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## Statement on Exercise: Benefits and Recommendations for Physical Activity Programs for All Americans - A Statement for Health Professionals by the Committee on Exercise and Cardiac Rehabilitation of the Council on Clinical Cardiology, American Heart Association

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# ***AHA Medical/Scientific Statement***

## ***Position Statement***

### **Statement on Exercise**

#### **Benefits and Recommendations for Physical Activity Programs for All Americans**

#### **A Statement for Health Professionals by the Committee on Exercise and Cardiac Rehabilitation of the Council on Clinical Cardiology, American Heart Association**

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**R**egular aerobic physical activity increases exercise capacity and plays a role in both primary and secondary prevention of cardiovascular disease.<sup>1,2</sup> The known benefits of regular aerobic exercise and recommendations for implementation of exercise programs are described in this report. Inactivity is recognized as a risk factor for coronary artery disease.

Exercise training increases cardiovascular functional capacity and decreases myocardial oxygen demand at any level of physical activity in apparently healthy persons as well as in most patients with cardiovascular disease. Regular physical activity is required to maintain these training effects. The potential risk of physical activity can be reduced by medical evaluation, supervision, and education.<sup>3</sup>

Exercise can help control blood lipid abnormalities, diabetes, and obesity; in addition, aerobic exercise adds an independent, modest blood pressure-lowering effect in certain hypertensive groups.<sup>4-6</sup> There is a relation between physical inactivity and cardiovascular mortality, and inactivity is a risk factor for the development of coronary artery disease.<sup>7-9</sup> Modest levels of physical activity are beneficial. Results of pooled studies reveal that persons who modify their behavior after myocardial infarction to include regular exercise have improved rates of survival.<sup>10-12</sup>

#### **Benefits of Exercise**

Healthy persons as well as many patients with cardiovascular disease can improve their exercise performance with training. This improvement is the result of an increased ability to use oxygen to derive energy for work. Exercise training increases maximal ventilatory oxygen uptake by increasing both maximal cardiac

output (the volume of blood ejected by the heart, which determines the amount of blood delivered to the exercising muscles) and the ability to extract oxygen from blood. Beneficial changes in hemodynamic, hormonal, metabolic, neurological, and respiratory function also occur with increased exercise capacity.

Exercise training results in decreased myocardial oxygen demands for the same level of external work performed, as demonstrated by a decrease in the product of heart rate  $\times$  systolic arterial blood pressure (an index of myocardial oxygen consumption). These changes are also beneficial in patients with coronary artery disease, who after exercise training may attain a higher level of physical work before reaching the level of myocardial oxygen requirement that results in myocardial ischemia.<sup>13</sup>

Exercise training favorably alters lipid and carbohydrate metabolism. The exercise-induced increase in high density lipoproteins is strongly associated with changes in body weight.<sup>14</sup> In addition, regular exercise in overweight women and men enhances the beneficial effect on blood lipoprotein levels of a low-saturated fat and low-cholesterol diet.<sup>15</sup>

Developing endurance, joint flexibility, and muscle strength is important in a comprehensive exercise program, especially as people age. However, static or isometric exercise alone is not known to lower cardiovascular risk. Patients with cardiovascular disease are usually asked to refrain from heavy lifting and forceful isometric exercises, although the use of light weights seems beneficial in developing muscle strength and joint flexibility. Careful isometric training alone or with aerobic training is generally safe and effective in patients with cardiovascular disease who are medically stable and are in a supervised program.<sup>16-19</sup>

Many activities of daily living require arm work more than leg work. Therefore, patients with coronary artery disease are advised to use their arms as well as their legs in exercise training. The arms respond like the legs to exercise training both quantitatively and qualitatively,

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although ventilatory oxygen uptake is less with arm ergometry and myocardial oxygen consumption may also be less because of decreased heart rate. Therefore, target heart rates are set at 10 beats per minute lower for arm training than for leg training.<sup>20,21</sup> Dynamic arm ergometry is usually well tolerated by patients with coronary artery disease; however, there may be an increased rise in blood pressure that may be of concern in certain subjects.

Maximal ventilatory oxygen uptake drops 5–10% per decade between the ages of 20 and 70,<sup>19</sup> and a lifetime of dynamic exercise maintains an individual's ventilatory oxygen uptake at a level that is higher than expected for any given age. There is some suggestion that the rate of decline of ventilatory oxygen uptake that normally occurs with age is less in persons who exercise compared with those who do not.<sup>22–25</sup> This issue requires additional study.

Middle-aged men and women who work in physically demanding jobs or perform moderate to strenuous recreational activities have fewer manifestations of coronary artery disease than their less active peers.<sup>7,8</sup> Meta-analysis studies of clinical trials reveal that medically prescribed and supervised exercise can reduce mortality rates of patients with coronary artery disease.<sup>10–12</sup> However, a unifactorial randomized controlled trial of exercise to study the development or progression of coronary artery disease has not been, and may never be, done because of the difficulty of maintaining controls and interventions, the necessity of modifying other risk factors, the confounding therapies known to affect survival, and major logistical and financial constraints.

Compared with the physical benefits of an aerobic training program, indications of psychological benefits are less convincing. However, one study revealed that exercise is associated with a number of psychological benefits, including reduced anxiety and depression and increased feelings of well-being.<sup>26</sup> Relatively few studies on the psychological effects of exercise among cardiac patients have been done, and in those studies conducted, there does not appear to be clear support for the beneficial effects of exercise on psychological functioning.<sup>27</sup> Participation in education and counseling groups as part of cardiac rehabilitation has been shown to improve patients' quality of life in a few well-designed randomized trials.<sup>28–31</sup> However, these studies have documented only modest improvements in psychological functioning. Even though such benefits remain to be more fully documented, one comprehensive review concluded that health professionals are under a general impression that exercise training may improve psychosocial function.<sup>32</sup>

One reason for the failure to find improvement in psychological functioning may be that the majority of cardiac patients function at a relatively high level. For example, in one study only depressed cardiac patients exhibited psychological improvements with exercise training.<sup>33</sup> There is also evidence that physical activity probably alleviates symptoms of mild and moderate depression and provides an alternative to alcoholism and substance abuse.<sup>34</sup>

### Implementation of Exercise Programs

Persons of all ages should include physical activity in a comprehensive program of health promotion and

disease prevention, and should increase their habitual physical activity to a level appropriate to their capacities, needs, and interest.

Activities such as walking, hiking, stair-climbing, aerobic exercise, calisthenics, jogging, running, bicycling, rowing, and swimming and sports such as tennis, racquetball, soccer, basketball, and touch football are especially beneficial when performed regularly. Brisk walking is also an excellent choice.<sup>35,36</sup> The training effect of such activities is most apparent at exercise intensities exceeding 50% of a person's exercise capacity. (Exercise capacity is defined as the point of maximal ventilatory oxygen uptake or the highest work intensity that can be achieved.) The evidence also supports the notion that even low-intensity activities performed daily can have some long-term health benefits and lower the risk of cardiovascular disease.<sup>35,37,38</sup> Such activities include walking for pleasure, gardening, yard work, house work, dancing, and prescribed home exercise. Low-intensity leisure activities like walking, golf, badminton, croquet, shuffleboard, lawn bowling, and ping-pong are recommended for the elderly. For health promotion, dynamic exercise of the large muscles for extended periods of time (30–60 minutes, three to four times weekly) is recommended.

Physical activity has risks as well as benefits. Estimates of sudden cardiac death rates per 100,000 hours of exercise range from 0 to 2.0/100,000 in general populations and from 0.13/100,000 to 0.61/100,000 in cardiac rehabilitation programs.<sup>39–41</sup> Falls and joint injuries are additional risks associated with physical activity (especially in older women), but most of these are not likely to require medical treatment. The incidence of such complications is less in patients participating in lower-intensity activities like walking.

### Medical Professionals

Preventive services are an important component of the national health agenda. Physicians have the opportunity and responsibility to promote regular exercise as well as the reduction of high blood pressure, management of abnormal blood lipids, and prevention and cessation of smoking.

Many physicians do not have time to add preventive services to their schedules and may delegate the task to other members of the health care team. However, the physician must set the agenda, for staff members under a physician's supervision cannot deliver preventive services unless the physician defines the services as medically appropriate. The physician must not neglect this responsibility to promote regular exercise and other health promotion strategies.

Nurses, an integral part of the health care team, may assess physical activity habits, prescribe exercise, and monitor responses to exercise in healthy persons and cardiac patients. The services of physical and occupational therapists, exercise scientists, and other health professionals may also be useful.<sup>42</sup>

Patients with known or suspected cardiovascular, respiratory, metabolic, orthopedic, or neurological disorders should consult their personal physicians before beginning or significantly increasing physical activity. Middle-aged or older sedentary individuals with symptoms of cardiovascular disease should also seek medical advice. In turn, physicians should give advice according

to recommended guidelines for exercise in such patients.<sup>19,41,43,44</sup> In addition, physicians should encourage their more sedentary patients to adopt a more active lifestyle and emphasize the risks associated with inactivity. Walking should be advocated as a form of exercise.<sup>36</sup> Physicians should assess each patient's physical activity pattern and, with the support of other health professionals, prescribe and give advice about physical activity with the individual patient's needs and capabilities in mind, providing systematic follow-up. A medical evaluation, including an exercise test, may be necessary for some persons but not for the apparently healthy subject less than 40 years old who has no coronary risk factors; the exercise test can also be an important basis for appropriate exercise prescription. In some instances it is recommended that patients with known cardiovascular disease undertake a prescribed, medically supervised exercise program to reduce morbidity (myocardial infarction or abnormal cardiac rhythms) and mortality.<sup>44,45</sup> Annual exercise testing is an important part of monitoring many patients with coronary artery disease.

Residency and fellowship training programs should prepare physicians to recommend proper exercise for their patients. An individual's customary physical activity level should be an integral part of a comprehensive medical history.<sup>42,46-48</sup> Professionals with a background in exercise science should work with medical personnel to establish appropriate exercise programs for persons with diagnosed health problems or who are at high risk for developing major health problems.

### *Parents*

Parents should be aware of the health benefits of regular physical activity and of how exercise contributes to quality of life. They should be encouraged to incorporate physical activity into their daily lives and those of all family members. Moreover, parents should teach their children that proper physical activity is a basic component of normal healthy living. This commitment provides an incentive, sets an example, and creates in children a positive attitude toward physical activity. Parents and other family members should be encouraged to support each other's exercise habits by sharing responsibilities such as child care, food preparation, and shopping. Families at high risk for cardiovascular disease may benefit from structured programs aimed at specific health behavior changes.<sup>38</sup>

### *Schools*

Children should be introduced to the principles of regular physical exercise and recreational activities at an early age. Schools at all levels should develop and encourage positive attitudes toward physical exercise, providing opportunities to learn physical skills and to perform physical activities, especially those that can be enjoyed for many years. The school curriculum should not overemphasize sports and activities that selectively eliminate children who are less skilled. Schools should teach the benefits of exercise and the development and maintenance of exercise conditioning throughout life.

Some studies demonstrate that such organized school programs are not only feasible but can also be successful.<sup>49,50</sup> In addition, these programs can be used to promote proper nutrition and cigarette smoking prevention and cessation.

### *Employers and Community Groups*

Employers and community organizations should develop both short-term and long-term plans tailored to the needs of persons in the community and workplace. Communities should develop exercise programs using local club, park, recreational, church, and school facilities. There is increasing evidence that worksite programs with a comprehensive approach to employee health, including prevention and cessation of smoking, dietary intervention, and exercise, whether on-site or nearby, are not only effective in modifying coronary risk factors but can also help reduce absenteeism, accidents, health care costs, hospital admissions, and days of rehabilitation.<sup>48</sup> Baseline assessment of an employee's health status can be performed at a relatively low cost and may include an assessment of physical conditioning. Public health interventions in the workplace have resulted in an increase in vigorous physical activity by participating employees that is associated with increases in objective measurements of physical conditioning.<sup>51</sup> As health care costs continue to increase, these programs will become more attractive to both small and large businesses.

### *Insurance Industry*

The insurance industry and the medical community are encouraged to engage in a collaborative effort to provide policyholders with exercise programs that meet American Heart Association standards.<sup>19</sup>

### **Additional Research and Future Issues**

There is a large body of knowledge on exercise, but data on exercise and its effects on the cardiovascular system and long-term survival are limited. The responsibility for conducting research lies with government, private health agencies, the insurance industry, employers, universities, and medical schools.

Basic knowledge of the anatomic, biochemical, and physiological changes that result from various patterns of physical activity (acute and chronic, sustained and intermittent, isotonic and isometric, low-intensity and high-intensity) in persons of different ages is needed, as is a determination of whether a certain minimal-intensity threshold of physical activity is required for benefit. The biomedical and economic impact of participation in specific exercise programs on coronary artery disease, peripheral vascular disease, and hypertension should also be evaluated. The psychosocial functioning of patients with coronary artery disease and the potential value of exercise in enhancing the quality of life of cardiac and other patients warrants further study. Future studies should include adequate numbers of women and the elderly to better meet research objectives.

Furthermore, the presence and extent of coronary risk factors in the disabled and in disadvantaged and minority groups need to be better identified and defined. Consequently, the effect that modifications like increases in physical activity would have on members of these groups should be explored, and large studies should also include a significant number of these persons.

Research should also be continued to establish the cost-effectiveness of physical activity programs for the enhancement of cardiovascular health,<sup>52</sup> with a focus on the type of promotional strategies required for initiating



and maintaining physical activity (e.g., insurance incentives, health personnel, and media materials) as well as on the social context of such activity (e.g., industrial and business settings, rural and urban settings, schools, churches, and families).

Societal, cultural, and personal factors that affect development or maintenance of lifelong patterns of physical activity should be identified and incorporated into strategies of exercise promotion.

In summary, future development and study should be not only of the benefits of physical activity, but also of the methods used to facilitate the dissemination of the present and future body of knowledge to all members of society.

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