

55. Counseling to Promote Physical Activity

RECOMMENDATION

Counseling patients to incorporate regular physical activity into their daily routines is recommended to prevent coronary heart disease, hypertension, obesity, and diabetes. This recommendation is based on the proven benefits of regular physical activity; the effectiveness of clinician counseling to promote physical activity is not established (see *Clinical Intervention*).

Burden of Suffering

In 1985, national survey data revealed that 56% of men and 61% of women in the U.S. either never engaged in physical activity or did so on an irregular basis.¹ Surveillance data from 1991 suggests the prevalence of sedentary lifestyle (58% overall) has not changed.² Coronary heart disease (CHD), the predominant risk associated with a sedentary lifestyle, is the leading cause of mortality in the U.S.³ In the sedentary, an estimated 35% of the excess CHD could be eliminated by becoming more physically active.⁴ The excess CHD risk attributable to sedentary lifestyle, and the societal costs of this excess risk, are higher than those attributed individually to obesity, hypertension, and smoking.^{4,5} The total burden of suffering attributable to sedentary lifestyle in the U.S. is unknown but is probably large.

Efficacy of Risk Reduction

Evidence exists that physical activity and fitness reduce morbidity and mortality for at least six chronic conditions: coronary heart disease, hypertension, obesity, diabetes, osteoporosis, and mental health disorders. Evidence linking sedentary lifestyle with other conditions exists but is not reviewed here.⁶⁻⁹ Moderate physical activity comprises activities that can be comfortably sustained for at least 60 minutes (e.g., walking, slow biking, raking leaves, cleaning windows, light restaurant work). Vigorous activity describes those of an intensity sufficient to result in fatigue within 20 minutes (e.g., shoveling snow).¹⁰

Coronary Heart Disease. There are no prospective intervention trials of physical activity for the primary prevention of CHD. Evidence from cohort

studies, however, has shown a consistent association between physical activity and reduced incidence of CHD.^{9,11-15} A relative risk of death from CHD of 1.9 (95% confidence interval, 1.6 to 2.2) for sedentary persons compared with the physically active was calculated in a meta-analysis of studies on primary prevention of CHD.¹¹ A relative risk of 1.9 was also reported in an earlier comprehensive review.¹² In a cohort of men, beginning moderately vigorous sports activity was associated with a 41% lower risk of death from CHD, which was comparable to the risk reduction associated with smoking cessation (44%).¹⁵ In another cohort study, initially unfit men who subsequently became fit had a 52% reduction in cardiovascular disease mortality compared with those who remained unfit.¹⁶ The absolute reduction in the age-adjusted death rate from cardiovascular disease was 34/10,000 man-years. Similar benefits from exercise have been reported in older men.^{14,17} Physiologically, the response to physical activity in women appears similar to that in men.¹⁸ Epidemiologic data sufficient to confirm a primary preventive role of physical activity for CHD in women are not yet available, however.^{9,19}

One reason that those who are physically active may be at decreased risk for CHD is self-selection—persons who choose to exercise may be healthier and have fewer overall risk factors for CHD. Studies controlling for such confounding variables, however, have found that the effects of exercise are independent of other CHD risk factors, and that the cardiovascular benefits may even be augmented in the presence of other risk factors for CHD.^{9,15,20} Moreover, the type of individual who adopts athletic behavior is not protected from CHD if regular exercise is discontinued (e.g., college athletes who are sedentary later in adult life).²¹

Although observational data cannot prove causal associations, the strength, consistency, and coherence of the evidence and presence of a biologic gradient, clearly suggest that both physical activity and fitness influence risk for CHD. Inference of a causal relationship between increased physical activity and decreased CHD is supported by demonstrated physiologic effects which suggest plausible biologic mechanisms (e.g., enhanced fibrinolysis, decreased platelet adhesiveness, improved lipoprotein profile, and lessened adrenergic response to stress).^{8,22}

Hypertension. Cohort studies suggest that physically inactive persons have a 35–52% greater risk of developing hypertension than those who exercise, independent of other risk factors for hypertension.^{23,24} A graded inverse relationship between increasing fitness quartile and blood pressure was noted in a large cohort.²⁵ Randomized controlled trials of primary prevention of hypertension to date, however, have been either nonspecific (i.e., exercise grouped together with diet and weight loss)^{26,27} or limited in sample size. Inconsistencies in results between studies of secondary preven-

tion^{28,29} suggest that certain subsets of individuals (e.g., women and individuals with diastolic elevations) may be more responsive to the blood pressure-lowering effects of physical activity than others.^{31,32} A meta-analysis of controlled longitudinal studies found a weighted net drop in systolic over diastolic blood pressure with endurance training of 3/3, 6/7, and 10/8 mm Hg in normotensive, borderline, and hypertensive subjects, respectively.³² A similar effect on blood pressure appears across ages 15–80 years,^{33,34} in different social groups, and in both men and women.³⁰ Low- to moderate-intensity endurance training or circuit weight training may be at least as effective in lowering blood pressure as are high-intensity endurance training and resistance training primarily for muscle strength.^{22,32,35,36} A sigmoidal relationship between physical activity and blood pressure benefit may exist, and the threshold of activity necessary for significant effect may be lower than that necessary for cardiovascular fitness or improvement in lipid profile.³¹ A possible mechanism is the attenuation of elevated sympathetic nervous system activity from hyperinsulinemia via the effects of exercise.^{32,37}

Obesity. Data from prospective population studies suggest an increased risk for the development of significant weight gain for persons in lower leisure-time physical activity categories compared to those in higher physical activity categories.^{38–40} Experimental data on secondary prevention of obesity confirm such a relationship.^{40,41} Physical activity can influence the development of obesity (e.g., assist in long-term maintenance of isocaloric or balanced energy state) and increase the chances of success in initial and long-term weight loss.⁴⁰ This influence stems from increased total energy output, preservation of lean body mass, changes in substrate utilization and fat distribution, and possible reversal of diet-induced suppression of basal metabolic rate, as well as psychologic reinforcement.^{9,42–44} An association between low levels of leisure time physical activity and insulin resistance with resultant hyperinsulinemia may link obesity (especially abdominal) with hypertension, hyperlipidemia, and CHD in some individuals.^{37,45} Morbidity and mortality in prospective cohort data have been lower in overweight individuals who are physically active even if they remain overweight.^{9,22,40,46,47} Normalization of the metabolic profile (e.g., glucose tolerance, insulin, lipids) is a plausible mechanism for such a decrease in morbidity and mortality.⁴⁸

Non-Insulin-Dependent Diabetes Mellitus. Prospective cohort data reveal an inverse relationship between the level of physical activity and the risk of developing non-insulin-dependent diabetes mellitus (NIDDM).^{49–51} This effect is pronounced among overweight men,⁴⁹ but it is also seen in women.⁵⁰ The age-adjusted risk of NIDDM is reduced by 6% for each 500-

kcal increment in energy expenditure per week.⁵¹ The protective effect of physical activity is especially pronounced in persons at highest risk for NIDDM (i.e., those with positive family history, obesity, or hypertension).⁵¹ In one cohort study, cardiopulmonary fitness appeared to attenuate mortality at each level of glycemic control.⁵² Possible mechanisms for these primary and secondary preventive effects are reviewed elsewhere,^{22,53} but decreased insulin resistance seems to play an important role. Both the onset of positive effects of physical activity on glycemic control and the loss of these effects upon its discontinuation are rapid.⁵³⁻⁵⁵

Osteoporosis. Nonrandomized controlled interventional data,⁵⁶⁻⁵⁸ confirmed by limited randomized controlled trial data,⁵⁹ support earlier studies suggesting that postmenopausal women can retard bone loss through physical activity.⁶⁰ Cross-sectional studies examining exercise history⁶¹ and fitness level⁶² reveal higher bone mass in the more active and fit, respectively. Some prospective data,^{63,64} along with cross-sectional data comparing the bone density of athletic women with that of nonathletic premenopausal women,^{60,61} suggest that physical activity can also reduce the rate of bone loss in premenopausal women with a normal hormonal milieu.

Direct evidence that physical activity reduces the incidence of hip fractures includes a recent large case-control study.⁶⁵ This study found a reduction in the risk of hip fracture in women who were active in the past, as well as in those with recent moderate activity.⁶⁵ Prior studies focused on recent activity⁶⁶ or were cross-sectional in study design.⁶⁷ A plausible biologic mechanism is suggested by a large cohort study that substantiated an inverse relationship between bone mineral density and hip fractures.^{68,69} Some studies have suggested that skeletal loads generating muscle pull or resistance rather than gravity or weight bearing alone may provide greater benefit to bone mineral density.^{63,70} Inconsistencies in the literature exist, however.⁷¹ Important questions remain unanswered, such as the role and relative impact of physical activity with respect to estrogen replacement. Furthermore, the percentage of variance in bone mineral density attributable to differences in activity is thought to be modest (20%) compared with the genetic contribution.⁷⁰

Mental Health Disorders. Some consistent findings have emerged from controlled trials assessing problems with affect, such as depression and anxiety, before and after various forms of physical activity. First, improvements are greatest in those who are more depressed and more anxious at the onset of the study.^{72,73} Second, improved cardiovascular fitness is not necessary for mood enhancement.⁷⁴ Third, several recent studies have shown diminished gain at high intensity compared to moderate intensity physical activity.⁷⁵⁻⁷⁷ Prospective cohort data suggest physical activity also has a preventive effect.⁷⁸ Study methodologies to date may lack the sensitivity to de-

tect decreased prevalence in those without preexisting affect disorders, however.^{77,79-81} Healthy individuals may derive a preventive effect from physical activity, while those with mild to moderate affect disorders derive a therapeutic benefit.^{73,82}

General well-being can apparently be enhanced with physical activity.^{73,80} Research on self-esteem and physical activity has been criticized as being overly simplistic.⁸³ A more complex model was postulated, giving rise to several new terms that may be considered dimensions of self-esteem, e.g., self-efficacy (capacity to produce a desired effect), self-acceptance, self-concept, physical competence.^{82,83} Exercise-induced increases in self-efficacy may have an important role in successful maintenance of physical activity habits.⁸⁴ Study results are mixed as to whether aerobic or anaerobic exercise imparts a greater increase in these components of self-esteem.⁸⁵⁻⁸⁷ Furthermore, the relative importance of perceived improvements in areas of life not quantified by standard psychometric batteries (e.g., sleep patterns, sex life) remains to be determined.⁸⁸ Cognition does not appear to be improved significantly with physical activity.^{82,89} Mechanisms for psychologic benefit remain undefined,^{90,91} and the role of β -endorphins requires further study.^{92,93}

Quantity and Intensity of Physical Activities. To improve cardiovascular fitness, exercise cannot be performed occasionally or seasonally,⁹⁴ nor can one expect protection from CHD simply by having exercised regularly in the past.²¹ Beginning moderately vigorous physical activity during adulthood, however, may reduce the risk of CHD to the level of those who have been active for many years.¹⁵ Among previously unfit men, achieving fitness, which requires regular physical activity, substantially reduces the risk of both all-cause and cardiovascular disease mortality.¹⁶ In a recent cohort study, participating in increasing levels of vigorous activity was associated with decreasing total mortality in a graded relationship.⁹⁵ Clearly, regular vigorous physical activity sufficient to achieve physical fitness is associated with important health benefits.

While regular vigorous physical activity is likely to be most beneficial, prior recommendations for developing and maintaining cardiorespiratory fitness⁹⁶ may inadequately address the potential benefits of low to moderate levels of physical activity and subsequent risk factor modification, particularly for unfit and sedentary individuals. Moderate physical activities have higher compliance rates than vigorous exercise activities, mesh better with daily lifestyle, and are well maintained over time.^{9,97,98} Studies with at least three levels of physical activity exposure uniformly reveal a reduction in CHD risk from the lowest to the next-to-lowest activity level.¹² It is not that more modest amounts of physical activity will provide the maximum reduction in CHD risk, but rather that those at greatest risk (i.e., the

sedentary and least fit) may derive substantial benefits from initiating even some activity.^{8,99} No clear minimal intensity of physical activity required for benefit has been defined. Intensity can convey an absolute or relative amount (e.g., what might be low intensity to one might be high intensity to another).⁹⁹ A linear dose-response relationship (except for the most vigorous levels or more than 3,000 kcal/week) seems to exist between physical activity and health (both lower incidence of disease and improved functional capability).⁸ Modifications in the physical activity message may be required to accommodate those with differing interests, limitations, or cultural milieu as well as those with disability¹⁰⁰ (especially when mobility is reduced).

A trial of middle-aged men compared the training effect of 30 minutes of moderate physical activity with three 10-minute bouts per day of equivalent activity separated by at least 4 hours. Over an 8-week study period, both groups achieved similar results.¹⁰¹ Also, cohort studies of physical activity exposure have assessed the amounts of activity performed per day and time devoted per week, not duration of specific workouts, and achieved significant results.^{15,47} Thus, attention to total energy expenditure per day and per week is warranted.⁸ How the expenditure is accumulated is secondary and dependent more on personal preference, musculoskeletal tolerance, and available facilities.

Potential Adverse Effects of Physical Activity. The benefits of physical activity must be weighed against its potential adverse effects, which include injury, osteoarthritis, myocardial infarction, and, rarely, sudden death. Data remain scarce on the incidence of injury during most noncompetitive physical activity.¹⁰² One exception is running, with an annual risk of injury of 35–65%; risk is positively related to the level of exposure to the activity and to prior injury.¹⁰² Aerobic dance participation also carries a relatively high risk, which increases with the frequency of classes.¹⁰² One trial randomly assigned 70–79-year-old men and women to strength training, walk/jog, or control groups. Injury rates were 8.7% for the strength training group during the full 26 weeks, 4.8% for the walk group during weeks 1–13, and 57% for those who jogged during weeks 14–26 and had walked during the first 14 weeks.¹⁰³ In cohort data, physical activity in men and women was also associated with an increased risk of orthopedic problems.¹⁰⁴ Most exercise-induced injuries are preventable. They often occur as a result of excessive levels of physical activity, sudden dramatic increases in activity level (especially in persons with poor baseline fitness), and improper exercise techniques or equipment. Intense exercise training can also result in the interruption of menstrual function, bone loss (partly reversible), and an increased fracture risk.^{70,71}

Long-term physical activity probably does not accelerate the development of osteoarthritis (OA) in major weight-bearing joints (e.g., hips,

knees). Case-control data revealed no significant difference in knee OA among groups with varying leisure-time physical activity; OA patients were significantly more likely to have been obese at 20 years of age or had prior knee injury.¹⁰⁵ In a 5-year longitudinal cohort with a mean age of 63, runners were matched with controls and followed radiographically and clinically; acceleration of OA in runners was not found.¹⁰⁶ Graduated activity that allows cartilage adaptation is less likely to induce OA than painful or mechanically improper motion that places infrequent but excessive stress on joints.¹⁰⁷ Available data suggest that moderate physical activity performed within the limits of comfort while putting joints through normal motions will not, in the absence of joint abnormality, inevitably lead to joint injury.¹⁰⁸

Adverse cardiovascular events are perhaps the greatest concern about vigorous exercise. Two recent large studies provide estimates of the relative risk of triggering myocardial infarctions within 1 hour of heavy physical activity compared with less strenuous or no exertion. These relative risks are 2.1 (95% confidence interval, 1.6 to 3.1)¹⁰⁹ and 5.9 (4.6–7.7),¹¹⁰ respectively. A protective effect was seen with regular physical activity in both studies, however. As the frequency of exercise per week increased, the relative risk of infarction during vigorous activity dropped.^{109,110} The risk of sudden death is known to be increased during vigorous physical activity.¹¹¹ This risk appears greater in sedentary persons who engage in vigorous activity as compared to those who are habitually active.¹¹² In those over 35 years of age, more than 80% of sudden deaths during or shortly after exercise are from CHD.¹¹³ Exercise as a cause of sudden cardiac death was reviewed recently.¹¹⁴ The overall risk of sudden death is lower, however, for those who are habitually active, despite the transient increase in risk during the actual physical activity, when compared with sedentary counterparts.^{112,113}

Effectiveness of Counseling

The rationale and evidence for effectiveness of physical activity counseling have been reviewed.⁶⁰ Prior studies that have demonstrated benefits from counseling provide little information about long-term compliance and are of limited generalizability, because the form of counseling, delivery (e.g., inclusion of community health promotion¹¹⁵), type of patients, or clinical setting have not been representative of typical primary care clinician counseling of healthy patients. A recent randomized controlled trial contained similar limitations; the frequency of physical activity was not significantly increased and follow-up was limited to 1 month.¹¹⁶ A nonrandomized controlled trial of brief physician counseling plus one brief follow-up phone call demonstrated significant increases in both self-reported and objectively measured (using an electronic monitor) physical activity; there were

important study limitations, however, including self-selection to the intervention group, use of patient volunteers, and follow-up of only 4–6 weeks.¹¹⁷ A multicenter cohort study using pre- and postintervention surveys to assess changes in several behaviors over 1 year did find an increase in beginning regular physical activity.¹¹⁸ Thus, sufficient published evidence concerning the efficacy of physical activity counseling is lacking.

Recommendations of Other Groups

The American College of Sports Medicine and the Centers for Disease Control and Prevention recommend that every adult accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week.¹¹⁹ The American Heart Association¹²⁰ and the American Academy of Family Physicians (AAFP)¹²¹ recommend that physicians counsel patients in selecting an exercise program and promote regular exercise. The policy of the AAFP is currently under review. The American College of Obstetricians and Gynecologists has issued guidelines on counseling women about regular exercise.¹²² The Canadian Task Force on the Periodic Health Examination (CTF) recommends that moderate-level physical activity be performed consistently to accumulate 30 minutes or more most days of the week.¹²³ The CTF found insufficient evidence to recommend for or against including physical activity counseling in the periodic health examination.

The American Academy of Pediatrics recommends teaching the importance of regular, moderate to vigorous physical activity as a way to prevent illness in adult life, and encouraging parents to serve as role models by participating in regular physical activity.¹²⁴ The Bright Futures guidelines recommend that children and adolescents participate in regular physical activity, and that parents encourage such activity.¹²⁵ The American Medical Association recommends that all adolescents receive annual guidance about the benefits of exercise and encouragement to engage in safe exercise on a regular basis.¹²⁶

Discussion

Direct evidence is limited that clinician counseling can increase the physical activity of asymptomatic patients, but other considerations warrant devoting time to this intervention. First, given the sizable independent relative risk for impaired health in sedentary individuals together with the large population at risk,⁸ even modest increases in physical activity levels could have great public health impact.¹²⁷ Second, consideration of the total societal cost⁴ associated with the sedentary lifestyle and its disproportionate burden¹²⁸ is also relevant. Third, the success of counseling in other settings and for other behavioral risk factors deserves consideration.⁶⁰

Clinician counseling may reinforce several other important interventions (e.g., school-based emphasis on lifelong activity patterns, reduction of barriers to physical activity at work and in the community) that can change sedentary behavior.

CLINICAL INTERVENTION

Counseling to promote regular physical activity is recommended for all children and adults. This recommendation is based on the proven efficacy of regular physical activity in reducing the risk for coronary heart disease, hypertension, obesity, and diabetes (“A” recommendation), although there is currently insufficient evidence that counseling asymptomatic primary care patients to incorporate physical activity into their daily routines will have a positive effect on their behavior (“C” recommendation). Clinicians should determine each patient’s activity level, ascertain barriers specific to that individual, and provide information on the role of physical activity in disease prevention. The clinician may then assist the patient in selecting appropriate types of physical activity. Factors that should be considered include medical limitations and activity characteristics that both improve health (e.g., increased caloric expenditure, enhanced cardiovascular fitness, low potential adverse effects) and enhance compliance (e.g., low perceived exertion, minimal cost, and convenience).

An emphasis on regular, moderate-intensity physical activity rather than on vigorous exercise is reasonable in sedentary persons. This emphasis encourages a variety of self-directed, moderate-level physical activities (e.g., walking or cycling to work, taking the stairs, raking leaves, mowing the lawn with a power mower, cycling for pleasure, swimming, racket sports)¹¹⁹ that can be more easily incorporated into an individual’s daily routine. An appropriate short-term goal is activity that is a small increase over current levels. Over a period of several months, progression to a level of activity that achieves cardiovascular fitness (e.g., 30 minutes of brisk walking most days of the week) would be ideal. Development and maintenance of muscular strength and joint flexibility is also desirable. Sporadic exercise, especially if extremely vigorous in an otherwise sedentary individual, should be discouraged in favor of moderate-level activities performed consistently.

The draft update of this chapter was prepared for the U.S. Preventive Services Task Force by John Burrell, MD, MPH, David Christiani, MD, MPH, and Donald M. Berwick, MD, MPP.

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