# Improving Patient Treatment Adherence

Hayden Bosworth
Editor

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## A Clinician's Guide

Springer

*Editor*
Hayden Bosworth
Duke University Medical Center
Erwin Road 2424
Suite 1105
27705 Durham, NC
USA
hayden.bosworth@duke.edu

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# Contents

# Contributors

**Kelli Allen, PhD** Associate Research Professor, General Internal Medicine; Research Health Scientist, Durham Veterans Affairs Medical Center, Duke University, Durham, NC, USA, domin004@mc.duke.edu

**Lori A. Bastian, MD, MPH** Center for Health Services Research in Primary Care, Durham Veterans Affairs Medical Center; Cancer Prevention, Detection and Control Research Program, Duke Comprehensive Cancer Center, Duke University Medical Center; Department of Medicine, Duke University Medical Center, Durham, NC, USA, basti001@mc.duke.edu

**Hayden B. Bosworth, PhD** Associate Director, Center for Health Services Research in Primary Care, Durham Veterans Affairs Medical Center; Research Professor, Departments of Medicine, Psychiatry and Behavioral Sciences, School of Nursing, Duke University Medical Center, Durham, NC, USA, hayden.bosworth@duke.edu

**Patrick S. Calhoun, PhD** Assistant Professor, Medical Psychology, Duke University Medical Center, Durham, NC, USA, patrick.calhoun2@va.gov

**Jeanette R. Chin, MD** Center for Health Services Research in Primary Care, Durham Veterans Affairs Medical Center, Duke University, Durham, NC, USA, jeanette.chin@duke.edu

**A. Meade Eggleston, PhD** Psychology Fellow, Veterans Affairs Mid-Atlantic Mental Illness, Research, and Clinical Center; Durham Veterans Affairs Medical Center, Durham, NC, USA, a.meade.eggleston@gmail.com

**Laura J. Fish, PhD** Cancer Prevention, Detection and Control Research Program, Duke Comprehensive Cancer Center; Department of Community and Family Medicine, Duke University Medical Center, Durham, NC, USA, laura.fish@duke.edu

**Serina E. Floyd, MD, MPH** Assistant Professor, Department of Obstetrics and Gynecology, Duke University Medical Center, Durham, NC, USA, floyd013@mc.duke.edu

**Jennifer M. Gierisch, PhD, MPH** Postdoctoral Scholar, General Internal Medicine, Duke University Medical Center, Durham, NC, USA, j.gierisch@duke.edu

**Karen Moore Goldstein, MD, MSPH** Staff Physician, The Jonathan Lax Treatment Center; Clinical Assistant Professor, Department of General Internal Medicine, University of Pennsylvania, Philadelphia, PA, USA, karen.goldstein@uphs.upenn.edu

**Vito S. Guerra** Postdoctoral Scholar, Psychology, Durham Veterans Affairs Medical Center, Durham, NC, USA, vito.guerra@va.gov

**S. Nicole Hastings, MD, MHS** Assistant Professor, Geriatrics, Duke University Medical Center, Durham, NC, USA, hasti003@mc.duke.edu

**Mike Hill, MSW** Center for Health Services Research in Primary Care, Durham Veterans Affairs Medical Center, Durham, NC, USA, michael.hill1b9a@va.gov

**Francis J. Keefe, PhD** Professor, Medical Psychology, Duke University Medical Center, Durham, NC, USA, keefe003@mc.duke.edu

**Alex R. Kemper, MD, MPH, MS** Division of Children's Primary Care, Department of Pediatrics, Duke University Medical Center, Durham, NC, USA, kempe006@mc.duke.edu

**Janine C. Kosmoski, Pharm.D** Christiana Health Care System, Newark, DE, USA, janine.kosmoski@va.gov

**Elizabeth Landolfo, MD** Assistant Professor, Division of Primary Care, Department of Pediatrics, Duke University Medical Center, Durham, NC, USA, lando002@mc.duke.edu

**Brigid Lynn, MPH** Center for Health Services Research in Primary Care, Durham Veterans Affairs Medical Center, Durham, NC, USA, brigid.lynn@va.gov

**Christine E. Marx** Associate Professor, Biological Psychiatry, Duke University Medical Center, Durham, NC, USA, christine.marx@va.gov

**Miriam Morey, PhD** Associate Professor, Division of Geriatrics, Duke University Medical Center, Durham, NC, USA, morey002@mc.duke.edu

**Jason M. Moss, PharmD** Geriatric Pharmacy Fellow, Department of Clinical Research, Campbell University College of Pharmacy and Health Sciences; Durham Veterans Affairs Geriatrics Research Education and Clinical Center, Durham, NC, USA, jason.moss@va.gov

**Lesley Rohrer, MPH** Center for Health Services Research in Primary Care, Durham Veterans Affairs Medical Center, Durham, NC, USA, lesley.rohrer@va.gov

**Carol D. Saur** Clinical Nurse Specialist, Department of Medicine, Duke University Medical Center, Durham, NC, USA, carol.saur@duke.edu

**Rebecca A. Shelby** Assistant Professor, Medical Psychology, Duke University Medical Center, Durham, NC, USA, shelb003@mc.duke.edu

**David C. Steffens** Head, Geriatric Psychiatry; Professor, Departments of Psychiatry and Medicine, Duke University Medical Center, Durham, NC, USA, david.steffens@duke.edu

**Jennifer L. Strauss** Assistant Professor, Department of Psychiatry and Behavioral Sciences, Duke University Medical Center; Investigator, Mid-Atlantic Research Educational and Clinical Center Health Scientist, Durham VAMC Center for Health Services Research in Primary Care, Durham, NC, USA, jennifer.strauss@duke.edu

**Geeta K. Swamy, MD** Assistant Professor, Department of Obstetrics and Gynecology, Duke University Medical Center, Durham, NC, USA, swamy002@mc.duke.edu

**Corrine I. Voils, PhD** Associate Professor, General Internal Medicine, Duke University Medical Center, Durham, NC, USA, corrine.voils@duke.edu

**Emmanuel B. Walter, MD, MPH** Professor, Division of Children's Primary Care, Department of Pediatrics, Duke University Medical Center, Durham, NC, USA, walte002@mc.duke.edu

**William S. Yancy, Jr., MD, MHS** Associate Professor, General Internal Medicine, Duke University Medical Center, Durham, NC, USA, yancy006@mc.duke.edu

# Chapter 1
# Introduction

**Hayden B. Bosworth**

While the United States national debate on health care is getting a lot of publicity, there has been limited focus on treatment adherence and prevention. In fact, less than 3% of the United States massive health budget goes toward population-based prevention and more than 90% is spent on treating diseases and their complications – many of which are easily preventable [1, 2]. The remaining health-care resources are directed toward financing and delivery of medical care, with substantially less emphasis on other determinants of health, such as behavioral choices, social circumstances, and environmental conditions [3].

The lack of focus on treatment adherence is a shame given the clear relationships between health behaviors and outcomes. Despite advances in health care, all too often the benefits of these treatments are not fully realized because of patient nonadherence. Almost all medical and behavioral health treatments require at least some degree of adherence to treatment (e.g., coming to appointments, picking up medications, agreeing to have procedures performed, use of contraception, obtaining immunizations, attending follow-up appointments), and many treatments require significant behavior change (e.g., following long-term demanding and complex medication regimens, improving

H.B. Bosworth (✉)
Center for Health Services Research in Primary Care, Durham Veterans Affairs Medical Center; Departments of Medicine, Psychiatry and Behavioral Sciences, School of Nursing, Duke University Medical Center, Durham, NC, USA
e-mail: hayden.bosworth@duke.edu

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diet and physical activity, reducing alcohol consumption, and cigarette smoking). Adherence has been defined as the extent to which a person's behavior – taking medication, following a diet, and/or executing lifestyle changes – corresponds with agreed recommendations from a health-care provider.

Unfortunately as reviewed in this book, few patients fail to make these behavior changes. When the major multiple health-protective behaviors are studied, few individuals meet the criteria for a healthy lifestyle. About one-third of adults adhere with most – six or more out of nine recommendations which include two to four servings of fruit per day, three to five servings of vegetables per day, less than 2,400 mg of sodium per day, less than 10% of kilocalories from saturated fat per day, at least 150 min of physical activity per week, not smoke, moderate alcohol use, blood cholesterol checked in the last 5 years, and blood pressure checked in past 2 years [4]. In the United States, only 3% of adults meet all four health behavior goals of being a nonsmoker, having a healthy weight, being physically active, and eating five or more fruits and vegetables a day [5].

Despite the low levels of adherence to recommended health behaviors, there is growing evidence of the impact of adherence to health behaviors. The major causes of morbidity and premature mortality in the United States – heart disease, cancer, and stroke – are influenced by multiple health risk behaviors, including smoking, alcohol abuse, physical inactivity, and poor diet. The 52-nation INTERHEART study identified tobacco use, obesity, lipids, and psychosocial factors as accounting for about 90% of the population-attributable risks for myocardial infarction [6, 7]. In a recent study of 77,782 middle-aged United States women, never smoking, engaging in regular physical activity, eating a healthy diet, and avoiding becoming overweight were each associated with a markedly lower mortality during 24 years of follow-up. It was estimated that 55% of all cause mortality, 44% cancer mortality, and 72% of cardiovascular mortality during the follow-up could have been avoided by adherence to these four lifestyle guidelines [8]. Mental illness, as well as stress and distress more broadly, also places a significant burden on health and productivity in the United States and globally [9].

Rates of nonadherence to treatment generally range from 20 to 40% for acute illness regimens, 20 to 60% for chronic illness regimens, and 50 to 80% preventive regimens [10]. Nonadherence to treatment

has been found to be high in psychotherapy and behavior therapy, with premature treatment dropout rates ranging from 30 to 60% [11]. Adherence to treatment by children and adolescents ranges from 43 to 100%, with an average of 58% in developed countries [12]. Several studies have suggested that adolescents are less adherent than younger children [13].

While there is increasing evidence documenting the problems and impact of nonadherence to treatment, other factors to consider and make the focus of treatment adherence all that more important are that improving treatment adherence also enhances patients' safety. Because most of the care needed for chronic conditions is based on patient self-management (usually requiring complex multi-therapies), use of medical technology for monitoring, and changes in the patient's lifestyle, patients face several potentially life-threatening risks if not appropriately supported by the health system.

Increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any improvement in specific medical treatments. Increasingly studies find significant cost savings and increases in the effectiveness of health interventions that are attributable to low-cost intervention for improving treatment adherence. Without a system that addresses the determinants of treatment adherence, advances in biomedical technology will fail to realize their potential to reduce the burden of chronic illness.

Given that patient nonadherence is such a significant barrier to effective and efficient health-care delivery, better recognition, understanding, and methods for reducing the impact of this problem are crucial steps toward promoting patient care, outcomes, and treatment costs.

## Defining Treatment Adherence

To define treatment adherence, multiple terms have been used including compliance, co-operation, concordance, mutuality, and therapeutic alliance, and operational definitions of these terms vary widely across studies [14]. Most definitions contain elements relating to patients' self-care responsibilities, their role in the treatment process, and their collaboration with health-care providers. In recent years, patients have been encouraged to participate more actively in decision making

regarding their health care. The terms "adherence" and "concordance" have been more preferred lately [15]. The term adherence will be used throughout this book and connotes the patient's participation and engagement in maintaining a regimen she/he believes will be beneficial, strongly implying a therapeutic partnership with providers that is essential to the individuals' success in following the prescribed treatment regimen. Similar to the World Health Organization recommendation, it is also recognized that adherence to a regimen may reflect behaviors ranging from seeking medical attention, filling prescriptions, obtaining immunizations, and executing behavioral modifications that address self-management of disease, smoking, contraception, unhealthy diet, and insufficient levels of physical activity.

## Clinical Measurement of Medical Regimen Adherence

Accurate assessment of adherence behavior is necessary for effective and efficient treatment planning. However, the challenge lies in that there is often no "gold standard" for measuring adherence behavior [16, 17] and often the use of a variety of strategies has been recommended in the literature. Relying on providers' rating of the degree to which their patients follow their recommendations often results in overestimated adherence [18, 19]. Similarly, relying on patients' subjective reports may be problematic as well. Patients who reveal that they have not followed treatment advice tend to describe their behavior accurately, whereas patients who deny their failure or are not aware of that they are not following recommendations report their behavior inaccurately [17].

In summary, measurement of treatment adherence provides useful information that outcome monitoring alone cannot provide, but it remains only an estimate of a patient's actual behavior. The goals of the provider, the accuracy requirements associated with the regimen, the available resources, the response burden on the patient, and how the results will be used should all be taken. No single measurement strategy has been deemed optimal. A multi-method approach that combines feasible self-reporting and reasonable objective measures supported by effective patient–provider communication is likely to be the best method for identifying problems with treatment adherence.

## Take Home Messages of the Book

There continues to be a tendency to focus on patient-related factors as the causes of problems with adherence with limited consideration of provider and health system-related contributing factors. Oftentimes, treatment adherence for a particular behavior is influenced by several factors – whether these factors are social and economic factors, the health-care team/system, the characteristics of the disease or health issue, therapies, and patient-related factors. In addition, individuals need to contend with adherence to multiple health recommendations and each behavior/health condition is likely to have a separate source of barriers to adherence. Similarly, whether the problem is acute/chronic or the behavior involves initiating or maintaining, there are likely to be different factors that influence treatment adherence. Additional recommendations readers will find in the book include

1. Patient-centered tailored interventions are likely required to improve treatment adherence given that there is no single intervention strategy that has been shown to be effective across all patients, conditions, and settings. Although teaching patients about their treatment regimen and disease/condition is important, additional focus on behavioral strategies to increase treatment adherence is needed. Patient education should involve less verbal instruction, and individuals should be provided clear succinct written instructions that they can refer to at home.
2. Adherence is a dynamic process that needs to be followed up. For many behaviors there are typically at least four phases to treatment adherence, contemplating, initiating, maintaining, and sustaining long-term behavior – phases that all have potentially different barriers and facilitators. For example, in Chapter 3, Drs. Yancy and Voils discuss differences in initiating diet interventions and maintaining them. The lack of a match between patient's stage and the practitioner's attempts at intervention means that treatments are frequently prescribed to patients who are not ready to follow them.
3. Incorporating family, community, and organizations is a likely key factor for success in improving adherence. Social support consisting of informal or formal support received by patients from other members of their community has been consistently reported as an

important factor affecting treatment adherence. There is growing evidence that support among patients can improve adherence to therapy while reducing the amount of time devoted by the health professionals to the care of chronic conditions.

4. There is a need for health professionals to be trained in identifying and alleviating treatment adherence. As recognized by the World Health Organization, health providers can have a significant impact on treatment adherence by assessing risk of nonadherence and delivering interventions to optimize adherence. Beyond training practitioners, the systems in which they work must design and support delivery systems that support this objective. Training will likely need to address three topics: knowledge (information on adherence) including the factors that have been reported to influence adherence and effective interventions available; clinically useful ways of using this information which includes ways to assess adherence and how priorities should be ranked and best available intervention chosen, when and how should patient progress be followed up and assessed; and behavioral tools for health professionals for creating and maintaining habits – this component should be taught using "role-play" and other educational strategies to ensure that health professionals incorporate behavioral tools for enhancing adherence into their daily practice (WHO).

## Conclusions

Clinicians are all challenged by identifying and addressing treatment nonadherence among their patients. Poor treatment adherence accounts for substantial worsening of disease, death, and increased health-care costs in the United States. Adherence to treatments with proven efficacy is a primary determinant of the effectiveness of treatment. Adherence clearly and directly optimizes clinical benefit and health-related quality of life of patients with disease (secondary and tertiary prevention), as well as prevents onset of disease (primary prevention). In addition, higher rates of adherence confer direct economic benefits by, for example, reducing costs associated with acute exacerbations of disease (e.g., hospitalizations, emergency department visits, expensive treatments). Indirect savings may result by

enhancing patients' quality of life and decreasing work days lost to illness. When adherence programs are combined with regular treatment and disease-specific education, significant improvements in health-promoting behaviors, symptom management, communication, and disability management have been observed. Despite these benefits, adherence is often far from optimal; this is especially true for lifestyle behaviors where, for example, poor diet and lack of exercise contribute to the growing obesity epidemic.

While increasing work has focused on examining treatment adherence, there remains a lack of a summary of proven methods for identifying and addressing patient nonadherence. Thus, this book provides (a) a summary of the impact of treatment nonadherence (e.g., costs, clinical outcomes, health-related quality of life); (b) a review of patient factors related to treatment adherence for specific behaviors (i.e., diet, exercise, medication use), as well as across diseases and special populations (e.g., children); and (c) proven methods for improving treatment adherence.

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# Chapter 2
# Physical Activity and Adherence

**Kelli Allen and Miriam C. Morey**

## Adherence to Physical Activity

There is abundant evidence supporting the health benefits of physical activity, including reduced risk for cardiovascular disease, stroke, some cancers, type 2 diabetes, osteoporosis, hypertension, high cholesterol, obesity, osteoarthritis, and all-cause mortality [1]. Physical activity is also associated with improved psychological health and functional status, as well as reduced health-care expenditures [2]. It has been estimated that the direct costs of physical inactivity account for approximately $24 billion, or 2.4% of US health-care expenditures [1, 2]. Furthermore, about 12% of all deaths in the USA can be attributed to physical inactivity [3].

This chapter provides a synopsis of research related to physical activity adherence, with a primary focus on adults. We discuss recommendations for physical activity, the problem of non-adherence to physical activity recommendations and factors associated with non-adherence, screening for non-adherence, and interventions to increase

K. Allen (✉)
General Internal Medicine; Durham Veterans Affairs Medical Center, Duke University, Durham, NC, USA
e-mail: domin004@mc.duke.edu

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physical activity. Finally, we will discuss clinical and policy implications of physical activity adherence research.

## *Physical Activity Guidelines and Recommendations*

There has been substantial debate and study regarding the amount of physical activity required for achieving health and fitness benefits. Guidelines from Healthy People 2010 (HP2010), the American College of Sports Medicine (ACSM), the American Heart Association (AHA), and the US Department of Health and Human Services (DHHS) advise the following [4–6] (Boxes 2.1 and 2.2):

### Box 2.1 Physical Activity Recommendations for Adults Under Age 65

* Do at least 30 or up to 60 (for greater benefit) min per day of moderate intensity aerobic activity, in bouts of at least 10 min each, to total 150–300 min per week

*OR*

* Do at least 20–30 min per day or more of vigorous intensity aerobic activity to total 75–150 min per week

*OR*

* Do an equivalent combination of moderate and vigorous activity

*AND*

* Do 8–10 strength training exercises, 8–12 repetitions of each, twice a week

**Box 2.2 Physical Activity Recommendations for Adults Age 65 and Older**

* Follow the same guidelines for aerobic activity as those for adults under age 65

*AND*

* 8–10 strength training exercises, 10–15 repetitions each, 2–3 times per week

*AND*

* Do balance exercises, if at risk for falling

* When older adults cannot do these recommended amounts of physical activity because of chronic conditions they should be as physically active as their abilities and conditions allow.

The guidelines emphasize that all adults should avoid inactivity. Some activity is better than none. The guidelines also emphasize that additional health benefits can be gained by performing physical activity in amounts greater than the minimum recommendations. It should also be noted that physical activity performed in the context of regular occupational, household, and leisure activities can produce benefits similar to those of structured exercise, as long as the frequency, intensity, and duration are sufficient [7].

## *The Problem of Non-adherence to Physical Activity Recommendations*

Estimates of the proportion of adults who do not meet physical activity recommendations vary slightly according to the specific set

of guidelines being considered (HP2010, ACSM/AHA, and DHHS). The Centers for Disease Control and Prevention (CDC) analyzed physical activity data from the 2007 Behavioral Risk Factor Surveillance System, which is a nationally representative sample of adults ≥18 years. These data showed that when considering the HP2010 guidelines, 48.8% of adults met physical activity recommendations compared with 64.5% who met recommendations according to the 2008 DHHS guidelines. Nevertheless, these and other data show that a large proportion of adults do not meet physical activity recommendations, and this is a significant public health problem [8]. These data also likely underestimate the problem of non-adherence, as adults tend to overreport physical activity levels in comparison to objective measures [9, 10].

Long-term adherence to physical activity is essential for the maintenance of health benefits. For example, Morey et al. reported that among older adults enrolled in a physical activity program for over 10 years, participants classified as adherent had a long-term survival benefit by time compared to a non-adherent group [11]. Other research showed that individuals who are more adherent to regular exercise programs, compared to those who are less adherent, experience greater improvements in fitness, physical function, quality of life, and disease-specific outcomes [12]. However, studies suggest that about 50% of adults who start a physical activity program will drop out within a few months [13].

## *Risk Factors for Non-adherence to Physical Activity Recommendations*

There have been several comprehensive reviews of the correlates and predictors of physical activity, covering over 380 studies [14–17]. This section describes prior research on key correlates of physical activity, focusing on seven categories of factors: demographic, health-related and biological, cognitive and psychological, behavioral, social, program-related, and environmental. Table 2.1 also provides a comprehensive summary of factors associated with physical inactivity.

**Table 2.1** Factors associated with physical inactivity

| |
|---|
| Demographic factors |
| Older age |
| Female gender |
| Non-white race/ethnicity |
| Low socioeconomic status |
| Health-related and clinical factors |
| Chronic illnesses |
| Poor general health and physical function |
| Overweight/obesity |
| Cognitive and psychological factors |
| Greater perceived barriers to physical activity |
| Lack of enjoyment of physical activity |
| Low expectations of benefits from physical activity |
| Poor psychological health |
| Low self-efficacy for physical activity |
| Low self-motivation for physical activity |
| Lack of readiness to change physical activity behaviors |
| Poor fitness level |
| Behavioral factors |
| Prior physical activity |
| Smoking |
| Type A behavior[a] |
| Social factors |
| Lack of cohesion in exercise group |
| Lack of physician influence/advice for physical activity |
| Lack of social support for physical activity |
| Program-related factors |
| High physical activity intensity |
| Long physical activity duration |
| Environmental factors |
| Lack of access to facilities/parks/trails |
| Lack of neighborhood safety |

[a]Type A behavior associated with poorer adherence in supervised exercise programs but greater overall physical activity levels

## Demographic Factors

The demographic factors most strongly associated with physical activity levels in prior research include the following:

### Age

While the benefits and safety of physical activity for older adults have been well established, increasing age is still one of the most consistent predictors of decreased physical activity [8, 9, 14, 18, 19]. About 60% of older adults in the USA do not meet physical activity recommendations [18, 20]. Some data suggest that physical activity levels increase slightly around the typical age of retirement (60–65), but then decline shortly afterward [21]. Studies have also shown that there is a greater age-related decline in physical activity among older women in comparison to older men [22].

Not surprisingly, poor health status is one of the most important and consistent correlates of physical inactivity among older adults [23]. Some specific health-related variables associated with reduced activity among older adults include poor perceptions of overall health, presence of chronic diseases, depressive symptoms, injuries, activity and mobility limitations, pain, and fear of pain [16, 24]. There are several other factors that seem to be particularly salient with respect to older adults' physical activity levels. First, some research suggests that social support for physical activity decreases substantially with age [25], and this may negatively affect activity among older adults. Second, older adults may be more likely than younger individuals to report lack of skill as a barrier to physical activity [26]. Third, misconceptions about physically activity are problematic among older adults. Specifically, older adults may be deterred from physical activity because of beliefs that activity must be vigorous or uncomfortable to produce benefits [27]. Fourth, physicians are less likely to ask older adults about physical activity and less likely to counsel their patients to become more physically active [28]. The US Preventive Task Force's conclusion that there was insufficient evidence that physical activity counseling by primary care providers was effective may have hindered incorporation of physical activity counseling into primary care [29]. However, more recent studies in primary care settings have reported significant improvements in physical activity among

elders, and physician advice appears to play a key role in older adults' physical activity [30, 31].

### Gender

Gender has also been a consistent predictor of physical activity, with men showing greater levels of activity than women [9, 14, 15, 18, 19]. While many barriers to physical activity are similarly influential among both women and men, there are some factors that are particularly relevant to women. First, previous physical activity guidelines emphasized fairly vigorous activity, which may have discouraged participation among women. Research has shown that only about 5% of women adopt vigorous activities (such as running) annually, but about 34% adopt moderate activities (such as walking) [32]. Newer physical activity guidelines focus more on moderate level activities, and this change may have a positive influence on women's activity levels as these recommendations continue to be conveyed. Second, women may experience a social environment that is not as supportive or conducive to activity as men. Women's frequent multiple roles, involving both work and family responsibilities, may be a particularly significant barrier to regular physical activity. For example, data show that women with young children at home are less active than women without young children [33].

### Race and Ethnicity

Racial and ethnic minorities suffer disproportionately from chronic illnesses that are associated with physical inactivity, and elimination of these health disparities is a national health priority [34]. Yet there are still considerable racial and ethnic differences in physical activity levels [35]. Blacks, Hispanics, Asian and Pacific Islanders, and American Indians/Alaska Natives all report lower levels of physical activity compared to non-Hispanic Whites [19, 34]. Data from the CDC's Behavioral Risk Factor Surveillance System show that when considering the 2008 DHHS guidelines, 68% of non-Hispanic Whites meet physical activity recommendations compared with only 57% of non-Hispanic Black and Hispanic participants [18].

While racial/ethnic differences in physical activity may partly be mediated by socioeconomic status (SES) [15], some studies have controlled for income, work status, or education in statistical models and still observed racial differences in physical activity level [36, 37]. Barriers and facilitators of physical activity have not been as well examined among racial and ethnic minority groups as among non-Hispanic Whites. However, these data are emerging, and in particular, there is a growing literature on physical activity among racial and ethnic minority women [38–43]. These studies indicate that among racial and ethnic minority women, family disapproval, family needs, and child care are particularly important barriers to physical activity [42, 43]. Research also shows that among racial and ethnic minorities in general, two key strategies for increasing physical activity may be enhancing social support for physical activity and augmenting access to places for physical activities [44].

## Socioeconomic Status

Overall, SES has been a fairly consistent correlate of physical activity [14, 19]. "Blue collar" occupational status (typically manual and industrial labor), low income, and lower education level have all been associated with less physical activity (especially leisure time physical activity) in some studies [14]. Women with low SES and low-skilled occupations are at particular risk for being physically inactive [45].

There are several likely reasons that physical activity levels are lower among individuals with low SES. First, these individuals are more likely to live in communities that have fewer parks or recreational facilities, are more likely to lack financial resources to purchase home exercise equipment, may lack social support or encouragement to lead a physically active lifestyle, and may also lack understanding about the health benefits of activity [46]. Second, some research suggests that individuals with lower income levels receive less advice from their physicians about preventive health behaviors such as physical activity [47]. Third, low SES is associated with poor adherence during and following clinical exercise programs such as cardiac rehabilitation [48], and this may be related to financial constraints, health-care coverage, and lack of work flexibility.

### Health-Related and Clinical Factors

Individuals with chronic diseases and overall poorer levels of health and physical function are less likely to be physically active [49]. For individuals with some chronic health conditions, involvement in a formal, structured exercise program can facilitate physical activity adherence. Alternatively, the use of group-mediated cognitive-behavioral therapy has been successful at integrating physical activity into daily life rather than delivered as an independent center-based activity among adults with chronic conditions [50].

Overweight/obesity is also strongly associated with lower activity levels [14, 18]. For example, Brownson et al. found that among a national sample of women in the USA, those who were overweight were significantly less likely to report being regularly active and more likely to report having no leisure time physical activity compared to women who were not overweight [51].

### Cognitive and Psychological Factors

A wide array of cognitive and psychological variables have been examined as potential correlates of physical activity adherence (see Table 2.1) [14, 15, 17]. Among these variables, studies have shown that the following are most consistently associated with greater physical activity levels: fewer perceived barriers, greater enjoyment of physical activity, greater expected benefits, better psychological health, greater self-efficacy for physical activity, greater self-motivation for physical activity, greater readiness to change, and better perceived health or fitness [14, 17].

Self-efficacy for physical activity, defined as an individual's confidence in his or her ability to be physically active on a regular basis, has been one of the strongest and most consistent cognitive correlates of activity level [14, 15, 17]. Self-efficacy is related to both adoption and maintenance of physical activity [32]. It has been correlated with physical activity in a variety of settings, including large population-based community samples, exercise groups for healthy individuals, and clinical exercise programs [14]. Self-efficacy has also been shown to predict future physical activity levels in longitudinal studies [17]. Furthermore, self-efficacy may be enhanced through training and

feedback [52] and therefore could be a particularly important target for interventions.

Perceived barriers also correlate strongly with physical activity [14, 15, 17]. The most commonly reported barrier to physical activity among US samples is lack of time [15]. Some other common barriers include lack of facilities, bad weather, safety, lack of exercise partner, fatigue or lack of energy, poor health, and self-consciousness about appearance [14]. Perceived barriers may incorporate both subjective and objective components. Objective barriers, such as lack of exercise facilities, may be modified by policy interventions, and subjective barriers may be modified through cognitive interventions that refute beliefs that hinder activity.

### Behavioral Factors

Behavioral factors that have been associated with current physical activity level include prior physical activity history, smoking, and Type A behavior. Of these, prior activity history has shown the most consistent association with current activity level [14, 17]. While not all studies have shown a significant association between smoking and physical activity, most have found an inverse relationship [14]. Type A behavior has been defined as a behavioral syndrome or style of living characterized by competitiveness, feelings of being under the pressures of time, striving for achievement, and aggressiveness [53]. Studies have indicated that Type A behavior is associated with greater overall levels of physical activity but lower adherence within supervised exercise programs [15, 17]. These results have implications for interventions, suggesting that individuals with greater Type A behavior may be better suited to individual or home-based physical activity programs.

### Social Factors

Social factors that have been studied as correlates of physical activity include exercise group cohesion, physician influence, and social support. Group cohesion has shown a modest positive correlation with adherence in some studies [17]. However, physician influence and social support have been stronger and more consistent correlates of physical activity level and adherence [14, 17]. Physician advice to

exercise has been reported as a correlate of physical activity among the general adult population [54]. Social support has been significantly associated with physical activity in cross-sectional and prospective studies, both in community samples and within organized exercise groups [14, 55]. While both family and friend support for physical activity appear to be influential [14, 17], the role of the spouse seems to be particularly important [55].

### Program-Related Factors

In addition to person-level characteristics, specific aspects of the physical activity regimen or program can influence adherence. Adherence may be poorer for high-intensity physical activity versus lower intensity levels [56]. With respect to exercise duration, some evidence indicates that completing several shorter bouts of activity may result in greater adherence than one longer bout, while retaining some health benefits [57]. Shorter, intermittent exercise periods may be particularly beneficial for reducing rates of attrition at the beginning of an exercise program [58].

Studies have also compared group- or center-based programs versus home-based programs. Some studies have found that home-based exercise is associated with greater adherence and higher levels of activity [59, 60]. However, some research has shown an advantage of center-based programs [61], and this may vary according to individual needs and preferences. Within the context of group- or center-based programs, there are several factors that have been shown to enhance adherence, including convenient time and location, reasonable cost, variety of exercise modalities, flexibility in exercise goals, and quality of the exercise leader [62].

### Environmental Factors

There is growing recognition that environmental factors have a tremendous influence on individuals' physical activity behavior [14]. Perhaps the most prominent theme to emerge in recent research involving environmental factors is that of convenient access. Studies show that simply having convenient access to parks, walking or biking trails, or other physical activity facilities is strongly associated with greater activity levels [63, 64]. Neighborhood safety is also another key factor,

particularly among older adults, women, and individuals with lower education levels [64].

## *Screening for Non-adherence to Physical Activity Recommendations*

There are numerous options for assessing physical activity. Most commonly, physical activity is measured via subjective self-report, using one of many available validated questionnaires [65]. While there is no single best questionnaire for assessing physical activity, some have been developed for specific patient groups (i.e., older adults), and this should be considered when selecting a measure. There are also objective measures of physical activity, including pedometers and accelerometers. While these objective measures may provide a more accurate assessment of activity level, use of this equipment may not be feasible in clinical settings and in some large-scale studies.

In clinical settings, a brief screening assessment for physical activity level is typically most appropriate. Many validated physical activity questionnaires, though useful in research settings, may be too time consuming to administer as part of a clinical screening process. However, brief assessments can be used to identify patients who are physically inactive [66, 67]. For example, Smith et al. found that the two-item assessment shown in Box 2.3 was feasible to use in a clinical setting and enabled physicians to ascertain the overall activity levels of patients [66]. These questions can be used to assess whether patients are meeting the guidelines for aerobic activity described in Boxes 2.1 and 2.2.

### Box 2.3 Physical Activity Screening Assessment

1. How many times a week do you usually do 20 min or more of vigorous intensity activity that makes you sweat or puff and pant (e.g., heavy lifting, digging, jogging, aerobics, or fast bicycling)?

   ☐ 3 or more times a week ☐ 1–2 times a week ☐ None

2. How many times a week do you usually do 30 min or more of moderate intensity physical activity or walking that increases your heart rate or makes you breathe harder than normal (e.g., carrying light loads, bicycling, at a regular pace, or doubles tennis)?

☐ 5 or more times per week ☐ 3–4 times a week ☐ 1–2 times a week ☐ None

*Source*: Ref. [66]

## *Physical Activity Adherence Intervention Studies*

There have been numerous studies designed to identify successful physical activity interventions. These studies have varied widely with respect to participant samples, settings, theoretical models, and intervention strategies. Physical activity interventions can be grouped into two main categories: public health/environmental/policy interventions and individual-based interventions (which also encompass small group classes). While this chapter focuses primarily on individual interventions that can be implemented in clinical settings, we first provide a brief overview of broad public health interventions.

### Public Health, Environmental, and Policy Interventions

Because the problem of physical inactivity is pervasive, large-scale, population-based strategies to this problem are an important counterpart to intensive individualized and small group interventions. Public health, environmental, and policy strategies to enhance physical activity adherence can range from very simple, low-cost interventions to complex policies involving budget allocation and transportation restructuring [68]. In general, broad mass media educational approaches seem to have little influence on physical activity levels within communities [69]. However, other types of environmental and policy interventions have shown promising results [70, 71]. These