James L. Holly, M.D.

American Heart Association Recommendations for Exercise
By James L. Holly, MD
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Definitions:

- ***Physical activity*** is defined as any bodily movement produced by skeletal muscles that results in energy expenditure beyond resting expenditure. *Exercise* is a subset of physical activity that is planned, structured, repetitive, and purposeful in the sense that improvement or maintenance of physical fitness is the objective.
- ***Physical fitness*** includes cardiorespiratory fitness, muscle strength, body composition, and flexibility, comprising a set of attributes that people have or achieve that relates to the ability to perform physical activity. When defining the amount of physical activity or exercise, an important interrelationship exists between the total dose of activity and the intensity at which the activity is performed.
- ***Dose*** refers to the total amount of energy expended in physical activity, whereas intensity reflects the rate of energy expenditure during such activity.
- ***Intensity*** can be defined in absolute or relative terms. Absolute intensity reflects the rate of energy expenditure during exercise and is usually expressed in metabolic equivalents or METs.
- ***Relative intensity*** refers to the percent of aerobic power utilized during exercise and is expressed as percent of maximal heart rate or percent of $\dot{V}O_2$max.

    1. ***Moderate-intensity*** activities are those performed at a relative intensity of 40% to 60% of $\dot{V}O_2$max (or absolute intensity of 4 to 6 METs).
    2. ***Vigorous-intensity*** activities are those performed at a relative intensity of >60% of $\dot{V}O_2$max (or absolute intensity of >6 METs).

For example, brisk walking at 3 miles per hour has an absolute intensity of 4 METs. In relative terms, this intensity is considered light for a 20-year-old healthy person but represents a vigorous intensity for an 80-year-old person.

Exercise and Heart Disease

We know that exercise and physical activity helps prevent cardiovascular heart disease, but what about someone who already has heart problems? The American Heart Association's statement on exercise and physical activity addresses this question also.

Several studies have concluded that comprehensive, exercise-based cardiac rehabilitation reduces mortality rates in patients after myocardial infarction. The most recent and comprehensive analysis identified 51 randomized controlled trials of exercise-based cardiac rehabilitation. All studies were published before January 1, 1999, and included 8440 patients who were primarily middle-aged, low-risk men. Patients were included if they had:

1. sustained a heart attack (myocardial infarction)
2. undergone coronary artery bypass grafting (CABG)
3. percutaneous transluminal coronary angioplasty (PTCA)
4. angina pectoris
5. coronary artery disease identified by angiography

Supervised exercise training in these programs was generally of 2 to 6 months' duration followed by unsupervised exercise. The mean follow-up was 2.4 years. Results were analyzed according to whether the cardiac rehabilitation program consisted of exercise only or also included psychosocial and/or educational interventions.

1. Total mortality was reduced 27% with exercise-only.
2. Cardiac mortality was reduced 31% for exercise-only.

Angina which cannot be operated

Exercise training is also useful for patients with angina pectoris who are not candidates for surgery. Early studies demonstrated that the symptomatic improvement in exercise tolerance after exercise training was due primarily to a reduction in the heart rate and systolic blood pressure. Recent angiographic studies documented that exercise training also reduces the abnormal contraction of the arteries due to the muscles in the artery walls response to abnormal chemicals produced by disease.

These studies also support the use of physical activity to improve exercise capacity after coronary bypass surgery and non-surgical. The Exercise Training Intervention after Coronary Angioplasty (ETICA) trial randomized 118 consecutive patients to 6 months of exercise training or control. Angiographic restenosis (recurrence of artery disease) was not affected by exercise training, but trained patients demonstrated significant increases in peak $\dot{V}O_2$ (ability to use oxygen) (26%) and quality-of-life parameters (27%).

Furthermore, during 25-40 months of follow-up, the exercise-trained patients had fewer cardiac events (11.9% versus 32.2%) and hospital readmissions (18.6% versus 46%) than subjects assigned to usual care. Residual coronary stenosis and recurrent cardiac events were reduced by 30% and 29%, respectively, in the trained subjects.

Treatment for Patients With Heart Failure

Activity restriction was recommended for heart failure (HF) patients until the late 1970s and 1980s. Since then, numerous trials have demonstrated that both exercise testing and

training of patients with HF appear to be safe. A detailed discussion of exercise and HF is presented in the AHA Statement on Exercise and Heart Failure. Exercise training benefits HF in several ways. The mean increase in peak $\dot{V}O_2$ in 15 randomized controlled trials of exercise training that included 426 HF patients was 20.5%. The frequency, duration, and intensity varied among the trials, but all showed an increase in the average peak $\dot{V}O_2$ between 12% and 31%. In addition to improving exercise capacity, exercise training in HF patients has been shown to:

- improve cardiac output (the amount of blood in the heart which is pushed out with each contraction) at maximal workloads
- improve mitochondrial size and density (this makes more energy available to the body)
- increase skeletal muscle oxidative enzymes (this improves the function of muscles and decreases fatigue)
- reduce endothelial dysfunction (this improves heart, kidney and artery function and decreases vascular disease)
- decrease circulating catecholamines (this puts less strain on the heart)

Exercise training has also been shown to improve quality of life in both men and women with moderate, chronic HF.

Treatment for Patients With Peripheral Arterial Disease and Claudication

Progressive physical activity is an effective treatment for improving walking distance in patients with peripheral arterial disease and exercise-induced claudication (pain in the legs). Supervised exercise may serve as a primary therapy for many individuals with claudication if such a program is available and if claudication is the primary functional limitation. An analysis of 21 exercise programs for patients with claudication demonstrated that, after exercise training, average walking distance to pain onset increased 179% or 675 feet, and average distance to maximal tolerated pain increased 122% or 1200 feet.

Although there are few direct comparisons of therapeutic exercise programs versus pharmacological or surgical interventions, these increases in walking distance are greater than those reported for the most widely used medicines for claudication. The greatest improvement with exercise training for claudication occurred with training to maximal tolerated pain, when training lasted at least 6 months, and when walking was the primary mode of exercise. A review of randomized controlled trials suggests that the evidence favoring exercise training outweighs that for peripheral angioplasty in improving exercise tolerance in claudication patients.

Exercise Training for Older Patients With CAD

Older patients constitute a high percentage of those with diagnosed CAD and are at high risk for disability after a coronary event. Studies of exercise rehabilitation in patients >65 years of age have evaluated outcomes in the elderly patients with coronary disease. Older

patients with CAD have exercise trainability comparable to that of younger patients participating in similar exercise rehabilitation, with elderly male and female patients showing comparable improvement. However, referral to and participation in exercise rehabilitation is less frequent for older patients, especially for older women. No significant complications or adverse outcomes of exercise training in older patients have been described in any study. Consequently, older patients of both genders should be strongly encouraged to participate in exercise-based cardiac rehabilitation.

Risks of Physical Activity

Physical activity and exercise training have risks that must be considered when recommending regular physical activity for the general population and for individuals with cardiovascular disease. Fortunately, several strategies are recognized as effective at reducing risk when recommending physical activity.

The most common risk of physical activity in adults is musculoskeletal injury. The incidence of injury can be as high as 55% in 8 weeks among women undergoing US Army basic training. In contrast, injuries are rare in research studies of supervised exercise training among older adults when individuals at high risk of injury are excluded. In a study of community adults aged 20 to 85 years with above-average activity levels, 25% reported a musculoskeletal injury over 1 year, and one third of injured adults stopped exercising.

Several factors affecting injury risk are modifiable and offer opportunities for risk management. Risk of injury increases with:

- obesity
- volume of exercise
- participation in vigorous exercise such as competitive sports,

The following protect against injury:

- higher fitness
- supervision
- stretching exercises
- protective equipment such as bike helmets
- well-designed environments

The general principle that the volume of physical activity should be increased gradually over time is widely regarded as critical for reducing injury risk. Walking, the most popular activity and the standard example of a moderate-intensity activity, is a low-risk activity. One study reported that increasing the duration of walking did not result in any increase in injury risk. In some situations, regular physical activity actually reduces injury risk, as indicated by a recent consensus statement that physical activity is recommended to reduce the risk of fall injuries in older adults.

Vigorous physical activity acutely increases the risk of sudden cardiac death and myocardial infarction among individuals with both diagnosed and occult heart disease.

Sedentary adults should avoid isolated bouts of unaccustomed vigorous physical activity and should follow the standard recommendation to increase physical activity levels gradually over time. The possible value of this strategy is supported by the observation that the risk of exercise-related cardiac events is greatest in the least active individuals.

Because atherosclerotic CAD is the most frequent cause of exercise-related events, the incidence of such events is higher among patients with known atherosclerotic coronary disease. Among participants in cardiac rehabilitation programs, the average incidence of cardiac arrest, nonfatal myocardial infarction, and death is 1 for every 117,000, 220,000, and 750,000 patient-hours of participation, respectively. The low ratio of cardiac arrest to death is due to the availability of acute medical care.

AHA Recommendations

The evidence summarized above and more extensively presented in the 1996 Surgeon General's Report attests to the value of exercise and physical activity in reducing the incidence of coronary heart disease. Indeed, the original AHA Statement on Exercise in 1992 was among the first documents to conclude that physical inactivity is a major CAD risk factor. Because atherosclerotic vascular disease remains the major cause of death in many countries, it is important that healthcare providers support the implementation and maintenance of exercise programs for their patients across the lifespan.

Health professionals should personally engage in an active lifestyle to familiarize themselves with the issues involved in maintaining lifelong physical activity and to set a positive example for patients and the public. This may increase the likelihood that healthcare providers will recommend physical activity to their patients. Healthcare providers should use their influence as parents and community members to encourage schools to provide physical education programs that teach the importance of, and the skills necessary for, developing and maintaining physically active lifestyles.

There is growing recognition of the contribution of social support and the value of integrating behavioral changes into daily routines to sustain improvements in physical activity levels. For this reason, healthcare providers should advocate changes in organizational practices within work sites and civic and recreational settings that encourage active living. Health professionals should also encourage their communities to make facilities for physical activity available to the public and to engineer environments conducive to safe physical activity. Such environmental engineering efforts should allow purposeful physical activities, such as walking to work and climbing stairs, to be used in lieu of labor-saving devices. Health professionals should support public health efforts that encourage these active lifestyles.

A physical activity history is an important component of the health history, and healthcare providers should include the patient's habitual physical activity as part of the medical record. Healthcare providers should identify for patients the importance of physical activity as primary or adjunctive therapy for such medical conditions as hypertension, hypertriglyceridemia, glucose intolerance, and obesity.

Health professionals should prescribe physical activity programs commensurate with those recommended by the CDC and the ACSM, i.e., 30 minutes or more of moderate-intensity physical activity such as brisk walking on most, and preferably all, days of the week. Patients should be encouraged to engage in a variety of physical activities and to progressively increase their activity as tolerated.

Remember it is your life and it is your health.