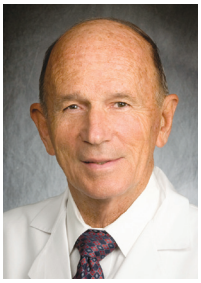

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THE BENEFITS OF EXERCISE IN PROMOTING LONG AND HEALTHY LIVES – MY OBSERVATIONS

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Exercise can be used in a variety of ways. It can be used for rest and relaxation, muscle building and figure contouring, and cardiovascular/pulmonary fitness. All 3 have merit, but only one has the potential of prolonging your life — cardiovascular conditioning. As I tried to determine the best type of exercise for cardiovascular conditioning, I looked at the following: isotonic exercises, which are traditional calisthenics and weight training; isometric exercises, exercises that contract muscles but do not move joints; isokinetic exercises, or exercises that have resistance through the full range of motion, for example, if you push a weight up, you must pull it down; anaerobic exercises, or exercises by definition that lead to exhaustion in less than 2 minutes; and aerobic exercises, or endurance-type physical activities. Other exercises, such as yoga and tai chi, are valuable for stretching, rest, and relaxation but have very little cardiovascular benefit.

For this reason, over 40 years ago I started studying the physiological effects of aerobic conditioning. Remember, too, that aerobic means "living in air or living in oxygen," and the best measure of aerobic conditioning is the ability to utilize the maximum amount of oxygen during exhaustive work. The benefits of aerobic conditioning include:

1) More efficient functioning of the lungs. Your maximum breathing capacity increases and you can ventilate more air in a short period of time.
2) Better extraction of oxygen or air in the lungs into the blood stream and more rapid elimination of carbon dioxide.
3) A more efficient and functioning heart. A highly conditioned athlete nearly always has a lower resting heart rate than a person who is not in condition because there is some dilatation of the heart and it can pump out more blood with each stroke, which is called the ejection fraction. In other words, it can do more work with less effort.
4) Blood volume tends to increase, along with the amount of hemoglobin and red blood cells. This enhances the ability of the body to transport oxygen from the lungs into the blood and into the muscles.
5) A change in metabolism to the extent that you can consume more calories without gaining weight.
6) In conjunction with any type of physical activity, there is an increase in muscle mass, a loss of fat, and an increase in bone density, delaying the onset of or preventing osteoporosis.
7) Due to the increase in muscle mass, there is a decrease in likelihood of diabetes since muscle handles sugar much better than fat.
8) There may be a decrease in body weight, but it does not occur rapidly unless there is caloric restriction in conjunction with the increased physical activity.
9) Nearly always, the serum triglycerides decrease in response to aerobic activity, and there is an increase in the good cholesterol (HDL). There may or may not be a decrease in the total cholesterol.

In response to aerobic-type activity, there may be a development of new blood vessels around partially obstructed or totally obstructed vessels, particularly in the heart. This is called an increase in collateral circulation, which at times can compensate for an obstruction and overcome the harmful effects of an obstructed vessel and reduce or eliminate angina. Aerobic activity has a relaxing effect on the digestive system, decreasing the likelihood of peptic ulcers or esophageal reflux.

Exercise can have a tranquilizing effect that is known as "nature's best tranquilizer." It does have an effect on both anxiety and depression. As you will find on page 10 of my book, *Start Strong, Finish Strong*, one example of this is how levels of physical fitness relate to quality of life (Table 1). Collectively, these physiological and psychological changes are called the "aerobic training effect."

In my first book, *Aerobics*, published in 1968, critics said I was too hard on calisthenics and weight lifting and overemphasized the need for aerobic activity. To the contrary, even then I said that calisthenics and weight lifting must be done *in conjunction with*, not *in place of*,

Table 1. Quality-of-Life Variables by Fitness States (10,331 men and women)

	Low (n = 1,077) %	Moderate (n = 3,555) %	High (n = 5,679) %	P for Trend
Unexplained Fatigue	25.8	16.3	11.2	<0.001
Problematic Snoring	49.9	34.8	21.9	<0.001
Frequent Heartburn	30.9	22.1	12.1	<0.001
Sexual Problems	11.0	7.4	5.0	<0.001
Decreased Sex Drive	29.8	22.2	19.6	<0.001
Impotence (men only)	9.7 (932*)	7.2 (3,126*)	4.6 (4,910*)	<0.001
Chronic Joint or Muscle Pain	34.0	29.3	23.5	<0.001
Low Back Pain	44.8	41.5	35.4	<0.001
Frequent Headaches	16.7	15.0	12.0	<0.001
Difficulty Sleeping	28.7	24.9	21.9	<0.001
Depression	20.9	15.9	12.9	<0.001
Anxiety	20.2	16.4	13.6	<0.001

** % (n)* *Source: ACLS, The Cooper Institute, January 2006*

an aerobic conditioning program. It is well known that it is possible to become over muscled, just as you can be over fat, and the heart will suffer either way.

In my latest books, I break down the need for cardiovascular conditioning, musculoskeletal and flexibility programs, Table 2. In this way you can be totally fit, not just aerobically fit, and at age 60 be able to not only run 2 miles in 20 minutes but also pick up a sack of groceries without injuring your back. The other "hidden benefits of exercise" are the epidemiological benefits. For example, people who are aerobically fit (and particularly if they take vitamin supplementation including vitamin D and omega-3) have a marked increase in immunity from upper respiratory infections and colds. Not only is there a decrease or absence of colds, but when they do occur they last for a shorter period of time, they are less symptomatic, and the recovery is more rapid. There is a direct relationship between these observations and levels of fitness.

Table 2. Optimal fitness ratios of cardiovascular versus musculoskeletal conditioning by age.

Age	Cardiovascular Training	Musculoskeletal Conditioning
30s	80%	20%
40s	70%	30%
50s	60%	40%
Over 60	55%	45%

Participation in an exercise program apparently lowers the risk of stroke, diabetes, and recurrent breast cancer, but it also can reduce the incidence of high blood pressure. The Nurses' Health Study found that even walking and moderate-intensity exercise for 30 to 45 minutes per day lowers the risk of developing type 2 diabetes and cardiovascular events by 30 to 40%.[1] Even colon cancer and Alzheimer's may be related to levels of physical activity. As indicated in the Quality of Life fitness chart in Table 1, people who are physically fit are less depressed and have less anxiety. Equally important is that coronary heart disease, prostate and breast cancer, diabetes, and obesity account for 75 percent of healthcare costs, yet the progression of these diseases can be stopped or even reversed with intensive lifestyle changes.[2]

We have a large data repository here at the Aerobics Center called the Cooper Center Longitudinal Study. There are more than 100,000 people in this study, and many have been coming to us on an annual basis for nearly 40 years. As a result, we have over 1.2 million person-years of follow-up on those patients, which is the largest database in the world with treadmill-measured levels of fitness correlated with all-risk mortality and longevity.

A study from our Cooper Institute entitled "Physical Fitness and All-Cause Mortality," published November 3, 1989 in the *Journal of the American Medical Association*, showed clearly that when compared with men who were totally sedentary, those men who essentially avoided inactivity and had moved up one block on a 5-block fitness classification scale had a reduction in deaths from all causes by 58% and an increase in life expectancy up to 6 years.[3] Those in the top 2 blocks of the fitness classification scale (i.e., they were aerobically fit) had a decrease in deaths from all causes by 65% and longevity estimated to be 9 years.

Projections are that men who have been coming to this clinic for 20 years or longer and have had at least 2 examinations during that time could have a life expectancy of 87.5 years. For women, that projected life expectancy is 90.5 years. Of course, you cannot attribute this to just their exercise program because we encourage our patients to embrace the total concept of wellness, which includes:

1) proper weight, nutrition, and supplementation (particularly vitamin D and omega-3),
2) avoidance of tobacco in any form,
3) collectively, 30 minutes of activity most days per week,
4) control of alcohol (no more than 6 drinks per week for women, 10 drinks per week for men) and eliminate habit-forming drugs,
5) an effective stress management program, and
6) a regular comprehensive examination of the type we do here at the Cooper Clinic.

Many of my patients who have achieved these goals say they have become "Cooperized." Most likely it is a combination of these requirements that enables our patients (both men and women) to have a projected life expectancy of 88 years, which is 10 years longer than the national average.

Up until this point, I have been discussing the value of exercise in healthy people. There is more and more data now documenting the value of exercise in cardiac rehabilitation programs. When I was in medical school in the 1950s, vigorous exercise was strongly discouraged and even contraindicated for anyone with heart disease. To the contrary, Dr. Terrence Kavanaugh and his colleagues at the Rehabilitation Institute at the University of Toronto have been exercising heart patients for almost 40 years. In following 12,169 post-MI, coronary bypass, and ischemic heart disease patients for up to 29 years, a powerful predictor of cardiac and all-cause mortality was the measured maximal oxygen utilization. Many of his patients were able to train to the extent that they could safely complete a 26.2-mile marathon![4] However, let me hasten to say that there is nothing known to man totally protective against coronary disease, whether it is medicine, surgery, or marathon running!

This is a summary of my current feelings on the preventive and rehabilitative value of exercise from a physiological, epidemiological, and psychological standpoint. I believe the results of these studies are too impressive to be ignored, but more good studies are still needed. Remember, exercise is not a panacea, it is only the foundation of any good preventive and rehabilitation program.

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