prevention (Marlatt and Gordon 1985) to help new exercisers anticipate problems with adherence. Factors that contribute to relapse include negative emotional or physiologic states, limited coping skills, social pressure, interpersonal conflict, limited social support, low motivation, high-risk situations, and stress (Brownell et al. 1986; Marlatt and George 1990). Principles of relapse prevention include identifying high-risk situations for relapse (e.g., change in season) and developing appropriate solutions (e.g., finding a place to walk inside during the winter). Helping people distinguish between a lapse (e.g., a few days of not participating in their planned activity) and a relapse (e.g., an extended period of not participating) is thought to improve adherence (Dishman 1991; Marcus and Stanton 1993).

Theory of Reasoned Action and Theory of Planned Behavior

The theory of reasoned action (Fishbein and Ajzen 1975; Ajzen and Fishbein 1980) states that individual performance of a given behavior is primarily determined by a person's intention to perform that behavior. This intention is determined by two major factors: the person's attitude toward the behavior (i.e., beliefs about the outcomes of the behavior and the value of these outcomes) and the influence of the person's social environment or subjective norm (i.e., beliefs about what other people think the person should do, as well as the person's motivation to comply with the opinions of others). The theory of planned behavior (Ajzen 1985, 1988) adds to the theory of reasoned action the concept of perceived control over the opportunities, resources, and skills necessary to perform a behavior. Ajzen's concept of

perceived behavioral control is similar to Bandura's (1977a) concept of self-efficacy—a person's perception of his or her ability to perform the behavior (Ajzen 1985, 1988). Perceived behavioral control over opportunities, resources, and skills necessary to perform a behavior is believed to be a critical aspect of behavior change processes.

Social Learning/Social Cognitive Theory

Social learning theory (Bandura 1977b), later renamed social cognitive theory (Bandura 1986), proposes that behavior change is affected by environmental influences, personal factors, and attributes of the behavior itself (Bandura 1977b). Each may affect or be affected by either of the other two. A central tenet of social cognitive theory is the concept of self-efficacy. A person must believe in his or her capability to perform the behavior (i.e., the person must possess self-efficacy) and must perceive an incentive to do so (i.e., the person's positive expectations from performing the behavior must outweigh the negative expectations). Additionally, a person must value the outcomes or consequences that he or she believes will occur as a result of performing a specific behavior or action. Outcomes may be classified as having immediate benefits (e.g., feeling energized following physical activity) or long-term benefits (e.g., experiencing improvements in cardiovascular health as a result of physical activity). But because these expected outcomes are filtered through a person's expectations or perceptions of being able to perform the behavior in the first place, self-efficacy is believed to be the single most important characteristic that determines a person's behavior change (Bandura 1986).

Self-efficacy can be increased in several ways, among them by providing clear instructions, providing the opportunity for skill development or training, and modeling the desired behavior. To be effective, models must evoke trust, admiration, and respect from the observer; models must not, however, appear to represent a level of behavior that the observer is unable to visualize attaining (Bandura 1986).

Social Support

Often associated with health behaviors such as physical activity, social support is frequently used in behavioral and social research. There is, however, considerable variation in how social support is conceptualized and measured (Israel and Schurman 1990). Social support for physical activity can be instrumental, as in giving a nondriver a ride to an exercise class; informational, as in telling someone about a walking program in the neighborhood; emotional, as in calling to see how someone is faring with a new walking program; or appraising, as in providing feedback and reinforcement in learning a new skill (Israel and Schurman 1990). Sources of support for physical activity include family members, friends, neighbors, co-workers, and exercise program leaders and participants.

Ecological Approaches

A criticism of most theories and models of behavior change is that they emphasize individual behavior change processes and pay little attention to sociocultural and physical environmental influences on behavior (McLeroy et al. 1988). Recently, interest has developed in ecological approaches to increasing participation in physical activity (McLeroy et al. 1988; CDC 1988; Stokols 1992). These approaches place the creation of supportive environments on a par with the development of personal skills and the reorientation of health services. Stokols (1992) and Simons-Morton and colleagues (CDC 1988; Simons-Morton, Simons-Morton, et al. 1988) have illustrated this concept of a health-promoting environment by describing how physical activity could be promoted by establishing environmental supports, such as bike paths, parks, and incentives to encourage walking or bicycling to work.

An underlying theme of ecological perspectives is that the most effective interventions occur on multiple levels. McLeroy and colleagues (1988), for example, have proposed a model that encompasses several levels of influences on health behaviors: intrapersonal factors, interpersonal and group factors, institutional factors, community factors, and public policy. Similarly, a model advanced by Simons-Morton and colleagues (CDC 1988) has three levels (individual, organizational, and governmental) in four settings (schools, worksites, health care institutions, and communities). Interventions that simultaneously influence these multiple levels and multiple settings may be expected to lead to greater and longer-lasting changes and maintenance of existing health-promoting habits. This is a promising area for

the design of future intervention research to promote physical activity.

Summary

Some similarities can be noted among the behavioral and social science theories and models used to understand and enhance health behaviors such as physical activity. Many of the theoretical approaches highlight the role of the perceived outcomes of behavior, although different terms are used for this construct, including perceived benefits and barriers (health belief model) and outcome expectations (social cognitive theory and theory of planned behavior) (Table 6-1). Several approaches also emphasize the influence of perceptions of control over behavior; this influence is given labels such as self-efficacy (health belief model, social cognitive theory) and perceived behavioral control (theory of planned behavior). Other theories and models feature the role of social influences, as in the concepts of observational learning (social cognitive theory), perceived norm (theory of reasoned action and theory of planned behavior), social support, and interpersonal influences (ecological perspective). Most of the theories and models, however, do not address the influence of the environment on health behavior.

Behavioral Research on Physical Activity among Adults

Behavioral research in this area includes studies on both the factors influencing physical activity among adults (determinants research) and the effectiveness of strategies and programs to increase this behavior (interventions research). Although many of the key concepts presented in the preceding section are featured in both types of research presented here, neither area is limited to those concepts only.

Factors Influencing Physical Activity among Adults

Research on the determinants of physical activity identifies those factors associated with, or predictive of, this behavior. This section reviews determinants studies in which the measured outcome was overall physical activity, adherence to or continued participation in structured physical activity programs, or movement from one stage of change to another (e.g., from contemplation to preparation). The section does not review studies in which the outcome measured was an intermediate measure of physical activity (e.g., intentions concerning future participation in physical activity). Although researchers have studied a wide array of potential influences on physical activity among adults, the section focuses on factors that can be modified, such as self-efficacy and social support, rather than on factors that cannot be changed, such as age, sex, and race/ethnicity.

Modifiable Determinants

The modifiable determinants of adult physical activity include personal, interpersonal, and environmental factors (Table 6-1). Self-efficacy, a construct from social cognitive theory, has been consistently and positively associated with adult physical activity (Courneya and McAuley 1994; Desmond et al. 1993; Hofstetter et al. 1991; Yordy and Lent 1993), physical activity stage of change (Marcus, Eaton, et al. 1994; Marcus and Owen 1992; Marcus, Pinto, et al. 1994; Marcus, Selby, et al. 1992), and adherence to structured physical activity programs (DuCharme and Brawley 1995; Duncan and McAuley 1993; McAuley, Lox, Duncan 1993; Poag-DuCharme and Brawley 1993; Robertson and Keller 1992). The evidence is less conclusive, however, for the theory of planned behavior's construct of perceived behavioral control (Courneya 1995; Courneya and McAuley 1995; Godin et al. 1991, 1995; Godin, Valois, Lepage 1993; Kimiecik 1992; Yordy and Lent 1993).

Several studies have found no association between adult physical activity (whether physical activity, stage of change, or adherence) and either the health belief model's constructs of perceived benefits (Hofstetter et al. 1991; Mirotznik, Feldman, Stein 1995; Oldridge and Streiner 1990; Taggart and Connor 1995) and perceived barriers (Desmond et al. 1993; Godin et al. 1995; Neuberger et al. 1994; Oldridge and Streiner 1990; Taggart and Connor 1995) or the theory of reasoned action and theory of planned behavior's construct of attitude toward the behavior (Courneya and McAuley 1995; Godin, Valois, Lepage 1993; Hawkes and Holm 1993). Nonetheless, the cumulative body of evidence supports the conclusion that expectations of both positive (e.g., benefits) and negative (e.g., barriers) behavioral outcomes are associated with physical activity among adults. Expectation of positive outcomes or

perceived benefits of physical activity has been consistently and positively associated with adult physical activity (Ali and Twibell 1995; Neuberger et al. 1994), physical activity stage of change (Booth et al. 1993; Calfas et al. 1994; Eaton et al. 1993; Marcus, Eaton, et al. 1994; Marcus and Owen 1992; Marcus, Pinto, et al. 1994; Marcus, Rakowski, Rossi 1992), and adherence to structured physical activity programs (Lynch et al. 1992; Robertson and Keller 1992). Conversely, the construct of perceived barriers to physical activity has been negatively associated with adult physical activity (Ali and Twibell 1995; Dishman and Steinhardt 1990; Godin et al. 1991; Hofstetter et al. 1991; Horne 1994), physical activity stage of change (Calfas et al. 1994; Lee 1993; Marcus, Eaton, et al. 1994; Marcus and Owen 1992; Marcus, Pinto, et al. 1994; Marcus, Rakowski, Rossi 1992), and adherence to structured physical activity programs (Howze, Smith, DiGilio 1989; Mirotznik et al. 1995; Robertson and Keller 1992). Additionally, attitude toward the behavior (outcome expectations and their values) has been consistently and positively related to physical activity (Courneya and McAuley 1994; Dishman and Steinhardt 1990; Godin et al. 1987, 1991; Kimiecik 1992; Yordy and Lent 1993) and stage of change (Courneya 1995).

Social support from family and friends has been consistently and positively related to adult physical activity (Felton and Parsons 1994; Horne 1994; Minor and Brown 1993; Sallis, Hovell, Hofstetter 1992; Treiber et al. 1991), stage of change (Lee 1993), and adherence to structured exercise programs (Duncan and McAuley 1993; Elward, Larson, Wagner 1992). Behavioral intention, a construct from the theory of reasoned action and the theory of planned behavior, also has consistently been associated with adult physical activity (Courneya and McAuley 1994; Godin et al. 1987, 1991; Godin, Valois, Lepage 1993; Kimiecik 1992; Yordy and Lent 1993), stage of change (Courneya 1995), and adherence to structured exercise programs (Courneya and McAuley 1995; DuCharme and Brawley 1995). Conversely, the construct of subjective norm from these theories has been both positively associated (Courneya 1995; Godin et al. 1987, 1991; Hawkes and Holm 1993; Kimiecik 1992; Yordy and Lent 1993) and not associated (Courneya and McAuley 1995; Godin et al. 1995; Hofstetter et al. 1991) with adult physical activity, stage of change, and adherence to structured exercise programs.

There is also mixed evidence regarding the positive relationship between the health belief model's construct of perceived severity of diseases and either physical activity (Godin et al. 1991) or adherence to structured exercise programs (Lynch et al. 1992; Mirotznik, Feldman, Stein 1995; Oldridge and Streiner 1990; Robertson and Keller 1992). Additionally, that model's construct of perceived susceptibility to illness has been unrelated to adult adherence to structured exercise programs (Lynch et al. 1992; Mirotznik et al. 1995; Oldridge and Streiner 1990).

The cumulative body of determinants research consistently reveals that exercise enjoyment is a determinant that has been positively associated with adult physical activity (Courneya and McAuley 1994; Horne 1994; McAuley 1991), stage of change (Calfas et al. 1994), and adherence to structured exercise programs (Wilson et al. 1994). Conversely, there has been no relationship between locus of control beliefs (i.e., perceptions of personal control over health, fitness, or physical activity) and either adult physical activity (Ali and Twibell 1995; Burk and Kimiecik 1994; Dishman and Steinhardt 1990; Duffy and MacDonald 1990) or adherence to structured exercise programs (Lynch et al. 1992; Oldridge and Streiner 1990). Although previous physical activity during adulthood has been consistently related to physical activity among adults (Godin et al. 1987, 1993; Minor and Brown 1993; Sharpe and Connell 1992) and stage of change (Eaton et al. 1993), history of physical activity during youth has been unrelated to adult physical activity (Powell and Dysinger 1987; Sallis, Hovell, Hofstetter 1992).

Determinants for Population Subgroups

Few determinants studies of heterogeneous samples have examined similar sets of characteristics in subgroups. Self-efficacy is the variable with the strongest and most consistent association with physical activity in different subgroups from the same large study sample. Self-efficacy has been positively related to physical activity among men, women, younger adults, older adults (Sallis et al. 1989), Latinos (Hovell et al. 1991), overweight persons (Hovell et al. 1990), and persons with injuries or disabilities (Hofstetter et al. 1991). The generalizability of the self-efficacy associations is extended by studies of university students and alumni (Calfas et al. 1994; Courneya and McAuley 1994; Yordy and Lent 1993), employed

women (Marcus, Pinto, et al. 1994), participants in structured exercise programs (Duncan and McAuley 1993; McAuley, Lox, Duncan 1993; Poag-DuCharme and Brawley 1993), and people with coronary heart disease (CHD) (Robertson and Keller 1992).

Summary

Ideally, theories and models of behavioral and social science could be used to guide research concerning the factors that influence adult physical activity. In actuality, the application of these approaches to determinants research in physical activity has generally been limited to individual and interpersonal theories and models. Social support and some factors from social cognitive theory, such as confidence in one's ability to engage in physical activity (i.e., self-efficacy) and beliefs about the outcome of physical activity, have been consistently related to physical activity among adults. Factors from other theories and models, however, have received mixed support. Although perceptions of the benefits of, and barriers to, physical activity have been consistently related to physical activity among adults, other constructs from the health belief model, such as perceptions of susceptibility to, and the severity of, disease, have not been related to adult physical activity. Further, constructs from the theory of reasoned action and the theory of planned behavior, including intentions and beliefs about the outcomes of behavior, have been consistently related to adult physical activity, whereas there has been equivocal evidence of this relationship for normative beliefs and perceptions of the difficulty of engaging in the behavior. Exercise enjoyment, a determinant that does not derive directly from any of the behavioral theories and models, has been consistently associated with adult physical activity.

Few studies have specifically contrasted physical activity determinants among different sex, age, racial/ethnic, geographic location, or health status subgroups. Many studies contain relatively homogeneous samples of groups, such as young adults, elderly persons, white adults, participants in weight loss groups, members of health clubs, persons with heart disease, and persons with arthritis. Because the numbers of participants in the studies that include these subgroups are small, and because the studies evaluated different factors, making comparisons between studies is problematic.

Interventions to Promote Physical Activity among Adults

This section reviews intervention studies in which the measured outcome was physical activity, adherence to physical activity, or movement in stage of change (Table 6-2). It does not include intervention studies designed to assess the effect of physical activity on health outcomes or risk factors (see Chapter 4). Further, this review places special emphasis on experimental and quasi-experimental studies, which are better able to control the influence of other factors and thus to determine if the outcomes were due to the intervention itself (Weiss 1972).

Individual Approaches

Individual behavioral management approaches, including those derived from learning theories, relapse prevention, stages of change, and social learning theory, have been used with mixed success in numerous intervention studies designed to increase physical activity (Table 6-2). Behavioral management approaches that have been applied include self-monitoring, feedback, reinforcement, contracting, incentives and contests, goal setting, skills training to prevent relapse, behavioral counseling, and prompts or reminders. Applications have been carried out in person, by mail, one-on-one, and in group settings. Typically, researchers have employed these in combination with other behavioral management approaches or with those derived from other theories, such as social support, making it more difficult to ascertain their specific effects. In numerous instances, physical activity was only one of several behaviors addressed in an intervention, which also makes it difficult to determine the extent that physical activity was emphasized as an intervention component relative to other components.

Self-monitoring of physical activity behavior has been one of the most frequently employed behavioral management techniques. Typically, it has involved individuals keeping written records of their physical activity, such as number of episodes per week, time spent per episode, and feelings during exercising. In one study, women who joined a health club were randomly assigned to a control condition or one of two intervention conditions—self-monitoring of attendance or self-monitoring plus extra staff attention (Weber and Wertheim 1989). Overall, women in the

Table 6-2. Studies of interventions to increase physical activity among adults

Study	Design	Theoretical approach	Population
Individual approaches			
Weber and Wertheim (1989)	3 month experimental	Self-monitoring	55 women who joined a gym; mean age = 27
King, Haskell, et al. (1995)	2 year experimental	Behavioral management	269 white adults aged 50–65 years
Lombard, Lombard, Winett (1995)	24 week experimental	Stages of change	155 university faculty and staff; mostly women
Cardinal and Sachs (1995)	12 week experimental	Stages of change	113 clerical staff at a university; mean age = 37; 63% black
Belisle (1987)	10 week quasi-experimental with 3-month follow-up	Relapse prevention	350 people enrolled in beginning exercise groups
Gossard et al. (1986)	12 week experimental	Behavioral management	64 overweight healthy men aged 40–60 years
King, Carl, et al. (1988)	16 week pretest-posttest	Behavioral management	38 blue-collar university employees; mean age = 45
King and Frederiksen (1984)	3 month experimental	Relapse prevention, social support, behavioral management	58 college women aged 18–20 years
King, Taylor, et al. (1988)	Study 1: 6 month experimental	Relapse prevention, behavioral management	152 Lockheed employees aged 42–55 years
	Study 2: 6 month experimental	Behavioral management	Lockheed employees from Study 1

I = intervention; C = control or comparison group.

Intervention	Findings and comments
I-1: Self-monitoring of attendance, fitness exam I-2: Self-monitoring, staff attention, fitness exam C: Fitness exam	I-1 had better attendance than I-2 overall; interest in self-monitoring waned after 4 weeks
I-1: Self-monitoring, telephone contact, vigorous exercise at home I-2: Self-monitoring, telephone contact, moderate exercise at home I-3: Self-monitoring, vigorous exercise in group	Better exercise adherence at 1 year in home-based groups; at year 2 better adherence in vigorous home-based group; 5 times per week schedule may have been difficult to follow
I-1: Weekly calls, general inquiry I-2: Weekly calls, structured inquiry I-3: Call every 3 weeks, general inquiry I-4: Call every 3 weeks, structured inquiry	Frequent call conditions had 63% walking compared with 26% and 22% in the infrequent condition; frequent call and structured inquiry had higher rate of walking than other groups
I-1: Mail-delivered lifestyle packet based on stages of change I-2: Mail-delivered structured exercise packet with exercise prescription C: Mail-delivered fitness feedback packet	No difference in stage of change status among or within groups
I: Exercise class and relapse prevention training C: Exercise class results across experimental groups	Higher attendance in relapse prevention group over 10 weeks and at 3 months; high attrition and inconsistent
I-1: Vigorous self-directed exercise, staff telephone calls, self-monitoring I-2: Moderate self-directed exercise, staff telephone calls, self-monitoring C: Staff telephone calls	Better adherence in the moderate-intensity group at 12 weeks compared with vigorous (96% vs. 90%) (no statistical tests reported); travel, work schedule conflicts, and weather were noted as barriers to physical activity
I: 90-minute classes 2 times/week after work, parcourse, self-monitoring, contests C: None	Twofold increase in bouts of exercise compared with nonparticipants. Participants different from nonparticipants at baseline
I-1: Team building, relapse prevention training; group exercise I-2: Team building, group exercise I-3: Relapse prevention training and jogging alone C: Jogging alone	I-2 and I-3 had twice the jogging episodes as I-1 and C at 5 weeks; at 3 months, 83% of I-3 were jogging compared with 38% of I-1 and I-2 and 36% of C
I-1: Home-based moderate exercise, self-monitoring with portable monitor, relapse prevention training, telephone calls from staff I-2: Same as I-1 without telephone calls from staff	No difference in number of sessions and duration reported at 6-month follow-up
I-1: Daily self-monitoring I-2: Weekly self-monitoring	I-1 had more exercise bouts per month (11 vs. 7.5)

Table 6-2. *Continued*

Study	Design	Theoretical approach	Population
Marcus and Stanton (1993)	18 week experimental	Relapse prevention, social learning theory	120 female university employees, mean age = 35
McAuley et al. (1994)	5 month experimental	Social learning theory	114 sedentary middle-aged adults
Owen et al. (1987)	12 week quasi-experimental	Behavioral management	343 white-collar and professional workers, mean age = 36, mostly women
Robison et al. (1992)	6 month quasi-experimental	Behavioral management, social support	137 university staff at 6 campus worksites, mean age = 40
Interventions in health care settings			
Logsdon, Lazaro, Meier (1989) (INSURE)	1 year quasi-experimental	None mentioned	2,218 patients from multi-specialty group practice sites
Calfas et al. (in press)	2 week quasi-experimental	Stage of change	212 patients
Community approaches			
Luepker et al. (1994) (Minnesota Heart Health Project)	5 to 6 year quasi-experimental; 3 matchedpairs	Diffusion of innovations, social learning theory, community organization, communication theory	Community longitudinal cohort (n = 7,097), independent survey (n = 300–500)
Young et al. (in press) (Stanford Five-City Project)	7 year quasi-experimental	Social learning theory, communication theory, community organization	2 sets of paired, medium-sized cities (5th city used for surveillance only)
Macera et al. (1995)	4 year quasi-experimental (2 matched communities)	None specified	Community residents ≥ 18 years; 24% African American (I), 35% African American (C)
Brownson et al. (1996)	4 year quasi-experimental	Social learning theory, stage theory of innovation	Rural communities; largely African American

I = intervention; C = control or comparison group.

Intervention	Findings and comments
I-1: Relapse prevention training and exercise I-2: Scheduled reinforcement for attendance and exercise C: Exercise only	Better attendance in I-1 at 9 weeks; no difference at 18 weeks or 2-month follow-up
I: Modeling of exercise, provision of efficacy-based information (mastery accomplishments, social modeling, social persuasion, physiological response), walking program C: Biweekly meetings on health information, walking program	Better class attendance (67% vs. 55%) and more minutes and miles walked among intervention group than controls
I: Self-management instruction, exercise class C: Exercise class	No difference in activity levels at 6 months
I: Weekly group meetings, contracts, cash incentives, social support, exercise C: Exercise, diary	Higher attendance among experimental groups than comparison groups (93–99% vs. 19%)
I: Screening and counseling from physicians who received continuing education; preventive visits at no charge	Increase in starting to exercise among intervention patients (34% to 24%)
I: Physician counseling; booster call from a health educator C: Nothing	Intervention patients increased walking (37 minutes vs. 10 minutes per week)
I: Screening and education; mass media; community participation; environmental change; professional education; youth and adults C: Nothing	Percent physically active higher in independent survey at 3 years; higher in the cohort at 7 years
I: Print materials; workshops and seminars; organized walking; organized walking events; "Heart & Sole" groups; worksite programs; TV spots	Men increased participation in vigorous activities; men and women in the intervention communities increased their overall number of physical activities; significant differences between intervention and comparison communities at baseline
I: Community cardiovascular risk reduction activities C: None specified	No difference in physical activity prevalence, physican counseling for exercise, or exercise knowledge
I: Community organization; development of 6 coalitions; exercise classes and walking classes and walking clubs; demonstrations; sermons; newspaper articles; community improvements; $5,000 to each coalition from the state health department	Increased physical activity levels in coalition communities, declining levels in communities without; net effect was 7%. Planned Approach to Community Health education planning model

Table 6-2. *Continued*

Study	Design	Theoretical approach	Population
Marcus, Banspach, et al. (1992) (Pawtucket Heart Health Program: Imagine Action)	6 week pretest-posttest uncontrolled	Stages of change	610 sample of community residents, mean age = 42
Worksites			
Blair et al. (1986) (Live for Life)	2 year quasi-experimental	None	4,300 Johnson & Johnson employees
Fries et al. (1993)	24 month experimental	None	4,712 Bank of America retirees
Heirich et al. (1993)	3 year experimental	None specified	1,300 automobile plant workers
Communication			
Osler and Jespersen (1993)	2 year quasi-experimental	Social learning theory, communications (diffusion of innovations); community organization	Rural communities in Denmark (n = 8,000 [I])
Owen et al. (1995)	2 year pretest-posttest	Social learning theory, social marketing theory	2 national physical activity campaigns in Australia
Brownell, Stunkard, Albaum (1980)	Study 1: 8 week quasi-experimental	None specified	21,091 general public observations at a mall, train station, bus terminal
	Study 2: 4 month quasi-experimental	None specified	24,603 general public observations at a train station
Blamey, Mutrie, Aitchison (1995)	16 week quasi-experimental	None	22,275 subway users observations

I = intervention; C = control or comparison group.

Intervention	Findings and comments
Written materials, resource manual, weekly fun walks, and activity nights	Participants more active after intervention with movement toward action and low relapse to earlier stage; suggests stage-based community intervention can result in movement toward action; study uncontrolled
I: Screening; lifestyle seminar; exercise programs; newsletters; contests; health communications; no smoking policies C: Screening only	20% of women and 30% of men began vigorous exercise of 2 years
I-1: Health risk appraisal; feedback letter; behavioral management materials; personalized health promotion program I-2: Health risk appraisal; no feedback; full program in year 2 C: No intervention	No difference in physical activity year 1; I-1 greater physical activity in year 2 over I-2
I-1: Fitness facility I-2: Outreach and counseling to high risk employees I-3: Outreach and counseling to all employees C: Health education events	Percent exercising 3 times per week: I-1 = 30%, , I-2 = 44%, I-3 = 45%, C = 37%
I: Heart Week with assessments, health education, weekly community exercise, TV, radio, newspaper community messages C: Not specified	No difference in self-reported physical activity, but intervention community expressed more interest in becoming active; low response rate to surveys (59%); became mainly a media campaign with little community involvement
I: Messages to promote walking and readiness to become active; modeling activity; radio and TV PSAs; T-shirts; special scripting of soap operas	1st campaign—increase in percent who walked for exercise (70% to 74%), greatest impact on 50+ age group (twofold increase in reported walking—not significant) 2nd campaign—small declines in reported walking and in intentions to be more active
I: Sign reading "Your heart needs exercise—here's your chance"	Number of people using the stairs increased from 5% to 14% when sign was up. Use declined to 7% when sign was removed
I: Sign reading "Your heart needs exercise—here's your chance"	Number of people using the stairs increased from 12% to 18%; effect remained for 1 month after sign was removed
I: Sign reading "Stay Healthy, Save Time, Use the Stairs"	Baseline stair use increased to 15–17% when sign was up; persisted at 12 weeks after sign removal; larger increase among men

Table 6-2. *Continued*

Study	Design	Theoretical approach	Population
Special populations: ethnic minorities			
Heath et al. (1991)	2 year quasi-experimental	None specified	86 Native Americans with diabetes
Lewis et al. (1993)	3 year quasi-experimental	Constituency-based model	African American residents of 6 public housing units
Nader et al. (1989) (San Diego Family Health Project)	3 month experimental 9 month maintenance	Social learning theory	623 Mexican and Anglo-American families with 5th grade children
Baranowski et al. (1990)	14 weeks	None specified	94 black families (63 adults, 64 children)
Special populations: persons at risk for chronic disease			
Perri et al. (1988)	18 month experimental	Behavioral management	123 overweight adults
Jeffery (1995)	7 year uncontrolled	None mentioned	280 community members trying to lose weight
King et al. (1989)	2 year experimental	None mentioned	96 men trying to maintain weight loss
Special Populations: older adults			
Mayer et al. (1994)	2 year experimental	Social learning theory	1,800 Medicare beneficiaries in HMO, mostly white, high SES

I = intervention; C = control or comparison group.

Intervention	Findings and comments
I: Exercise class C: Nonparticipants	Participants in the exercise program lost 4 kg of weight on average, compared with 0.9 kg among nonparticipants; improvements occurred in fasting blood glucose levels and medication requirements
I-1: Basic exercise program I-2: Basic exercise program; social; goal setting; attention; information; barrier reduction	Communities that were better organized and had more committed leaders had better program attendance and higher physical activity levels
I: Family newsletter; telephone; mail; personal contact; feedback; family behavior management; physical activity; nutrition education C: Periodic evaluation	No difference in physical activity at 1 year
I: Individual counseling, small group education, aerobic activity, incentives (babysitting, transportation), telephone prompts, assessment C: Assessment only	No difference in energy expenditure; low participation (20%)
I-1: Behavior therapy I-2: Behavior therapy, maintenance I-3: Behavior therapy, maintenance, social influence I-4: Behavior therapy, maintenance, exercise I-5: Behavior therapy, maintenance, exercise, social influence	Difference adherence in high exercise groups at 6 months; no differences at 12 and 18 months; high attrition (24%)
I-1: Diet management I-2: Weight management, including exercise I-3: Physical activity	I-2 resulted in greater weight loss at end, but no differences were observed at 1 year
I: Monthly mailings, advice and tips for coping, staff telephone calls C: No intervention	Men who exercised and received the intervention regained less weight in year 2 than exercisers who did not get the intervention or dieters who were exposed to the intervention
I: Health risk appraisal, feedback, health education sessions, medical tests, immunizations, goal setting, self-monitoring C: Not specified	No change in physical activity (3+ times a week) at 1 year, but 21% vs.14% moved from sedentary to active (no statistical test reported); attrition 16% in experimental group at 1 year

self-monitoring group had significantly better adherence over 12 weeks than those in the self-monitoring plus attention or control groups; however, adherence over the last 6 weeks of the study was significantly better in the self-monitoring plus attention group. Actual differences were not large, amounting to 4 to 5 days of gym attendance over 3 weeks, compared with about 3 days among controls. In all three groups, adherence dropped off most sharply during the first 6 weeks of the study.

Classes, health clubs, and fitness centers are resources to promote physical activity, and numerous studies have been undertaken to improve attendance (Table 6-2). However, many people prefer to exercise on their own. Several studies have used behavioral management techniques to encourage people to do so on their own (Table 6-2). In some studies, training in behavioral management techniques has occurred in a group setting before the participants began exercising on their own; in others, information has been provided by mail. Results have been equivocal. King, Haskell, and colleagues (1995) assigned 50- through 65-year-old participants to one of three conditions: a vigorous, group-based program (three 60-minute sessions); a vigorous, home-based program (three 60-minute sessions); and a moderate, home-based program (five 30-minute sessions). At 1 year, adherence was significantly greater in both home-based programs than in the group-based program. At 2 years, however, the vigorous, home-based program had higher adherence than the other two programs. Researchers hypothesize that it was more difficult for the moderate group to schedule 5 days of weekly physical activity than for the vigorous group to schedule 3 days. Another study encouraged self-monitoring and social support (walking with a partner) and also tested a schedule of calling participants to prompt them to walk. Frequent calls (once a week) resulted in three times the number of reported episodes of activity than resulted from calling every 3 weeks (Lombard, Lombard, Winett 1995). Cardinal and Sachs (1995) randomly assigned 133 women to receive one of the three packets of information promoting physical activity: self-instructional packages that were based on stage of change and that provided tailored feedback; a packet containing a standard exercise prescription; and a packet providing minimal information about health status and exercise status. No significant differences were observed among the three groups at baseline, 1 month, or 7 months.

The advent of interactive expert-system computer technologies has allowed for increased individualization of mailed feedback and other types of printed materials for health promotion (Skinner, Strecher, Hospers 1994). Whether these technologies can be shown to be effective in promoting physical activity at low cost is yet to be determined.

In summary, behavioral management approaches have been employed with mixed results. Where an effect has been demonstrated, it has often been small. Evidence of the effectiveness of techniques like self-monitoring, frequent follow-up telephone calls, and incentives appear to be generally positive over the short run, but not over longer intervals. Evidence on the relative effectiveness of interventions on adherence to moderate or vigorous activity is limited and unclear. Because of the small number of studies, the variety of outcome measures employed, and the diversity of settings examined, it is not clear under what circumstances behavioral management approaches work best.

In a number of studies, methodological issues, such as high attrition rates, short follow-up, small sample sizes, lack of control or comparison groups, incomplete reporting of data, or lack of clarity about how theoretical constructs were operationalized, also make it difficult to determine the effectiveness of behavioral management approaches or to generalize results to other settings or population groups. Stages of change theory suggests that people move back and forth across stages before they become able to sustain a behavior such as physical activity. The relatively short time frame of many studies and the use of outcome measures that are not sensitive to stages of change may have limited the ability to determine if and to what extent possessing behavioral management skills is useful in the maintenance of regular physical activity.

Interventions in Health Care Settings

Health care settings offer an opportunity to individually counsel adults and young people about physical activity as well as other healthful behaviors, such as dietary practices (U.S. Preventive Services Task Force 1996). Approximately 80 percent of the

U.S. population see a physician during a 1-year period (National Center for Health Statistics 1991), but the extent to which physicians counsel their patients to be physically active is unclear. One survey of physicians found 92 percent reporting that they or someone in their practice counseled patients about exercise (Mullen and Tabak 1989), but in a more recent study, only 49 percent of primary care physicians stated they believed that regular daily physical activity was very important for the average patient (Wechsler et al. 1996). Counseling is likely to be brief, often less than 2 minutes (Wells et al. 1986), and ineffective counseling approaches are often employed (Orleans et al. 1985). Physicians may be less likely to counsel patients about health habits if their own health habits are poor (Wells et al. 1984).

Only three studies attempting to improve the physical activity counseling skills of primary care physicians have been reported in the literature; the results suggest small but generally positive effects on patients, with from 7 to 10 percent of sedentary persons starting to be physically active (Table 6-2). One feasibility trial of multiple risk factor reduction—the Industrywide Network for Social, Urban, and Rural Efforts (INSURE) Project—indicates that continuing medical education seminars, combined with reimbursement for prevention counseling and reminders to providers, can increase the percentage of these physicians' patients who subsequently start exercising (Logsdon, Lazaro, Meir 1989). The Physician-based Assessment and Counseling for Exercise (PACE) program incorporated social cognitive theory and the transtheoretical model to individualize brief (2–5 minutes) counseling messages for patients. Compared with patients who did not receive the program counseling, those who did had significantly greater improvements at 4–6 weeks in their reported stage of physical activity readiness, their reported amount of walking for exercise, and their scores from an activity monitor (Calfas et al. in press).

The Canadian Task Force on the Periodic Health Examination (1994) cited insufficient evidence as the reason for not making a recommendation regarding physical activity counseling. However, several other professional organizations have recently recommended routine physical activity counseling. The American Heart Association (Fletcher et al. 1992), the American Academy of Pediatrics (1994), the American Medical Association (1994), the President's Council on Physical Fitness and Sports (1992), and the U.S. Preventive Services Task Force (1989, 1996) all recommend including physical activity counseling as part of routine clinical preventive services for both adults and young people.

In summary, many providers do not believe that physical activity is an important topic to discuss with their patients, and many lack effective counseling skills. The studies that have attempted to increase provider counseling for physical activity demonstrate that providers can be effective in increasing physical activity among their patients. It is not known what alternative approaches to provider counseling can be used effectively in health care settings, although the work of Mayer and colleagues (1994) suggests that well-trained counselors conducting health education classes with patients may help older adults make changes in their stage of physical activity.

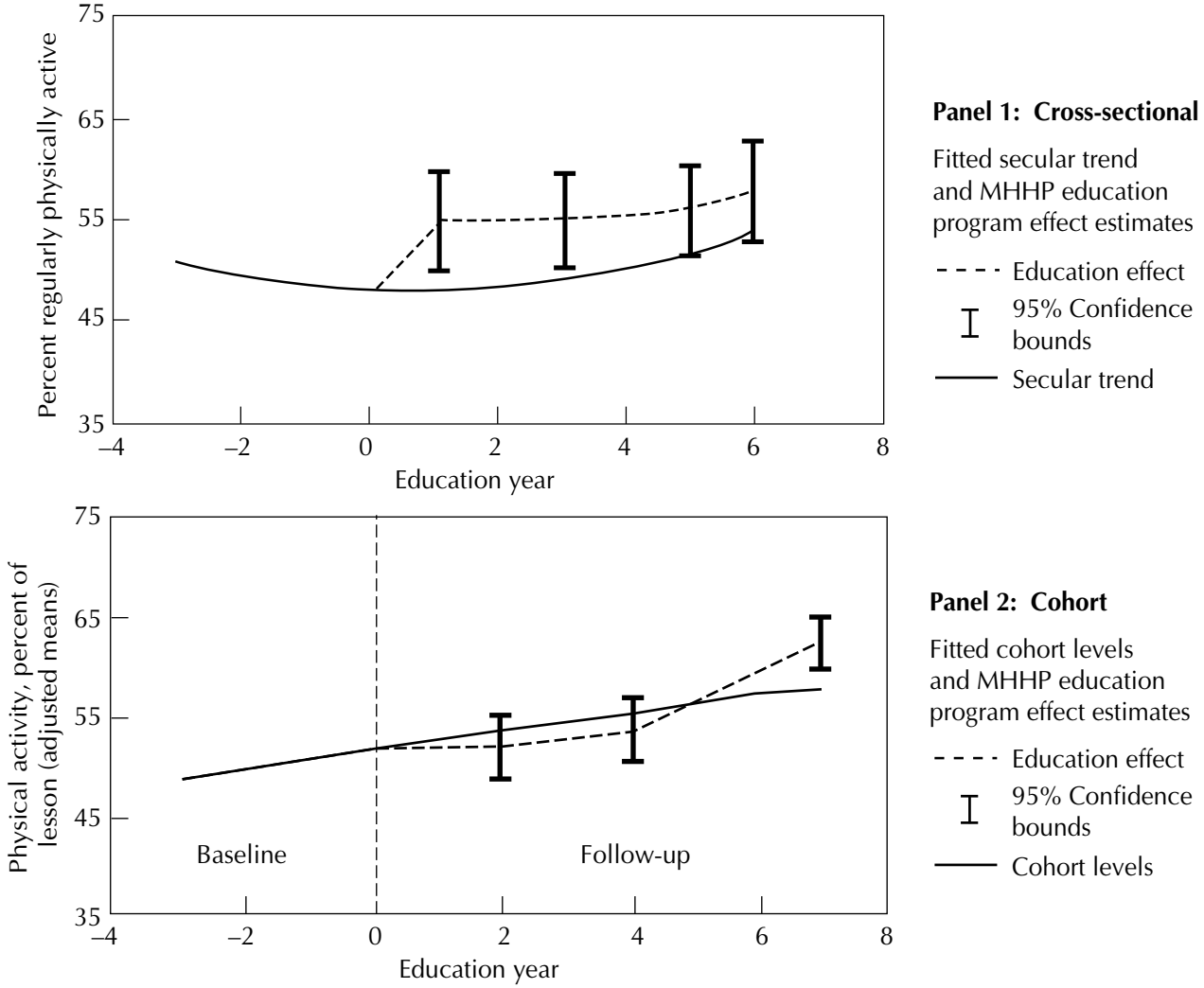
Community Approaches

Communitywide prevention programs have evolved from the concept that a population, rather than an individual, approach is required to achieve primary prevention of disease through risk factor reduction (Luepker et al. 1994). Behaviors and lifestyle choices that contribute to an individual's risk profile are influenced by personal, cultural, and environmental factors (Bandura 1977b). Much of the current knowledge regarding community-based prevention strategies has been gained over the past 20 years from three U.S. research field trials for community-based health promotion—including physical activity promotion—to reduce cardiovascular disease (Table 6-2).

These three trials, which were funded by the National Heart, Lung, and Blood Institute during the 1980s, were the Minnesota Heart Health Program (MHHP) (Luepker et al. 1994), the Pawtucket Heart Health Program (PHHP) (Carleton et al. 1995), and the Stanford Five-City Project (SFCP) (Farquhar et al. 1990). The MHHP advocated regular physical activity as part of its broad effort to reduce risk for CHD in whole communities in the upper Midwest (Crow et al. 1986; Mittelmark et al. 1986). Three intervention communities received a 5- to 6-year program designed to reduce smoking, serum cholesterol, and blood pressure and to increase physical activity; three other communities served as comparison sites. Mass media were used to educate the public about the relationship

between regular physical activity and reduced risk for CHD and to increase opportunities for physical activity. Health professionals promoted physical activity through their local organizations, through their advisory committees on preventive practice, and through serving as role models and opinion leaders. Systematic risk factor screening and education provided on-site measurement, education, and counseling aimed in part at increasing to 60 percent the prevalence of physical activity among the residents in the three intervention communities. The adult education component made available personal, intensive, and multiple-contact programs to increase physical activity; this strategy focused on self-management and included changes in existing behaviors, in the meaning of those behaviors, and in the environmental cues that supported them. Direct education programs for school-aged children promoted physical activity in young people and their parents. The MHHP investigators reported small but significant effects for physical activity in the first 3 years among people in the cross-sectional study group; that effect disappeared with an increasing secular trend in physical activity in the comparison groups. The cohort group (followed over time) showed no intervention effect until the last follow-up survey (Figure 6-1).

Figure 6-1. Results of the Minnesota Heart Health Program on physical activity. Graph compares the percentage of respondents reporting regular physical activity in intervention cities and the secular trend estimated from control cities



Source: Luepker RV et al. *American Journal of Public Health* 1994 (reprinted with permission).
Note: Adjusted for age, sex, and education.

The PHHP fostered community involvement in heart healthy behavior changes in Pawtucket, Rhode Island (Carleton et al. 1995). The focus was on grassroots organizing, volunteer delivery, and partnerships with existing organizations rather than on using electronic media (Lasater et al. 1986). In the area of physical activity promotion, the emphasis was on environmental and policy change through partnerships with city government and others. Working with the Department of Parks and Recreation, the PHHP was instrumental in establishing cardiovascular fitness trails in both of the city's parks. Early in its existence, the PHHP also helped that department place on the ballot and pass a large bond issue in return for renovations (e.g., lights, fencing to keep stray dogs out, resurfacing) to an existing quarter-mile track for walking. The Pawtucket 6-week Imagine Action Program, designed around the stages of change model, enrolled more than 600 participants, who subsequently reported being more active as a result of the program (Marcus, Banspach, et al. 1992). Results of this uncontrolled study suggest that a stage-based approach may be effective in moving people toward regular physical activity.

The SFCP included two intervention and two comparison communities in northern California (only morbidity and mortality data were monitored in the fifth city, and those results were not reported in this study). This project was designed to increase physical activity and weight control and to reduce plasma cholesterol levels, cigarette use, and blood pressure (Farquhar et al. 1990). Greater emphasis was placed on nutrition, weight control, and blood pressure than on physical activity. The program used concepts from social learning theory, diffusion theory, community organization, and social marketing in combination with a communication and behavior change model (Flora, Maccoby, Farquhar 1989). The program relied heavily on the use of electronic and print media for the delivery of health education information. General education was supplemented by four to five annual education campaigns targeting specific risk factors. Direct face-to-face activities included classes, contests, and school-based programs (Farquhar et al. 1990). Overall, the educational intervention had no significant impact on physical activity levels, knowledge, self-efficacy, or attitudes toward physical activity (Young et al., in press). In the cross-sectional sample, men in the experimental communities were significantly more likely than those in the control communities to engage in at least one vigorous activity. For women in both the cross-sectional and cohort studies, a small but significant increase was observed in the number of moderate activities engaged in (Young et al., in press).

Among smaller-scale community studies, the results of efforts to promote physical activity have been mixed (Table 6-2). One exception was the community-based cardiovascular disease prevention program aimed at black residents in rural communities in the Missouri "Bootheel" (Brownson et al. 1996). In this 5-year, low-cost intervention project, educational efforts were combined with environmental changes. Local coalitions formed walking clubs, built walking trails, started exercise classes in churches, and organized special events to promote both physical activity and good nutrition. Although no difference in levels of physical inactivity was observed between the Bootheel and the rest of the state at follow-up, physical inactivity declined an average of 3 percent in Bootheel communities that had coalitions and increased an average of 3.8 percent in those without, for a net improvement of 6.8 percent.

In summary, results of community-based interventions to increase physical activity have been generally disappointing. Measurement of physical activity has varied across studies, making comparisons difficult. The presence of active community coalitions, widespread community involvement, and well-organized community efforts appear to be important, however, in increasing physical activity levels.

Worksite Programs

Physical activity programs conducted on the worksite have the potential to reach a large percentage of the U.S. population (Bezold, Carlson, Peck 1986; National Center for Health Statistics 1987). As settings for physical activity promotion, many worksites have easy access to employees and supportive social networks and can make changes in the environment to help convey physical activity as an organizational norm (Shephard, in press).

The proportion of worksites offering physical activity and fitness programs has grown in recent years, from 22 percent in 1985 to 42 percent in 1992 (Table 6-3). For two groups of employers, those with 50–99 employees and those with 100–249

Table 6-3. Summary of progress toward *Healthy People 2000* objective 1.10

"Increase the proportion of worksites offering employer-sponsored physical activity and fitness programs as follows:"

Year 2000 objective	1985	1992	Year 2000 target
Physical activity and fitness worksites with:			
50–99 employees	14%	33%	20%
100–249 employees	23%	47%	35%
250–749 employees	32%	66%	50%
750+ employees	54%	83%	80%

Source: U.S. Department of Health and Human Services, 1992 National Survey of Worksite Health Promotion Activities, 1993.

employees, the percentage with exercise programs more than doubled over that time period. In each worksite size category, the percentage with exercise programs had already (i.e., in 1992) exceeded the year 2000 national objective for worksite health promotion listed in *Healthy People 2000* (USDHHS 1993). Generally, the extent of participation, effectiveness, and quality of those programs is unknown, for only a few worksite physical activity programs have been evaluated (Table 6-2).

In the Johnson & Johnson Live for Life program (Wilbur 1983), employees at four experimental sites participated in lifestyle seminars, contests, and exercise programs and received newsletters on health issues and other health communications. Experimental and control sites both received an annual health assessment. Overall, at the end of 2 years, 20 percent of women and 30 percent of men in the experimental sites reported beginning a vigorous exercise program; the prevalence at three comparison sites was 7 percent for women and 19 percent for men (Blair et al. 1986).

Fries and associates (1993) evaluated the effectiveness of a health promotion program that included physical activity for Bank of America retirees. In one intervention group, each participant paid $30 for a personalized, mail-delivered program that included a health risk appraisal and behavioral management books and other materials. A second group received a risk appraisal and nothing else for the first 12 months, after which it received the full intervention. A control group was monitored for claims data only. The first intervention group did not differ from the second in self-reported physical activity at the end of year 1 but was significantly different in year 2.

Worksite programs less often attract sedentary, blue-collar, or less-educated employees, but interventions that are tailored to these persons' needs and interests (King, Carl, et al. 1988) and provide counseling and peer support (Heirich et al. 1993) show promise. In a controlled study, Heirich and colleagues (1993) compared different programs at four automotive manufacturing plants of like size and employee populations. The three approaches tested were 1) a staffed physical fitness facility, 2) one-to-one counseling and outreach with high-risk employees (i.e., those who had hypertension, were overweight, or smoked cigarettes), and 3) one-to-one counseling and outreach to all employees, peer support, and organizational change (e.g., the institution of nonsmoking areas). The fourth site, which served as a control, offered health education classes and special events. After 3 years, exercise prevalence at the four sites was lowest at the plant with the exercise facility . In the two counseling and outreach sites, nearly half of the employees reported exercising 3 times a week.

In summary, considerable progress has been made in meeting the *Healthy People 2000* goals for worksite physical activity programs. Too few studies exist to clearly determine what elements are required for physical activity programs at work to be effective in increasing physical activity levels among all employees, attracting diverse employee groups (such as blue-collar workers), or maintaining exercise levels

over time. However, the limited research available suggests that widespread employee involvement and support coupled with organizational commitment evidenced by the presence of policies and programs may be important factors in increasing levels of physical activity. Existing controlled studies have been done in larger worksites; studies have not yet shown what might work in smaller worksites and in diverse worksites (e.g., where many employees travel or facilities may not exist).

Communications Strategies

Communications strategies, both electronic and print, have the potential for reaching individuals and communities with a rapidity unmatched by other intervention strategies. For the general population, media can play several roles: to increase the perceived importance of physical activity as a health issue, to communicate the health and other benefits of physical activity, to generate interest in physical activity and awareness about available programs, to provide role models for physically active lifestyles, and to provide cues to action, such as getting people to request further information on physical activity, visit an exercise site, or begin exercising (Donovan and Owen 1994).

The effectiveness of different forms of media alone, including broadcast and print media, for promoting either initial adoption or subsequent maintenance of physical activity remains unclear because the few systematically evaluated interventions employing communications strategies have shown mixed results (Osler and Jespersen 1993; Booth et al. 1992; Owen et al. 1995; Luepker et al. 1994; Farquhar et al. 1990). The SFCP, discussed earlier, resulted in small increases in the number of moderate activities engaged in by women and vigorous activity engaged in by men. Two national mass media campaigns to increase physical activity, particularly walking, to prevent cardiovascular disease were conducted in Australia in 1990 and 1991 (Booth et al. 1992). Drawing on social marketing and social learning theories, both campaigns included paid advertisements on national television, public service announcements on radio, scripted episodes on two nationally broadcast television dramas, posters and leaflets, stickers, T-shirts and sweatshirts, magazine articles, distribution of a professional article, soap operas specially scripted to feature physical activity, and publicity tours by two experts in heart health. The budgets and paid television coverage for the 1990 and 1991 campaigns were similar. Both campaigns were evaluated by one-on-one, home-based interviews with structured cross-sectional random samples of approximately 2,500 people 2 weeks before and 3 to 4 weeks after each campaign. Both campaigns resulted in significant differences in message awareness (46 percent vs. 71 percent in 1990; 63 percent vs. 74 percent in 1991). The 1990 postcampaign survey revealed significant increases in walking for exercise ($p < 0.01$) compared with the precampaign period, although the actual percentage increase was small (73.9 percent vs. 70.1 percent). In particular, adults over 50 years of age were nearly two times more likely to report walking at follow-up than before the campaign. The 1991 campaign produced different results. Evaluation showed that the percentage of persons reporting walking in the previous 2 weeks declined from precampaign levels among all adult age groups except people over 60 years of age. Intention to become more active also declined overall, from 26.3 percent to 24.8 percent (Owen et al. 1995).

Communications intended to serve as cues to action have been tested at places where people can choose whether to walk or ride. This approach involves placing signs to use the stairs near escalators in public places like train and bus stations or shopping malls (Brownell, Stunkard, Albaum 1980; Blamey, Mutrie, Aitchison 1995). For example, signs that said "Stay Healthy, Save Time, Use the Stairs" increased the percentage of people using stairs instead of an adjacent escalator from 8 percent to 15–17 percent (Blamey, Mutrie, Aitchison 1995). Twelve weeks after the sign was removed, the increase in stair use remained significant but showed a trend toward baseline.

In summary, communications strategies have had limited impact. It is not clear if communications approaches would be more effective in getting people to be regularly active if they were linked with opportunities to act on messages or if messages were tailored to stages of change or to the needs of subgroups in the population (Carleton et al. 1995; Donovan and Owen 1994; Young et al. in press).

Appropriately placed communications that serve as cues to action appear to increase the decision to use the stairs instead of ride the escalator.

Special Population Programs

Racial and Ethnic Minorities

The few interventions studies that have been conducted with racial and ethnic minorities have produced mixed results. The Bootheel Project referred to earlier in this chapter found increased levels of physical activity in black communities with coalitions. The Physical Activity for Risk Reduction project (Lewis et al. 1993) was undertaken in black communities in Birmingham, Alabama, using a combination of behavioral management and community organization approaches. In the intervention groups, community members played roles in defining needs, identifying strategies, and conducting interventions. In those communities where strong organization, leadership, and commitment to the project were observed, statistically significant increases in physical activity were also noted.

Results of two family-based health promotion programs that used behavioral management approaches to promote physical activity showed no greater increase in physical activity among those participating in the programs than among those in a control group. Nader and colleagues (1989) conducted a nutrition and physical activity program for Anglo-American and Mexican American families with children in fifth and sixth grades; the program improved dietary habits but did not succeed in increasing physical activity levels, although participation in the program was high. Another family-based program, a 14-week intervention for African American families that included educational sessions and twice-weekly fitness center activities, had low attendance and did not increase physical activity (Baranowski et al. 1990).

The Indian Health Service undertook the community-based Zuni Diabetes Project to increase physical activity and decrease body weight among Zuni Indians in New Mexico who had non–insulin-dependent diabetes mellitus (NIDDM) (Leonard, Leonard, Wilson 1986). The exercise program consisted of several 1-hour aerobic sessions offered during the week. Zuni Indians who were trained in exercise and group leadership methods helped coordinate the program and build community ownership. After participating in aerobic sessions through the program, 43 percent of the participants began and maintained an at-home exercise program, whereas only 18 percent of a comparison group of previously sedentary nonparticipants with NIDDM did so (Heath et al. 1987).

People Who Are Overweight

Being overweight increases the risk of developing chronic diseases (see Chapter 4). Results of interventions to promote physical activity for weight loss have been mixed (Perri et al. 1988; Jeffery 1995; King et al. 1989).

The MHHP , one of the large community intervention trials discussed earlier in this chapter (Luepker et al. 1994), developed a series of component programs containing strategies to increase physical activity for losing weight or preventing weight gain (Jeffery 1995). The Building Your Fitness Futures program was a 4-week adult education class that focused on how to develop a regular exercise program. The Wise Weighs programs was an 8-week adult education class that emphasized weight management strategies related to diet and exercise. The third MHHP intervention, a correspondence course, addressed diet and exercise through monthly newsletters and tested two levels of financial contract incentives ($5 and $60 dollars). Each of these programs was evaluated in the MHHP randomized trial. The Building Your Fitness Futures and the Wise Weighs programs resulted in only small weight loss that was not significant after 1 year. The correspondence course resulted in significantly greater weight loss among participants with $60 incentives than among those with $5 incentives.

Preventing weight gain may be easier than promoting weight loss. Wing (1995) suggests that there are three time periods during which interventions to prevent weight gain might be most effective: in the years between ages 25 and 35 years, in the peri-menopausal period for women, and in the year following successful weight loss. A fourth MHHP program that addressed physical activity, the Weight Gain Prevention Program, was a randomized trial of 211 community volunteers. The participants (approximately two-thirds women) were randomly assigned to either the intervention group (n = 103) or the no-contact control group (n = 108). This program was for normal-weight adults and included monthly newsletters and four

classes emphasizing diet and regular exercise as well as a financial incentive component linked to weight maintenance. The intervention group lost 2 pounds on average over the course of the year and were significantly less likely to gain weight than the control group (82 percent vs. 56 percent) (Jeffery 1995).

Older Adults

Many of the diseases and disabling conditions associated with aging can be prevented, postponed, or ameliorated with regular physical activity (see Chapter 4). The few interventions that have been tested to increase physical activity levels among older adults show generally positive results. The 1990 Australian Heart Week campaign reviewed earlier resulted in a twofold increase in walking among adults over 50 years of age (Owen et al. 1995). Retirees in the study by Fries (1993), also discussed earlier, showed significantly greater improvements in physical activity in year 2 than did persons in the control group. Participants in a longitudinal study of Medicare recipients (n = 1,800) who belonged to a health maintenance organization were randomly assigned to a preventive care or a control group (Mayer et al. 1994). The intervention employed information and behavior modification approaches. Participants received recommended immunizations, completed a health risk appraisal, received face-to-face counseling that included goal setting, received follow-up telephone counseling, and participated in educational sessions on health promotion topics. A focus on physical activity was a priority in goal-setting discussions; 42 percent of participants selected increasing physical activity as their goal. Members of both groups were largely white, well educated, and generally had above-average incomes. The prevalence of physical activity was high in both groups at baseline; approximately 60 percent reported getting regular exercise. At 1 year, the intervention group showed a significant 7 percent increase in self-reported physical activity.

Much of the published research on physical activity describes researcher-initiated interventions. However, individuals and small groups of people often initiate physical activity on their own, independent of any formal program. A qualitative research study by Duncan, Travis, and McAuley (1995) used observations and in-depth interviews to examine motivation for initiating and maintaining mall walking by older persons in rural West Virginia. Most participants in this study reported becoming physically active at the urging of their physicians; several others were motivated by personal interest in health maintenance, and some were encouraged by family members. Mall walkers maintained a regular routine, showing up at the same time each day, walking in pairs or small groups, and then adjourning to a mall eatery for coffee or breakfast. Interviews revealed that participants perceived mall walking as meaningful "work" to be doing during retirement. A need for socializing with others, a sense of belonging to a community of mall walkers, and the safe environment of the mall were other factors contributing to adherence. Study researchers recommended that community-based physical activity programs try to replicate various aspects of work, such as keeping attendance records and providing occasional recognition or acknowledgment of a job well done (such as pins, certificates, or celebrations).

People with Disabilities

People with disabilities have similar health promotion and disease prevention needs as persons without disabilities. Interventions to promote physical activity for risk reduction among persons with mobility, visual, hearing, mental, or emotional impairments are largely absent from the literature. Physical activity interventions for managing chronic conditions, on the other hand, have led to enhanced cardiorespiratory fitness and improved skeletal muscle function in persons with multiple sclerosis (Ponichtera-Mulcare 1993), increased walking capacity and reduction in pain for patients with low back pain (Frost et al. 1995), and improvements in endurance among patients with chronic obstructive pulmonary disease (Atkins and Robert 1984).

In summary, interventions that have been successful in increasing physical activity among minorities have employed community organization strategies, such as coalition building and community engagement at all levels. Family-oriented interventions in community centers that have employed behavioral management approaches have not resulted in increases in physical activity. Physical activity interventions incorporating incentives show promise for promoting weight loss or preventing weight gain. Although there are a limited number of

studies, positive effects have been shown for interventions and communications strategies promoting physical activity in older adult populations, at least among older white adults with moderate incomes and education levels. What is not well known is what interventions may be effective with racial or ethnic minority older adults who may face barriers such as language, transportation, income, education, or disability. It is not clear what interventions might be effective to promote physical activity, other than for disease management, among people with disabilities, or what strategies might assist with the management of pain, periods of illness, environmental barriers, or other circumstances to improve adherence with physical activity recommendations.

Summary

The review of adult intervention research literature provides limited evidence that interventions to promote physical activity can be effective in a variety of settings using a variety of strategies. Controlled interventions that have been effective at the workplace, in health care settings, and in communities have resulted in increased physical activity, although effects have tended to be small, in the range of 5–10 percent, and short-lived. Multiple interventions conducted over time may need to be employed to sustain physical activity behavior. Most experimental and quasi-experimental intervention research has been theory-based, much if not most relying largely on behavioral management strategies, often in combination with other approaches, such as communications and social support. Mixed results have made it impossible to determine what theory or theories alone or in combination have most relevance to physical activity. Research strategies that appear promising include the tailoring of interventions to people's needs, experiences, and stages of change; the timing of intervention strategies to reinforce new behaviors and prevent relapse (such as through frequent follow-up telephone calls); peer involvement and support; and an engaged community at all levels. It is not known if interventions could be strengthened by combining them with policy approaches (Luepker 1994; Winkleby 1994).

Intervention studies with adults were often conducted over a brief period of time, had little or no follow-up, and focused on the endpoint of specified vigorous physical activity rather than on moderate-intensity physical activity or total amount of activity. Studies used different endpoints, such as class participation versus specified changes in behavior, making them difficult to compare. Because physical activity interventions were often only one component of an intervention to reduce multiple risk factors, they may not have been robust enough to result in much or any increase in physical activity. Few if any studies compared their results to a standard of effectiveness, such as recommended frequency or duration of moderate or vigorous physical activity, or clearly stated the extent of stage-based change.

Behavioral Research on Physical Activity among Children and Adolescents

Behavioral research in this area includes studies on the factors influencing physical activity among young people as well as studies examining the effectiveness of interventions to increase this behavior. This research, however, is more limited than the determinants and interventions literature for adults.

Factors Influencing Physical Activity among Children and Adolescents

The emphasis in this section is on factors that influence unstructured physical activity during free time among youths rather than on supervised physical activity, such as physical education classes. Studies of organized youth sports have also been excluded. Only studies with some measure of physical activity as the outcome, however, are included in this review. For example, studies that investigated attitudes toward physical activity and did not relate those to a measure of physical activity were excluded. As was the case in the adult section, this section focuses on studies that address modifiable determinants of physical activity, such as self-efficacy, rather than on studies that examine factors that cannot be altered to influence participation in physical activity, such as age, sex, and race/ethnicity.

Modifiable Determinants

The modifiable determinants of youth physical activity include personal, interpersonal, and environmental factors (Table 6-1). Self-efficacy, a construct

from social cognitive theory, has been positively associated with physical activity among older children and adolescents (Reynolds et al. 1990; Trost et al. 1996; Zakarian et al. 1994). Similarly, perceptions of physical or sports competence (Biddle and Armstrong 1992; Biddle and Goudas 1996; Dempsey, Kimiecik, Horn 1993; Ferguson et al. 1989; Tappe, Duda, Menges-Ehrnwald 1990) also have been positively associated with physical activity among older children and adolescents.

Expectations about the outcomes of physical activity are associated with physical activity among preadolescents and adolescents. Perceived benefits have been positively associated (Ferguson et al. 1989; Tappe, Duda, Menges-Ehrnwald 1990; Zakarian et al. 1994), whereas perceived barriers have been negatively associated (Stucky-Ropp and DiLorenzo 1993; Tappe, Duda, Menges-Ehrnwald 1990; Zakarian et al. 1994). Intention to be active, a construct from the theory of reasoned action and the theory of planned behavior, has been consistently and positively related to physical activity among older children and adolescents (Biddle and Goudas 1996; Ferguson et al. 1989; Godin and Shephard 1986; Reynolds et al. 1990) .

Enjoyment, the major reason young people engage in physical activity (Borra et al. 1995), has been positively associated with physical activity among both children and adolescents (Stucky-Ropp and DiLorenzo 1993; Tinsley et al. 1995). Favorable attitudes toward physical education also have been positively related to adolescent participation in physical activity (Ferguson et al. 1989; Zakarian et al. 1994).

Social influences—such as physically active role models and support for physical activity—are important determinants of physical activity among young people (Tinsley et al. 1995). Parental activity (Moore et al. 1991; Poest et al. 1989; Sallis, Patterson, McKenzie et al. 1988) is positively related to physical activity among preschoolers. Studies reveal no relationship between parental physical activity and physical activity among elementary school children (McMurray et al. 1993; Sallis, Alcaraz, et al. 1992), and either no relationship (Biddle and Goudas 1996; Garcia et al. 1995; Stucky-Ropp and DiLorenzo 1993; Sallis, Patterson, Buono, et al. 1988) or positive relationships (Anderssen and Wold 1992; Butcher 1985; Gottlieb and Chen 1985; Stucky-Ropp and DiLorenzo 1993; Sallis, Patterson, Buono, et al. 1988) to the physical activity of middle school students (grades 5–8). Parental physical activity is positively related to physical activity among older adolescents (Reynolds et al. 1990; Zakarian et al. 1994). The physical activity of friends (Anderssen and Wold 1992; Stucky-Ropp and DiLorenzo 1993; Zakarian et al. 1994) and siblings (Perusse et al. 1989; Sallis, Patterson, Buono, et al. 1988) also is positively associated with physical activity among older children and adolescents.

Parental encouragement is positively related to physical activity among preschoolers (McKenzie, Sallis, et al. 1991; Klesges et al. 1984, 1986; Sallis et al. 1993), and parental or adult support for physical activity is positively associated with physical activity among adolescents (Anderssen and Wold 1992; Biddle and Goudas 1996; Butcher 1985; Zakarian et al. 1994). Friends' support for physical activity (Anderssen and Wold 1992; Zakarian et al. 1994) also is positively related to physical activity among adolescents.

Direct help from parents, such as organizing exercise activities (Anderssen and Wold 1992) or providing transportation (Sallis, Alacraz, et al. 1992), is positively related to physical activity among older children and younger adolescents. Access to play spaces and facilities (Garcia et al. 1995; Sallis et al. 1993; Zakarian et al. 1994) is positively related to physical activity among youths of all ages. The availability of equipment has been positively related to physical activity among preadolescent and adolescent girls (Butcher 1985; Stucky-Ropp and DiLorenzo 1993). Further, two studies of young children have demonstrated that time spent outdoors is a positive correlate of physical activity level (Klesges et al. 1990; Sallis et al. 1993).

Determinants for Population Subgroups

Among the limited number of subgroup-specific determinants studies, sex-specific differences are investigated most frequently. In two studies of adolescents (Kelder et al. 1995; Tappe, Duda, Menges-Ehrnwald 1990), competition motivated boys more than girls, and weight management motivated girls more than boys. Additionally, boys have higher levels of self-efficacy than girls (Trost et al. 1996)

and higher levels of perceived competence (Tappe, Duda, Menges-Ehrnwald 1990) for physical activity.

Summary

Few studies of the factors that influence physical activity among children and adolescents have applied the theories and models of behavioral and social science. The research reviewed in this section, however, has revealed that many of the factors that influence physical activity among adults are also determinants of physical activity among children and adolescents. Older children's and adolescents' intentions to engage in physical activity, as well as their perceptions of their ability to engage in such activity (i.e., self-efficacy and perceived competence), are positively related to their participation in physical activity. Social influences, such as parental and peer engagement in, and support for, physical activity, also are positively related to physical activity among young people. Further, exercise enjoyment and positive attitudes toward physical education have been positively associated with physical activity among older children and adolescents. Research is limited, however, on patterns of determinants for population subgroups, such as girls, ethnic minorities, and children with disabilities or chronic health conditions (e.g., asthma).

Interventions to Promote Physical Activity among Children and Adolescents

The most extensive and promising research on interventions for promoting physical activity among young people has been conducted with students in schools, primarily at the elementary school level. Although many school-based studies have focused on short-term results, a few studies have also examined long-term behavioral outcomes. There is limited evidence concerning the effectiveness of school-community programs, interventions in health care settings, family programs, and programs for special populations. In this section, the emphasis is on interventions designed to promote both unstructured physical activity during free time and supervised physical activity, such as physical education classes. Interventions designed to increase participation in, or adherence to, organized youth sports have been excluded from this review. The review places special emphasis on experimental studies, which feature random assignment of individuals or groups to intervention (experimental) or comparison (control) conditions, or quasi-experimental studies, which feature intervention and comparison groups.

School Programs

Because most young people between the ages of 6 and 16 years attend school, schools offer an almost populationwide setting for promoting physical activity to young people, primarily through classroom curricula for physical education and health education. The CDC (in press) recommends that comprehensive school and community health programs promoting physical activity among children and adolescents be developed to increase knowledge about physical activity and exercise, develop behavioral and motor skills promoting lifelong physical activity, foster positive attitudes toward physical activity, and encourage physical activity outside of physical education classes. CDC's 1994 School Health Policies and Programs Study (Kann et al. 1995) examined the current nationwide status of policies and programs for multiple components of a school health program. The study examined kindergarten through 12th-grade health education and physical education at state, district, school, and classroom levels (Errecart et al. 1995). Results from the health education component of this study revealed that physical activity and fitness instruction were required in 65 percent of states and 82 percent of districts and were included in a required health education course in 78 percent of schools. Only 41 percent of health education teachers provided more than one class period of instruction on these physical activity topics during the school year (Collins et al. 1995).

Results from the physical education component of the School Health Policies and Program Study revealed that physical education instruction is required by most states (94 percent) and school districts (95 percent) (Pate, Small, et al. 1995). These policies, however, do not require students to take physical education every year. For instance, although most middle and junior high schools (92 percent) and most senior high schools (93 percent) require at least one physical education course, only half of these middle and junior high schools and only 26 percent of these senior high schools require the equivalent of at least 3 years of physical education. Additionally, only 26 percent of all states require

schools to offer a course at the senior high school level in lifetime physical activity (i.e., physical activity that can be practiced throughout one's lifetime) (Pate, Small, et al. 1995). The School Health Policies and Programs Study also revealed that instructional practices in physical education often do not reflect the emphasis on lifetime physical activity that is recommended in the national objectives in *Healthy People 2000* (USDHHS 1990), in the National Physical Education Standards (National Association for Sport and Physical Education 1995), and in the CDC's *Guidelines for School and Community Health Programs to Promote Physical Activity Among Youth* (in press). More than half of physical education teachers devoted multiple class periods to traditional sports activities, such as basketball (87 percent), volleyball (82 percent), and baseball/softball (82 percent), whereas much smaller proportions of teachers devoted multiple class periods to lifetime physical activities, such as jogging (47 percent), aerobic dance (30 percent), and swimming (14 percent) (Pate, Small, et al. 1995) (Table 6-4). Additionally, only 15 percent of all physical education teachers required students to develop individualized fitness programs (Pate, Small, et al. 1995). Despite current guidelines' emphasis on lifetime physical activity, during the 2 years preceding the study only 22 percent of physical education teachers received in-service training on developing individualized fitness programs, and only 13 percent received training on increasing students' physical activity outside of physical education class (Pate, Small, et al. 1995).

Detailed findings from the School Health Policies and Programs Study are important because school-based physical education may be the most widely available resource for promoting physical activity among young people in the United States. For physical education to meet public health goals, it should provide all students with recommended amounts of weekly physical activity (USDHHS 1990).

Table 6-4. Percentage of all physical education courses in which more than one class period was devoted to each activity, by activity, School Health Policies and Programs Study, 1994

Activity	Percentage of all courses
Basketball	86.8
Volleyball	82.3
Baseball/softball	81.5
Flag/touch football	68.5
Soccer	65.2
Jogging	46.5*
Weight lifting or training	37.3*
Tennis	30.3*
Aerobic dance	29.6*
Walking quickly	14.7*
Swimming	13.6*
Handball	13.2*
Racquetball	4.9*
Hiking/backpacking	3.0*
Bicycling	1.3*

Source: Adapted from Pate RP et al. School physical education. *Journal of School Health* 1995 (reprinted with permission).

*Lifetime physical activities

Ironically, observations of physical education classes indicate that insufficient class time is spent actually engaging in physical activity (McKenzie et al. 1995; McKenzie et al., in press; Simons-Morton et al. 1991, 1993, 1994).

The School Health Policies and Programs Study provided a national overview of the status of school health programs (Kann et al. 1995). Intervention research has been reported from several studies (Table 6-5). Most of the early research in schools focused on knowledge-based health education classroom lessons; these studies generally reported positive changes in knowledge and attitudes but not in behaviors. Summarized in review articles (Sallis, Simons-Morton, et al. 1992; Simons-Morton, Parcel, O'Hara et al. 1988), these studies suffered from methodological problems, such as small samples and measurement limitations. Contemporary programs emphasize the importance of multicomponent interventions that address both the individual and the environmental level to support engagement in physical activity among youths (Kelder, Perry, Klepp 1993; Luepker et al. 1996; McKenzie et al., in press; Perry et al. 1990, 1992; Simons-Morton, Parcel, O'Hara 1988; Stone et al. 1995).

The Know Your Body (KYB) program (Williams, Carter, Eng 1980) has been the focus of three school-based cardiovascular risk reduction studies (Bush, Zuckerman, Taggart, et al. 1989; Bush, Zuckerman, Theiss, et al. 1989; Resnicow et al. 1992; Walter 1989). This program includes health screening, behavior-oriented health education curricula, and special interventions for students with one or more cardiovascular disease risk factors (e.g., hypercholesterolemia, hypertension, obesity, lack of exercise, cigarette smoking) (Williams, Carter, Eng 1980). Although this program was designed to improve students' knowledge, attitudes, and behaviors related to physical activity, nutrition, and cigarette use, the measurement and reporting of physical activity behavior has been inconsistent among the three studies. In the first study, the measure for self-reported physical activity was found to be unreliable, and the results related to this measure were not reported (Walter 1989). In the second KYB study, students' physical activity behavior was not assessed (Resnicow et al. 1992). The third study was a 5-year, randomized cardiovascular risk reduction trial among 1,234 African American students in grades four through six from nine schools stratified for socioeconomic status (Bush, Zuckerman, Taggart, et al. 1989; Bush, Zuckerman, Theiss, et al. 1989). This project included the KYB health education curriculum, health screening, parent education, and KYB advisory boards for parents, community members, students, and physicians. After 4 years, students from both the intervention and control schools had significant increases in health knowledge at posttest, and intervention students had significantly better gains in health knowledge (Bush, Zuckerman, Theiss, et al. 1989). Physical activity, however, decreased significantly among students from both the intervention and control schools, and there was no difference in physical activity between the intervention and control schools.

The Stanford Adolescent Heart Health Program (Killen et al. 1988) was a classroom-based randomized cardiovascular disease risk reduction trial for 1,447 tenth graders from four matched high schools within two school districts. One school within each district was designated at random to receive a 20-week risk reduction intervention, and the other school served as the control. The classroom-based intervention focused on three cardiovascular risk factors, including physical activity. At the 2-month follow-up, students from the intervention schools had significantly higher gains in knowledge about physical activity than did students in the control schools. Among students not regularly exercising at baseline, those in the intervention schools had significantly greater increases in physical activity than did those in control schools. Additionally, students who received the intervention had significantly lower resting heart rates and subscapular and triceps skinfold measures. The long-term effectiveness of this program was not reported.

An Australian study (Dwyer et al. 1979, 1983) was one of the first randomized trials that investigated the effects of daily physical activity on the health of elementary school students. The study included 513 fifth-grade students from seven Adelaide metropolitan schools. Three classes from each school participated in the study and were randomly assigned to one of three conditions: fitness, skills, or control. Students in the control condition received the usual three 30-minute physical education classes per week. The students in both intervention conditions received 75 minutes of daily physical

education: one condition emphasized fitness activities featuring high levels of physical activity, and the other emphasized skill development activities without special emphasis on the intensity or duration of physical activity. With the class as the unit of analysis, the fitness condition led to significantly greater increases in endurance fitness and decreases in skinfold measurements. Although this study did not evaluate the impact of increased physical education on students' engagement in physical activity outside of class, it showed that academic test scores did not differ between the intervention and control groups, despite the additional 275 minutes of class time the intervention groups spent on physical education rather than on traditional academic subjects.

Go For Health (GFH) was a 3-year school health project designed to promote healthful diet and exercise behaviors among elementary school students (Parcel et al. 1987; Simons-Morton, Parcel, O'Hara 1988; Simons-Morton et al. 1991). This project involved four elementary schools (kindergarten through fourth grade) from the Texas City Independent School District. Two schools were assigned to serve as controls, and the other two were designated as GFH intervention schools. The intervention was based on social cognitive theory and included a GFH health education curriculum, physical education classes that focused on vigorous physical activity, and lower-fat school lunches. The physical activity results revealed a significant increase from pretest to posttest (2 years) in the percentage of physical education class time that students in the intervention schools were engaged in moderate-to-vigorous physical activity. Additionally, posttest values were significantly greater than those for the control schools (Simons-Morton et al. 1991). Although this study did not examine changes in physical activity outside of physical education classes, it highlighted the importance of organizational changes to promote physical activity among students.

The Sports, Play, and Active Recreation for Kids (SPARK) study, conducted in San Diego, California, tested the effects of combining a health-related physical education curriculum and in-service programs on the quantity and quality of physical education classes in elementary schools (McKenzie et al. 1993). In a single school district, 28 fourth-grade classes in seven schools were randomly assigned to one of three conditions: 10 classes were taught in their usual manner by classroom teachers (control group); 10 classes were taught the SPARK program by classroom teachers who had received in-service training and follow-up consultations; and 8 classes were taught the SPARK program by physical education specialists hired by the research project. Direct observation found that students assigned to either of the two intervention groups engaged in significantly more weekly physical activity during physical education classes than did controls. Teachers who received the new physical education curriculum and in-service training provided significantly higher-quality instruction than did teachers in the control group, although the trained classroom teachers' instruction did not match the quality of the instruction provided by the physical education specialists. This study demonstrated that an improved physical education curriculum, combined with well-designed training for physical education specialists and classroom teachers, can substantially increase the amount of physical activity children receive in school (McKenzie et al. 1993) and can help ensure that the resulting physical education classes are enjoyable (McKenzie et al. 1994).

The Child and Adolescent Trial for Cardiovascular Health (CATCH) study was a multicenter, randomized trial to test the effectiveness of a cardiovascular health promotion program in 96 schools in four states (Luepker et al. 1996; Perry et al. 1990, 1992; Stone 1994). A major component of CATCH was an innovative health-related physical education program, beginning at the third grade, for elementary school students. For 2.5 years, randomly assigned schools received a standardized physical education intervention, including new curriculum, staff development, and follow-up consultations. In these intervention schools, observed participation in moderate-to-vigorous activity during physical education classes increased from 37.4 percent of class time at baseline to 51.9 percent (Luepker et al. 1996). This increase represented an average of 12 more minutes of daily vigorous physical activity in physical education classes than was observed among children in control schools (Luepker et al. 1996; McKenzie et al. 1995). Figure 6-2 shows the effect of CATCH on physical activity during physical education class. The CATCH study showed that children's

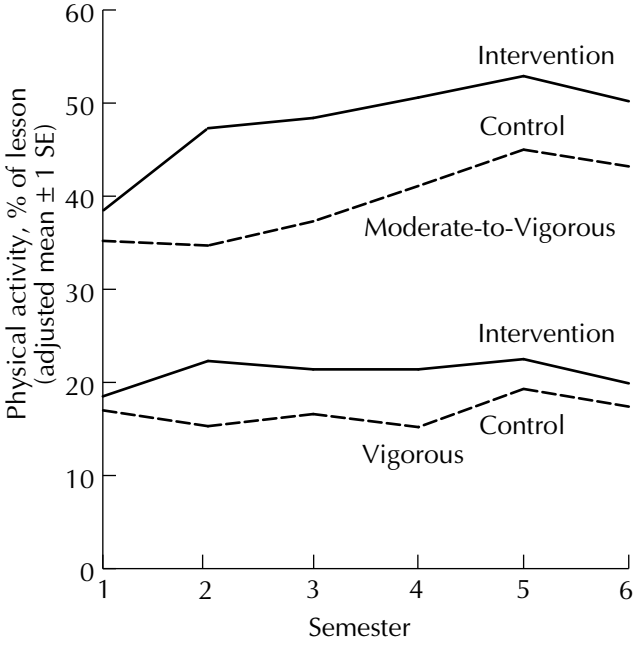
Table 6-5. Studies of interventions to increase physical activity among children and adolescents

Study	Design	Theoretical approach	Population
School programs			
Bush, Zuckerman, Taggart, et al. (1989), Bush, Zuckerman, Theiss, et al. (1989) (Know Your Body)	4 year experimental	Social learning theory	1,234 students initially in grades 4–6, follow-up in grades 7–9
Killen et al. (1988) (Stanford Adolescent Heart Health Program)	7 week experimental 2-month follow-up	Social cognitive theory	1,447 students in grade 10
Dwyer et al. (1983)	14 week experimental	None	513 students in grade 5
Simons-Morton et al. (1991) (Go For Health)	3 year quasi-experimental	Social cognitive theory	409 grades 3 and 4 PE classes
McKenzie et al. (1993) (SPARK)	8 month experimental		112 PE lessons
Luepker et al. (1996); McKenzie (in press); Edmundson et al. (1996) (CATCH)	3 year experimental	Social cognitive theory	96 schools; 3,239 students initially in grade 3, follow-up at grade 5
School-community programs			
Kelder, Perry, Klepp (1993) (Minnesota Heart Health Program: Class of 1989 Study)	7 year quasi-experimental	Social learning theory	Students in grade 6 from 2 Minnesota Heart Health Program communities

I = intervention; C = control or comparison; HE = health education; PE = physical education.

Intervention	Findings and comments
I-1: 45 minutes, 2 times/week, Know Your Body HE curriculum; health screening and results I-2: 45 minutes, 2 times/week, Know Your Body HE curriculum; health screening C: Health screening	Decrease in physical activity for both groups between pretest and follow-up. No difference in physical activity between groups at posttest. Increase in posttest knowledge by each group. Great increases in knowledge by intervention groups at posttest, 18% response rate at 4-year follow-up
I: 20 classroom PE sessions, 50 minutes each, 3 times/week, HE risk reduction curriculum C: No intervention	Intervention groups compared with control had a higher proportion of nonexercisers at baseline exercising at follow-up
I-1: 75 minutes daily PE, fitness curriculum I-2: 75 minutes daily PE, skill curriculum C: 30 minutes PE 3 times/week, standard curriculum	Physical activity not assessed; no differences in academic achievement between intervention and control groups despite additional 275 minutes of time spent in PE by intervention groups
I: 6 behaviorally based HE modules; five 6- to 8-week modules of PE, children's active PE curriculum; reduced fat and sodium school lunch C: No intervention	Increase from pretest to posttest in the percent of PE class time intervention school students spent in moderate-to-vigorous physical activity; higher percentage of PE class time spent in moderate-to-vigorous physical activity by intervention schools compared with controls in posttest
I-1: PE provided by PE specialists I-2: PE provided by "specially trained" classroom teachers C: PE provided by classroom teachers	At posttest PE specialists spent more minutes per lesson on very active physical activity and fitness activities than specially trained classroom teachers and classroom teachers; specially trained classroom teachers spent more minutes per lesson on very active physical activity and fitness activities than classroom teachers
I-1: HE curricula; PE featuring enjoyable moderate-to-vigorous physical activity; EAT SMART school food service intervention I-2: Same as I-1 with family involvement C: No intervention	Intervention schools compared to control schools provided a greater percentage of PE time spent in moderate to vigorous physical activity at posttest; family involvement had no effect on physical activity and psychosocial outcomes; data from the intervention groups combined for comparison with the control groups; intervention students were not different from control students in total daily physical activity at posttest; intervention students spent 12 more minutes per day engaged in vigorous physical activity than controls; pretest-to-posttest increases in students' perceptions of self-efficacy for exercise and positive social reinforcement for exercise among both intervention and control students; intervention students' posttest scores on these and other psychosocial measures were not different from those of control students
I: Peer-led physical activity challenge at grade 8; 10 lesson Slice of Life HE curriculum at grade 10 C: No intervention	At 7-year follow-up students from schools in intervention community had higher levels of physical activity than students from schools in control community, particularly among girls; 45% response rate at 7-year follow-up

Figure 6-2. Moderate-to-vigorous and vigorous physical activity observed during Child and Adolescent Trial for Cardiovascular Health (CATCH) physical education classes



Source: Luepker RV et al. *Journal of the American Medical Association* 1996 (reprinted with permission).

Note: Observed at six time points, 1991 through 1994. The CATCH intervention, introduced during semester 2, increased the percentage of time spent in moderate-to-vigorous and vigorous activity as measured by the System for Observing Fitness Instruction Time classroom observation system. Intervention and control curves diverged significantly according to repeated-measures analysis of variance with the class session as the unit of analysis: for moderate-to-vigorous activity, P = 2.17, df = 5, 1979, P = .02; for vigorous activity, F = 2.95, df = 5, 1979, P = .04. Analysis controlled for CATCH site, the location of the lesson, the specialty of the teacher, and random variation among schools and weeks of observation.

physical activity can be increased by a standardized intervention applied to existing physical education programs in four geographically and ethnically diverse regions. Although the intervention students showed significant pretest to follow-up increases in their perceptions of positive social reinforcement and self-efficacy for exercise (Edmundson et al. 1996), these psychosocial determinants were not significantly more prevalent than those observed among the control groups at follow-up (Luepker et al. 1996). Although the family intervention component produced no additional increase in physical activity among students (Luepker et al. 1996), the CATCH physical education and classroom programs successfully increased moderate-to-vigorous physical activity in physical education class and increased students' daily participation in vigorous physical activity.

School-Community Programs

The Class of 1989 Study (Kelder, Perry, Klepp 1993; Kelder et al. 1995), an ancillary study of the MHHP (Luepker et al. 1994), tested the efficacy of a school-based health promotion program. One of three MHHP intervention communities and its matched pair were involved in the Class of 1989 Study. The intervention cities were engaged in an extensive communitywide intervention program designed to improve eating, exercise, and smoking patterns for the entire population. The physical activity intervention included a peer-led physical activity challenge, in which students were encouraged to engage in out-of-school exercise activities. The program's assessment included annual measurements collected from a large number of students (baseline n = 2,376) for 7 years, beginning in the sixth grade. Throughout most of the follow-up period, physical activity levels were significantly higher among female students in the intervention community than among those in the control community. For male students, the levels did not differ significantly between the communities. Results suggest that at least among female students, a multicomponent intervention that includes peer-led behavioral education in schools and complementary communitywide strategies can increase levels of regular physical activity (Kelder, Perry, Klepp 1993; Kelder et al. 1995).

Interventions in Health Care Settings

Health professionals also have a potential role in promoting physical activity, healthy eating, and other health behaviors among children and adolescents (American Medical Association 1994; U.S. Preventive Services Task Force 1996). Results of a national survey of pediatricians showed that one-half of respondents believed that regular exercise during childhood is important in preventing cardiovascular disease in adulthood (Nader et al. 1987). However, only one-fourth believed they would be effective in counseling their young patients to get regular vigorous exercise. The American Medical Association's Guidelines for Adolescent Preventive Health Services (1994) is one

example of practical counseling recommendations that have been developed for those who provide health services to adolescents.

Special Population Programs

Physical activity can assist in the treatment or rehabilitation of several diseases that occur during youth (Rowland 1990; Greenan-Fowler 1987); however, relatively few interventions have been conducted to examine how to promote physical activity among young people with special needs. The most extensive study is a series of randomized investigations of children who are overweight (Epstein, Wing, Valoski 1985; Epstein, McCurley, et al. 1990; Epstein, Valoski, et al. 1990; Epstein et al.1994). In this series, family-based treatments of 5- to 12-year-old obese children incorporated both physical activity and nutrition interventions, and the programs were based specifically on principles of behavior modification. Parents were trained to improve their children's physical activity by setting behavioral change goals with their children, by identifying effective reinforcers (e.g., spending time with parents), and by reinforcing children when goals were met. Ten-year follow-ups of children in these four randomized studies revealed that 30 percent of children receiving family-based interventions were no longer obese, and 20 percent had decreased their percentage overweight by 20 percent or more (Epstein et al. 1994). The 10-year follow-up investigation also revealed that the percentage of overweight children in each study decreased most when the intervention involved both the parent and the child or when a change in lifestyle exercise was emphasized. Epstein and colleagues (1994) also compared the effectiveness of three forms of physical activity interventions: lifestyle physical activity, in which activity was incorporated into daily routines; structured aerobic exercise; and calisthenics. At the 10-year follow-up, the lifestyle group had lost the most weight, and both the lifestyle group and the aerobic exercise group had greater weight-loss results than the calisthenics group (Epstein et al. 1994).

Summary

The preceding review of the research literature on interventions among young people reveals that school-based approaches have had consistently strong effects on increasing physical activity in elementary school students when the intervention orients the physical education program toward delivering moderate-to-vigorous physical activity. Further, social learning theory appears to have had the widest application to this interventions research. Much research has taken place at the elementary school level; very little is known about increasing children's physical activity in middle and high school physical education classes or in settings other than school physical education classes. It seems likely that these interventions would be strengthened by designing programs that combine school and community policy with health education and physical education. Data are lacking on ways to tailor interventions to the needs and interests of young people and to prevent the rapid decline in physical activity that occurs during late childhood and adolescence, especially among girls. Additionally, few physical activity interventions and research studies encompass populations particularly characterized by race/ethnicity, socioeconomic status, risk factor status, disabilities, or geographic location.

Promising Approaches, Barriers, and Resources

Many questions remain about how best to promote physical activity in the general population of young people and adults, as well as in clinical populations and other subgroups. Policy initiatives, the provision of more physical activity facilities and programs, and media campaigns are promising, but studies testing their effects are limited. The following two sections describe existing policy and program approaches[1] that have the potential to increase population levels of physical activity but have received little or no evaluation. They are reviewed separately from the previously discussed, better-documented research studies.

[1]Descriptions of specific physical activity programs across the United States can be found in the Combined Health Information Database, a computerized bibliographic database of health information and health promotion resources developed and managed by several federal agencies, including the CDC, the National Institutes of Health, the Department of Veterans Affairs, and the Health Resources and Services Administration. Intended for all health professionals who need to locate health information for themselves or their clients, this resource is available in many libraries, state agencies, and federal agencies.

Environmental and Policy Approaches

Most interventions that have been evaluated in research studies are discrete programs targeting population subgroups (e.g., employees, schoolchildren) or communities. Interventions have shown some success in promoting physical activity, but their results have been inconsistent. A possible reason for limited results is a lack of concomitant support from the larger environment within which such interventions take place. Many physical activity researchers believe that environmental and policy interventions must occur to complement interventions that focus on behavior change among individuals or small groups. This larger perspective recognizes the powerful moderating effect that environment has on individual volition. As King, Jeffery, and colleagues (1995) observe, "Environmental and policy interventions are based on the recognition that people's health is integrally connected to their physical and social environments" (p. 501).

Two premises underlie environmental and policy approaches. First, interventions addressing chronic disease risk factors, such as physical inactivity, require comprehensive, population-based approaches that incorporate both individual and societal-level strategies (Green and Simons-Morton 1996; Schmid, Pratt, Howze 1995). Second, strategies should not rely solely on active approaches requiring individual initiative, such as enrolling in exercise classes, but should also incorporate passive approaches, such as providing walking trails or policies that permit employees to exercise during work hours (Schmid, Pratt, Howze 1995). An example of intervention elements combining passive and active approaches is a school board policy that permits school facilities to remain open before and after school for community use, together with health communications that make citizens aware of these facilities and encourage their use.

As presented previously, ecological models of health behavior (McLeroy et al. 1988; CDC 1988; Stokols 1992) provide frameworks for conceptualizing what the role of policy approaches is to health promotion and how individuals interact with their social, institutional, cultural, and physical environments. The concept of the health-promoting environment suggests that communities and other settings can facilitate healthy behaviors by providing environmental inducements to be active, such as by offering safe, accessible, and attractive trails for walking and biking.

National objectives and recommendations have encouraged the development of policies, programs, and surveillance strategies that would help create an environment that promotes physical activity (USDHHS 1990; Pate, Pratt, et al. 1995; National Association for Sport and Physical Education 1995; U.S. Department of Transportation [USDOT] 1994). Increasing national levels of physical activity and of cardiorespiratory fitness has also been targeted as a priority health objective in *Healthy People 2000* (USDHHS 1990) and the *Dietary Guidelines for Americans* (U.S. Department of Agriculture and USDHHS 1995).

Many efforts to raise public awareness and promote physical activity are under way. In 1994, the American Heart Association, the American College of Sports Medicine, and the American Alliance for Health, Physical Education, Recreation and Dance formed a National Coalition for Promoting Physical Activity. The coalition's goals are to increase public awareness of the benefits of physical activity, provide an opportunity for forming effective partnerships, and enhance delivery of consistent messages about physical activity (National Coalition for Promoting Physical Activity 1995). The CDC has established guidelines for promoting physical activity and healthy eating among young people (CDC 1996; CDC in press) and has initiated a public education effort to encourage active lifestyles and healthy eating among Americans. The National Institutes of Health (NIH) has used national campaigns to promote messages to both the general public and patients on the importance of physical activity and a heart healthy diet. The NIH also sponsors research on physical activity in special populations, including women from diverse economic backgrounds, and in various settings, such as worksites, schools, and health care institutions. In 1995, the NIH sponsored the Consensus Development Conference on Physical Activity and Cardiovascular Health, which recommended regular physical activity for most persons aged 2 years and older (see Appendix B in Chapter 2). The President's Council on Physical Fitness and Sports works with a broad range of partners in private industry, voluntary organizations, and the media to promote physical activity, fitness, and sports participation by Americans of all

ages. As part of the midcourse review of the physical activity and fitness objectives of *Healthy People 2000*, the council presented a synopsis of ongoing grassroots activities by Healthy People 2000 Consortium members in support of increasing participation in physical activity and improvement in fitness (USDHHS 1995). The President's Council on Physical Fitness and Sports is also an advisory body to the President and to the Secretary of the DHHS on matters involving physical activity, fitness, and sports that enhance and improve health. Thirty-nine Governor's Councils on Physical Fitness and Sports stimulate state and local activities and program development; these efforts target fitness promotion for school-aged youths, older adults, working adults, and families (National Association of Governor's Councils on Physical Fitness and Sports 1996).

Community-Based Approaches

Community-based programs can be tailored to meet the needs of their specific populations. More collaborative work is under way between state and local governments, community groups, and businesses to reduce risk factors among employees and residents. Two-year follow-up data from one such effort in Smyth County, Virginia, suggested that 40 percent of school system employees had increased their physical activity participation during the program period (CDC 1992).

Two large subpopulations may be especially important to address in community-based programs: young people and older adults. Communities will face a growing need to provide a supportive environment for their children and adolescents. Between 1995 and 2020, the number of young people under 18 years old will increase by an estimated 13 percent, from 69 million to 78 million (Bureau of the Census 1996). The framework for community-level physical activity programs for young people is already in place: millions of American youths participate in sports sponsored by community leagues, religious organizations, social service organizations, and schools. In addition to organized sports, communities need to provide recreational programs and opportunities for all young people in a community, because such programs may encourage a lifetime habit of physical activity as well as other immediate community benefits. According to The Trust for Public Land, arrests among young people in one community decreased by 28 percent after the community instituted an academic and recreational support program for teenagers (National Park Service 1994). In another community, juvenile crime dropped 55 percent when community recreational facilities stayed open until 2 a.m. (National Park Service 1994).

Communities will also need to meet the challenges of a growing population of older adults. Between 1995 and 2020, the number of people over the age of 60 will increase by 43 percent, from 44 to 63 million (Bureau of the Census 1996). Programs and facilities designed to meet the needs of aging baby boomers and older adults can help ensure that these rapidly growing segments of the population obtain the health benefits of regular, moderate physical activity. In one community, 35 age-peer exercise instructors for older adults were recruited and trained by a local university as volunteers to conduct age-appropriate physical activity programs on a regular basis at sites such as libraries, senior centers, and nursing homes in their neighborhoods. Because they were age peers, the instructors were sensitive to many of the concerns that older adults had about physical activity, such as fear of falling and fracturing a hip. Over the following year, instructors conducted more than 1,500 half-hour exercise programs for more than 500 older adults at 20 sites (DiGilio, Howze, Shack 1992).

Places of worship represent a potentially effective site for physical activity promotion programs in communities, since these settings can provide the impetus for starting—and the social support for maintaining—behavioral regimens (Eng, Hatch, Callan 1985; Eng and Hatch 1991) such as regular physical activity. Among the advantages of such settings are a history of participating in a range of community health and social projects; large memberships, including families; a presence in virtually every U.S. community; and connections to minority and low-income communities typically underserved by health promotion programs (King 1991). The Fitness Through Churches Project promoted aerobic exercise in conjunction with other health behaviors to African American residents of Durham, North Carolina (Hatch et al. 1986). The results from this pilot program suggest that physical activity programs offered at places of worship are feasible and attractive to clergy and their congregations. Another project, the Health and Religion Project (HARP) of

Rhode Island (Lasater et al. 1986), found that volunteers can be trained to provide heart health programs, including physical activity, in church settings (DePue et al. 1990).

Societal Barriers

The major barrier to physical activity is the age in which we live. In the past, most activities of daily living involved significant expenditures of energy. In contrast, the overarching goal of modern technology has been to reduce this expenditure through the production of devices and services explicitly designed to obviate physical labor. From the days of hunting and gathering to turn-of-the-century farming practices and early industrial labor, the process of earning a living was once a strenuous activity. Today, many Americans engage in little or no physical activity in the course of a working day typically spent sitting at a desk or standing at a counter or cash register. A large part of many people's time is spent inside buildings where elevators or escalators are prominent features and stairs are difficult to find and may seem unsafe. Motorized transportation carries millions of Americans to and from work and on almost every errand. These inactive daily expeditions occur virtually door-to-door, with the help of parking lots built as near to destinations as possible to minimize walking and increase convenience and safety. Whereas older cities and towns were built on the assumption that stores and services would be within walking distance of local residents, the design of most new residential areas reflects the supposition that people will drive from home to most destinations. Thus work, home, and shopping are often separated by distances that not only discourage walking but may even necessitate commuting by motorized transportation.

Television viewing, video games, and computer use have contributed substantially to the amount of time people spend in sedentary pursuits (President's Council on Physical Fitness and Sports and Sporting Goods Manufacturers Association 1993). Next to sleeping, watching TV occupies the greatest amount of leisure time during childhood (Dietz 1990). Preschoolers exhibit the highest rate of TV watching (27–28 hours per week). By the time a person graduates from high school, he or she will likely have spent 15,000–18,000 hours in front of a television—and 12,000 hours in school (Strasburger 1992).

In the face of these powerful societal inducements to be inactive, efforts must be made to encourage physical activity within the course of the day and to create environments in communities, schools, and workplaces that afford maximum opportunity to be active. Policy interventions can address public concerns about safety, financial costs, and access to indoor and outdoor facilities. Such interventions also can address the concerns of employers and governments about liability in the event of injury. At the state and local level, governments determine building codes and public safety, traffic, and zoning statutes that have potential bearing on physical activity opportunities in communities.

Concerns about crime can be a major barrier to physical activity for both adults and young people. In a national survey of parents, 46 percent believed their neighborhood was not very safe from crime for their children (Princeton Survey Research Associates 1994). Minority parents were about half as likely as white parents to report that their neighborhoods were safe. Successful implementation of policy interventions may help address such concerns. For example, decisions to put more police on a beat in a high-crime area may help residents feel safer going outside to walk. Similarly, neighborhood watch groups formed to increase safety and reduce crime may be a vehicle for promoting physical activity. Opening schools for community recreation and malls for walking can provide safe and all-weather venues that enable all members of the community to be active.

Transportation, health, and community planners as well as private citizens can help ensure that children living in areas near schools can safely walk or bike to school and that adults can walk or bike to work. Fear of traffic is one of the most frequently cited reasons for not bicycling (USDOT 1993). Adult pedestrians and bicyclists account for 14 percent of yearly traffic fatalities (USDOT 1994). In a survey of adults, those who rode a bicycle in the preceding year were asked whether they would commute to work by bicycle under specific conditions. Fifty-three percent said they would do so if safe, separate, designated paths existed; 47 percent would if their

employer offered financial or other incentives; 46 percent would if safe bike lanes were available; and 45 percent would if their workplace had showers, lockers, and a secure area for bike storage (USDOT 1994). More than half the respondents indicated they would walk, or walk more, if there were safe pathways (protected from automobile hazards) and if crime were not a consideration. A majority also wanted their local government to provide better opportunities to walk and bicycle.

These percentages stand in sharp relief against current practice: only 4.5 percent of Americans commute to work by bicycle or on foot (USDOT 1994). Even in such comparatively small numbers, these people are estimated to save as much as 1.3 billion gallons of gasoline yearly and to prevent 16.3 million metric tons of exhaust emissions (USDOT 1994). Every mile walked or cycled for transportation saves 5 to 22 cents that would have been spent for a mile by automobile, including reduced cost from pollution and oil imports (USDOT 1994). The Intermodal Surface Transportation Efficiency Act, passed in 1991, promotes alternatives to automobile use by making funds available for states to construct or improve bicycling facilities and pedestrian walkways (USDOT 1993). Decisions on how these funds are used are made locally, and organizations such as local transportation, health, and parks departments can promote the use of these funds in ways that increase the prevalence of physical activity in their communities.

In a growing number of communities, concerns about environmental quality have led to zoning restrictions that protect open spaces and other areas that can subsequently be used for recreational pursuits. Such greenways, or linear open space, can connect neighborhoods and foster the use of bicycling and walking for transportation (Indianapolis Department of Parks and Recreation 1994).

Societal Resources

Although there is no comprehensive listing of physical activity resources in the United States, such a document would be extensive. Millions of Americans have sports supplies, bicycles, and exercise machines in their homes or have access to public and private resources such as tennis courts, parks, playgrounds, and health clubs. Numerous organizations promote physical activity as part of their mission or in fund-raising efforts such as walks or runs. In addition, TV programs, magazines, books, videos, and CD-ROMs on physical activity are marketed. Although using a computer is a sedentary activity, physical activity interest and advocacy groups are on the Internet, and the World Wide Web contains information about many organizations and resources related to physical activity. The multitude of physical education teachers, aerobics instructors, dance instructors, recreation leaders, coaches, and personal trainers constitute an energetic pool of physical activity advocates and role models.

Ensuring the availability and accessibility of environments and facilities conducive to exercise is central to seeing that the public has the opportunity to obtain regular physical activity. Facilities should be convenient, affordable, comfortable, and safe (King et al. 1992). Many communities offer sufficient facilities, but unless they are also accessible and affordable, people may not use them (Sallis et al. 1990). Walking for exercise needs no more equipment than a comfortable pair of shoes, but it does require a safe environment. Other activities vary widely in the resources they require—specialized clothing and equipment, playgrounds, bicycle lanes, swimming pools, fields for outdoor games, courts for indoor games, fitness facilities for weight lifting and aerobic exercise, studios for dancing, to mention a few.

Proximity of resources to home or worksites is particularly important (Sallis et al. 1990). In a telephone survey, 72 percent of respondents indicated that there was a park or playground within walking distance of their home, and 75 percent of these persons had used them (Godbey et al. 1992). Rural residents are less likely to have such access (Godbey et al.1992), but they may have open spaces of other kinds. In addition, large indoor areas, such as shopping malls and schools, have become popular venues for individuals and for walking groups and clubs. In some communities, schools stay open before or after the school day so community residents can use them for hall walking (King, Jeffery, et al. 1995). Results from a survey of exercise facilities in San Diego, California, suggest that schools may be the most available yet least-used resource for physical activity among community residents (Sallis et al. 1990).

Summary

The scope, quality, and effectiveness of the wide range of policies and programs described in this section have the potential to foster more physically active lifestyles in the U.S. population. These efforts could be targeted to meet the needs of population subgroups and could be designed to use effective strategies. Public health goals for physical activity and fitness are more likely to be achieved if policies and programs are guided by approaches known to be effective and tailored to meet the needs of all members of the community. Policies and programs should be periodically evaluated to learn how they can be improved to promote physical activity.

The discussion of existing barriers and resources makes it clear that attention should be given to addressing not only the challenges of individual behavior change but also the environmental barriers that inhibit a populationwide transition from a sedentary to an active lifestyle. Expenditure of resources for bike paths, parks, programs, and law enforcement to make playgrounds and streets safer will encourage physical activity in daily living and should thus be viewed as contributing to the health of all Americans. At the same time, evaluations of such changes can occur and more research accordingly conducted to clarify how much the availability of community spaces, facilities, and programs might encourage physical activity. Such information would better inform specific public policy decisions about providing environmental supports and resources to promote physical activity.

Behavioral and social scientists, exercise specialists, recreation specialists, health professionals, architects, city planners, and engineers—all these disciplines need to work together to engage communities, schools, and worksites in creating opportunities and removing barriers to physical activity. To create lasting behavior change in communities, policies as well as individuals must change. Interventions that simultaneously influence individuals, community organizations, and government policies should lead to greater and longer-lasting changes.

Chapter Summary

This chapter has reviewed approaches taken by researchers to understand and encourage physical activity among adults, children, and adolescents living in a technologically advanced society. Behavioral and social science research on physical activity is a relatively recent endeavor, and many questions remain to be answered about not only increasing but also sustaining physical activity. Several factors seem to be key influences on physical activity levels for both adults and young people. Having confidence in one's ability to be active (self-efficacy); enjoying physical activity; receiving support from family, friends, or peers; and perceiving that the benefits of physical activity outweigh its barriers or costs appear to be central determining factors influencing activity levels across the life span.

For adults, some interventions in communities, in health care settings, in worksites, and at home have resulted in small increases in physical activity, which if widely applied could create significant public health benefits. Among young people, school-based programs are the most widely available resource for promoting physical activity and have the potential for reaching large numbers of children and adolescents. Research indicates that children's levels of physical activity in physical education class are greater when physical education teachers are specially trained in methods to increase the time their students spend engaging in moderate-to-vigorous physical activity. Few studies, however, have been conducted at middle and high school levels—a time when most adolescents decrease their physical activity.

Only limited information exists about the needs of population subgroups of all ages and how determinants of physical activity may change over the life span because of puberty, the normal aging process, health conditions, type of occupation, and other biological, social, and environmental influences. Effective approaches for weight gain prevention are few, especially in light of the recently observed trend of increasing weight among U.S. adults and children (Kuczmarski et al. 1994; Troiano et al. 1995). Although recommendations given by health care providers can increase physical activity among adults, a similar effect of counseling for children and adolescents has not been examined. It is unclear what approaches can help people recover from relapses into inactivity—whether from illness, the weather, demands at work or at home, or other reasons—and sustain the habit of regular physical activity over time. Questions also remain about how to address barriers to physical activity and how to more effectively use

resources in communities, schools, and worksites to increase physical activity. Recent research and promising approaches have begun to address some of these questions and provide direction for future research and interventions to promote physical activity among all Americans.

Conclusions

1. Consistent influences on physical activity patterns among adults and young people include confidence in one's ability to engage in regular physical activity (e.g., self-efficacy), enjoyment of physical activity, support from others, positive beliefs concerning the benefits of physical activity, and lack of perceived barriers to being physically active.
2. For adults, some interventions have been successful in increasing physical activity in communities, worksites, health care settings, and at home.
3. Interventions targeting physical education in elementary school can substantially increase the amount of time students spend being physically active in physical education class.

Research Needs

Determinants of Physical Activity

1. Assess the determinants of various patterns of physical activity among those who are sedentary, intermittently active, routinely active at work, and regularly active.
2. Assess determinants of physical activity for various population subgroups (e.g., by age, sex, race/ethnicity, socioeconomic status, health/disability status, geographic location).
3. Examine patterns and determinants of physical activity at various developmental and life transitions, such as from school to work, from one job or city to another, from work to retirement, and from health to chronic illness.
4. Evaluate the interactive effects of psychosocial, cultural, environmental, and public policy influences on physical activity.

Physical Activity Interventions

1. Develop and evaluate the effectiveness of interventions that include policy and environmental supports.
2. Develop and evaluate interventions designed to promote adoption and maintenance of moderate physical activity that addresses the specific needs and circumstances of population subgroups, such as racial/ethnic groups, men and women, girls and boys, the elderly, the disabled, the overweight, low-income groups, and persons at life transitions, such as adolescence, early adulthood, family formation, and retirement.
3. Develop and evaluate the effectiveness of interventions to promote physical activity in combination with healthy dietary practices that can be broadly disseminated to reach large segments of the population and can be sustained over time.

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