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## ABSTRACT

Collected here are fourteen statements on the beneficial effects of physical fitness programs for older persons presented at hearings before the Subcommittee on Aging of the Committee on Labor and Public Welfare, U.S. Senate. Areas discussed include: What research tells us regarding the contribution of exercise to the health of older people; exercise and the aging process; activity and older Americans; staying youthful and fit; importance of physical activity for the elderly; physical activity and aging; psychological importance of physical fitness; value of regular exercise programs for senior citizens; and a fitness program for senior citizens developed by the National Association for Human Development with quotes from various leaders of physical fitness. A statement by C. Carson Conrad, Executive Director, President's Council on Physical Fitness and Sports, is representative of much of the testimony: Regular exercise can significantly delay the aging process by inhibiting the losses of vital capacity, muscular strength, and joint flexibility, which are characteristic of the middle and later years. It is a fundamental law of physiology that the functional efficiency of an organ or system improves with use and regresses with disease. Regular exercise may deter the onset of degenerative diseases, which are among today's major killers, and it may improve the ability to survive and recover from heart attack by promoting the development of collateral circulation in the heart muscle. A state of physical fitness enhances the quality of life for the elderly by increasing their independence. The ability to go places and do things without being dependent on others provides a strong psychological lift that is conducive to good mental health.  
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# Testimony on Physical Fitness for Older Persons

From Selected Hearings before the Sub-  
committee on Aging of the Committee on  
Labor and Public Welfare, U.S. Senate,  
Ninety-fourth Congress, April 23, 1975

SP010 582

NATIONAL ASSOCIATION FOR HUMAN DEVELOPMENT  
1750 Penna. Ave., N.W., Washington, D.C. 20006

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Senator BEALL. Our next witnesses are a panel on physical fitness and the elderly.

The chairman of the panel is Dr. Samuel Fox III, Cardiology Exercise Laboratory, Georgetown University. He is accompanied by Dr. Herbert deVries, Exercise Physiology Laboratory, South Laguna, Calif.; Mrs. Ann Radd, National Association for Human Development; Dr. Frederick C. Swartz, chairman of the Committee on Aging of the Council on Medical Service of the American Medical Association; and Dr. Robert M. Butler, of Washington, D.C.

**STATEMENT OF DR. SAMUEL FOX III, CARDIOLOGY EXERCISE LABORATORY, GEORGETOWN UNIVERSITY, ACCOMPANIED BY DR. HERBERT de VRIES, PH. D., EXERCISE PHYSIOLOGY LABORATORY, SOUTH LAGUNA, CALIF.; MRS. ANN RADD, NATIONAL ASSOCIATION FOR HUMAN DEVELOPMENT; AND DR. FREDERICK C. SWARTZ, CHAIRMAN, COMMITTEE ON AGING, COUNCIL ON MEDICAL SERVICES, AMERICAN MEDICAL ASSOCIATION**

Dr. Fox. I must report that Dr. Butler is otherwise engaged with pressing professional commitments and sent his regrets. We regret he is not able to be with us today.

Senator BEALL. You may proceed as you wish.

Dr. Fox. Thank you, Mr. Chairman, and members of the subcommittee.

It is indeed a pleasure for us to be here and a privilege to speak on behalf of this very important aspect of trying to maintain the fitness and to enhance the health and performance of our elderly citizens, and indeed all Americans so when they reach later years, they will not serve as a burden on themselves and the rest of society.

There is much that suggests very strongly that through a program of increased physical activity, we can retain their flexibility, agility, capability of getting around and being self-sufficient, and having self-respect, which we wish them to have.

We have a panel here of experts who will speak directly to this. In addition, there are some other renowned individuals whose work is well known to many, who have written statements that support their interest and understanding and concern for this problem. We wish to submit those.

They include Harold Elrick, M.D.; Theodore Klumpp, M.D.; Lawrence Lamb, M.D.; Allan J. Ryan, M.D., and Merritt H. Stiles, M.D., a gentleman who took up skiing at the age of 55 and ended up being the chairman of the U.S. Ski Committee. His statement at age 75 is on the rewards that he personally has found with the active life.

Senator BEALL. Their statements will certainly be included in the record at the conclusion of your testimony.

Dr. Fox. My statement is very brief.

It is a privilege to appear before you as a private citizen, a resident of Bethesda, Md., although I work chiefly in the District of Columbia.

I am privileged to serve as a member of the President's Council on Physical Fitness and Sports. Previously, I have served as a cardiologist in the Naval Medical Corps and with the U.S. Public Health Service in laboratory research and later as Assistant Director of the National Heart Institute of the National Institutes of Health.

Subsequently, I was chief of the heart disease and stroke control program of the U.S. Public Health Service, and, in 1970, returned to academic medicine where now I serve as professor of medicine at Georgetown Medical Center and also have an appointment as clinical professor of medicine at George Washington University.

In 1972 and 1973, I served as president of the American College of Cardiology, headquartered in Bethesda, Md.

In the area of heart disease, I believe we are all impressed with the overwhelming importance of the preventive approach to avoiding the physical disability, mental distress, and drain on resources that result from circulatory diseases which clearly appear to be responsive to preventive action. There is a large—and increasing—body of knowledge strongly persuasive of the important place of an increase in habitual physical activity in attempts to delay or prevent the manifestations of atherosclerosis—the clogging of arteries by fatty material—which prevents an adequate blood supply reaching the heart muscle—resulting in heart attack—or the brain—resulting in a stroke.

Each year, we lose two-thirds of a million Americans from heart attacks—many of them with good years of health otherwise available to them—and there is another two-thirds of a million survivors who need encouragement and guidance to return to self-sufficiency and to avoid dependence on others for their shopping, housekeeping, and other services. There are over 4 million living Americans with established coronary disease.

Over 200,000 deaths from cerebral vascular accidents occur each year in the United States and there are over 2 million survivors of strokes—many cast aside and requiring assistance where, with adequate retraining programs, they could return to a rewarding level of self-sufficiency and self-respect.

It is my personal conviction from over 25 years of medical practice, research and teaching, that the maintenance of a vigorous lifestyle, including participation in such activities as country dancing, bicycling, moderately strenuous lifetime sports such as tennis, badminton, canoeing, skiing, and swimming, and useful yard work and gardening will do as much for the enhancement of general health and the improvement of the quality of life as they may for the prevention of the dread diseases.

We need to exert leadership at the Federal level to develop programs to help maintain the interest and involvement of our senior citizens in such activities. I believe we will be able to promptly document financial savings, above the costs of such programs, not to speak of the psychological and physiologic benefits that will be derived by individuals and society through having appropriate physical activity programs available and attractively continued so as to motivate persons to retain their flexibility, agility, strength, and enthusiasm.

It is therefore with deep personal conviction that I appear before you in support of the renewal of the Older American's Act with a strong request that it include specific authority for projects and programs to maintain the physical vigor and activity of our elders in their later years. I will be glad to try to answer any questions and I thank you for the privilege of appearing before you.

As you wish, sir, I will be glad to answer questions now or call on my colleagues to give their testimony.

Senator BEALL. I think it might be better if we have all the testimony and then go into questions.

Dr. Fox. Thank you.

I regret I did not follow my notes, because I have not introduced my colleagues.

On my left is Mrs. Ann Radd, of the National Association for Human Development, who will be the last of our group to testify. On my immediate right is Dr. Frederick S. Swartz of Lansing, Mich.; I would like to call on Dr. Herbert deVries of South Laguna, Calif., director of the exercise physiology laboratory on the faculty of the University of Southern California.

Dr. deVries.

Dr. DE VRIES. Thank you, Mr. Chairman and members of the subcommittee.

As we grow older, there appear to be losses in functional capacity at the cellular level, at the tissue level, the organ level, and the system level of organization. However, as pointed out by Dr. Nathan Shock, of Baltimore, the decrements in physiological functions that take place with increasing age become most readily apparent in the response of the whole organism to stress.

The exercise physiologist's interest lies in the measurement of the human organism's responses to the most physiological of stressors, physical activity. We are most concerned with the various functional capacities of the human individual and how they may be lost through aging or other processes, and how they may be improved through such modalities as physical conditioning, improved nutrition, and better relaxation.

Thus, before reviewing the evidence for the potential contributions of physical exercise to the health of older people, it is necessary to discuss some of the physiological changes which have been reported as accompanying the aging process and which collectively result in gross losses of functional capacity which the aging individual experiences as a creeping loss of "vigor."

There is a large and rapidly growing body of literature which deals with the physiology of aging. The discussion of that literature here need only be cursory, since excellent reviews are available.

As we grow older, the ability of the heart to function as a pump at rest declines approximately 1 percent per year, probably due to a lessening strength of the heart muscle. A similar loss is seen at maximal exercise. Along with this loss, the arterial blood pressure ordinarily increases and the coronary arteries gradually become plugged up, and the circulation in general slows down.

Along with these changes in the cardiovascular system, the respiratory system also loses some of its youthful capacity. The vital capacity decreases and the ability to move large volumes of air during heavy exercise declines. In general, the chest wall seems to become stiffer and breathing requires more muscular effort.

Our skeletal muscles decrease gradually in strength and in their ability to persevere with heavy workloads—endurance. Indeed, we probably lose about 3 to 5 percent of our active protoplasm—largely muscle—each decade after maturity. In spite of this loss of active tissue, however, we usually allow ourselves to gain weight as we grow older. This is worthy of note that even if we maintained the weight of our early maturity, we would still be getting fatter, since the replacement of the active tissue lost is very largely adipose tissue.

While many other, sometimes more obvious, changes occur also, such as drying and wrinkling of the skin, and graying of the hair, the foregoing changes noted are most important in determining the functional capacity of the individual; that is to say his level of vigor, best measured as his capacity for oxygen consumption, sometimes referred to as aerobic capacity. By age 75, men have on the average lost about 50 percent of their maximal oxygen consumption and the data for women follow roughly a parallel course.

But most interestingly, many of these changes, particularly the loss of aerobic capacity or vigor, can be brought about in young, well-conditioned men by the simple expedient of enforced bed rest—in as little as 3 weeks. For example, in one of the better studies in this area, it was found that in 3 weeks of bed rest, the maximal cardiac output decreased 26 percent; the maximal exercise stroke volume of the heart by 30 percent; and the maximal ventilatory capacity by 30 percent; and oxygen consumption by 30 percent; and even the amount of active tissue declined by 1.5 percent.

Thus, we see that inactivity can produce losses in function entirely similar to those brought about more slowly in the average individual when he grows more sedentary as he grows older. These observations lead us to question how much of the observed agewise losses in function are truly necessary age changes and how much may be brought about by the long-term deconditioning of the increasingly sedentary life we lead as we grow older.

On the basis of the evidence presented, it may be hypothesized that the functional losses which have been observed and reported as age-wise changes in the medical literature must be considered to be the resultant of at least three component factors: (1) true aging processes; (2) unrecognized disease processes; and (3) deconditioning resulting from our increasingly sedentary lifestyle as we grow older. Of these three factors, only the third is headily modified by methods presently available.

#### POTENTIAL FOR IMPROVEMENT OF HEALTH AND PHYSICAL FITNESS IN OLD AGE

Only a few years ago, the trainability of older people was still in question. In Germany, it had been concluded that commencement of physical training in a person unaccustomed to sport causes slight effects of adaptation after 40, while after 60 there is practically no observable effect. An article from Japan also stated that marked improvement of physical ability by training cannot be expected in older people.

On the other hand, Czechoslovakian physiologists had reported better physical performance and functional capacities in a sample of physically active older men than in a comparable sample of sedentary older men.

Two other investigators had shown significant improvement in physical working capacity and cardiac function by conditioning older people although the sample size was very small in both, 8 in one, and 13 in the other. An excellent series of investigations from Stockholm clearly demonstrated the trainability of men in the 34 to 50 age bracket. This work demonstrated a 14-percent improvement in aerobic capacity;

t 13-percent increase in cardiac output, and some suggestion of decreased numbers of EKG abnormalities. However, it is difficult to consider even the upper end of this age bracket as old although the investigators did refer to their subjects as "middle-aged and older" men.

Other investigations dealing with middle-aged men have shown that vigorous exercise can reduce cardiac abnormalities and serum triglyceride levels and it is in general feasible for middle-aged men and produces changes in functional capacity and body composition that run counter to the downhill trend usually seen with aging. Highly significant reductions in the blood pressure of hypertensive middle-aged men have also been brought about in a 6-month period of physical conditioning.

Since very little experimental evidence existed regarding the physical conditioning effects upon older men and women—defined as 50 and over—it was decided to develop a mobile exercise physiology laboratory at the Andrus Gerontology Center which could be taken to a retirement community for further study. This work was supported by the Administration on Aging.

In the first experiment, 112 older males, aged 52 to 87—mean age equals 69.5—volunteered for participation in a vigorous exercise training regimen. They exercised under our supervision at calisthenics, jogging, and stretching at each workout for approximately 1 hour, three times per week.

The subjects were pretested and retested at 6, 18, and 42 weeks. The most significant findings were related to oxygen transport capacity. Oxygen pulse and lung ventilation at near maximal workloads improved by 29.4 and 35.2 percent respectively. Vital capacity improved by 19.6 percent. Significant improvement was also found in percentage body fat, physical work capacity and both systolic and diastolic blood pressure. Controls did not improve on any of the above measures.

A group of seven men was placed in a modified exercise program because of various cardiovascular problems. This group exercised in the same manner, except that they substituted a progressive walking program for the jogging and were restricted to a maximum heart rate of 120 instead of 145, which obtained with the normal group. This group was exercised for 6 weeks, at which time their improvement showed a similar pattern to that of the harder working normal subjects at 6 weeks.

Life history of physical activity was evaluated in a subgroup of 53. Neither the mean of high and low years of activity nor the peak level of activity engaged in for a period of 6 weeks or more correlated positively with physiological improvement found.

In a subsequent study, 17 older women, ages 52 to 79, from the same community, participated in a vigorous 3-month exercise program and again physical fitness was significantly improved although the women did not show the large improvement in the respiratory system shown by the men.

On the basis of a series of studies with this older subject population over a period of 5 years, during which not a single untoward incident occurred, we concluded that (1) the exercise regimen as developed was both safe and effective for normal older men and women; (2) the trainability of older men and women with respect to physical work capacity is not significantly different from that in youth in a

relative sense, that is, the percentage gains are similar; and (3) the training gains do not seem to depend upon having trained vigorously in youth.

Other health benefits which have been reported to accrue as the result of physical conditioning of the older organism include: improved muscle strength and increased joint mobility, with respect to the muscle-skeletal system; increased total blood volume and a regression of EKG abnormalities with respect to the cardiovascular system. Also reported is a retarding effect on the typical agewise regression of lung function and aerobic capacity.

It is of interest that a general feeling of "well being" is often reported as one of the results of physical conditioning in older people. Unfortunately, this is not easily subject to scientific inquiry. However, in comparing the tranquilizer effects of a light workout—brisk 15-minute simulated walk—against a commonly-prescribed tranquilizer, meprobamate—Miltown—it was found that the workout brought about a highly significant reduction of 20 to 23 percent in nervous tension in older men and women; whereas, the meprobamate had no immediate effect. It is possible that this tranquilizer effect of exercise is the basis for the reported euphoria.

In summary, it must be pointed out that most of the data cited in support of the health benefits from physical conditioning are as yet not firmly enough grounded on repeated and corroborated experiments from independently directed laboratory investigations to constitute irrefutable scientific evidence.

It must also be recognized that the data do not allow any conclusions to be drawn with respect to the effect of the physiological benefits reported upon either morbidity or mortality statistics.

However, the weight of the available evidence at the present time does suggest that the intelligent choice of life style would include a suitably vigorous physical fitness regimen.

It is the writer's strong belief that physical fitness for old age should ideally have begun in the "earlier years" in order that maximum benefits may accrue to each individual. However, when this has not occurred for one reason or another, data are now available to support the concept of trainability even in old age. Ideally, physical fitness is a condition which should be achieved in youth, pursued to middle age, and never relinquished insofar as that is humanly possible.

Mr. Chairman, that concludes the main body of my testimony. If time permits, I would like to make a short addendum with respect to the training of personnel.

Senator BEALL. Thank you, Doctor.

Dr. DEVRIES. In view of the many benefits likely to result from the improvement of physical fitness in the elderly, it seems desirable to begin the implementation of programs in: (1) exercise; (2) nutrition; and (3) stress reduction, or relaxation procedures.

However, training of older people in these areas requires instructors with highly specialized preparation and skills. At the present time, it is the resource which is lacking.

It would appear that the highest priority should be given to the training of such leadership. Ideally, every senior center, YMCA, YWCA, and public school adult education center should have available the services of, or at least consultation with, an exercise physiologist with special training in geriatric physical fitness.

Under his direction, in cooperation with local cardiologists, grass roots leadership could be trained among both lay and physical education personnel. Centers for the training of the key leadership at the top could conceivably be easily established at those universities already having both a commitment to gerontology and interested and competent physical education personnel such as exist at USC, Michigan State, and Duke. With appropriate Government-agency funding, such programs could be implemented in a very short time. The research produced by faculty and graduate students involved in such a training program would constitute an additional spinoff of value to gerontology.

Thank you very much.

Senator BEALL. Thank you, Doctor.

Dr. FOX. If we may have Dr. Swartz's statement.

Dr. SWARTZ. Mr. Chairman and members of the committee, I am Dr. Frederick C. Swartz of Lansing, Mich., in the active practice of internal medicine in that town, and I also happen to be chairman of the Committee on Aging of the Council on Medical Service of the American Medical Association. The Committee on Aging of the American Medical Association has from the beginning considered all people in the later years to be the field of their concern.

This takes us back to the earliest concept of medicine as a profession. At the time of the establishment of the earliest university, the area of medicine was deemed to be man's relationship to nature. Using this as our platform, it can be readily understood that our interest involved every aspect of living of the oldster.

Our problem then became how could medicine be helpful in every phase of living. We have come up with many answers but this paper deals only with physical fitness.

A survey of those, at present, in the later years, both the well and the afflicted, reveals a far too great number who already present the "shaky hand and tottery gait" syndrome, or a tendency to go in that direction. It seems like a plague of feebleness, fragileness that seems to take possession of the individual. For some reason or other the spring is gone from the step. The free swinging gait is gone. Maybe from the fear of falling there is a tendency to take smaller steps and walk almost in such a crouch so that the body won't have so far to fall should that occur. It has been said that one is old because he stoops, not that one stoops because he is old.

Sometimes this picture is related to medical pathology which explains the symptoms, but most often there is no pathological lesion demonstrable. In either case, the answer is the same but to a different degree.

This syndrome of shaky hand and tottery gait is responsible in a large degree for much of the dependency of the present aged group. The treatment of this condition, varying only in degree of intensity of application, is physical exercise program. This is not a 15-minute-a-day deal, but a total change of lifestyle even at this late date.

Quoting from "Physiology of Medical Practice" by Guild, Fuisz, and Botar, "Many people rank physical fitness alongside motherhood and liberty. Without motherhood, they say, there is extinction; without liberty, slavery; and without physical fitness, death." Of course they stretch the point—but it is a fact that physical fitness does add a dynamic bonus to daily living.

Physical fitness really implies more than the ability to do a day's work without running out of gas, or surviving the emergency snow shoveling or grass cutting. It is also a state of physical well-being that breeds confidence, poise, posture, physical ability, and an exhilarating feeling of buoyancy.

Most people confuse physical fitness with the absence of disease and most people confuse activity with meaningful exercise. Most people think themselves healthy and fit when asymptomatic, without one thought about the upkeep for reconditioning of the castle God gives them in which to live.

The media makes much of the great strides in heart surgery of all kinds without ever suggesting the fact that this effort involves so small a section of our people—and their contribution casts a very small ripple on the sea of morbidity and mortality.

There are others that maintain, and with more reason, that the greatest health problem at the moment is in the area of chronic disease.

At this point, we would like to suggest that our greatest health problem is in the physical fitness of the Nation. Here the answer is the simplest and the cheapest, has the greatest application, and its reflection on the reduction of morbidity and mortality rates would be immediate and tremendous. It is entirely possible that a well-practiced physical fitness program begun early in life would increase the life expectancy by 10 years, not to mention the improvement in the quality of living in the later years.

There are many exercise programs that could be employed. None of these meet the approval of all the experts. In the daily practice of a primary physician, we are concerned with getting results. We have to instill the motivation and accept what we can that will not distract from the already over-filled life of the patient.

We have the feeling in an anecdotal way—that is, without real scientific assay with controls, et cetera—that those who participate in these physical fitness programs have fewer illnesses, a greater chance of living longer, and certainly have a greater zest for living.

Much fear is often expressed by the patient and his relatives of the possibility of injury or heart attack from an exercise program. We guard against this by beginning gently and adding new increments of exercise only when enough progress has been made to indicate that the addition is safe.

We sometimes have to point out that the only hazard-free area in this world is the graveyard. If you want to play the game of life, you must accept some risk—the possibility of a broken leg may be a small price for the chance to make a touchdown.

After the daily formal exercise program has been mastered and put into force, we proceed to institute a more strenuous program two or three times weekly. This may be typified by a walk for exercise or bike riding on a stationary bike—stationary largely because weather ceases to be an excuse for nonparticipation and the room housing the bike is usually safer than the street or highway. Improved speed, skill, strength, stamina, circulation, and range of motion should be the objective of all physical fitness programs.

To sugarcoat the exercise program one may keep occupied mentally and educationally at these times with a cassette or record of music or discussion of economics or drama or poetry or be entertained by radio

or TV. Most people who get about this far along with the program think they have done it all, but as we mentioned, this constitutes a complete change in lifestyle so there is more.

One of the most important items that contributes to good body function is good posture. We insist on oldsters sitting up straight in their chair, feet on the floor, and walking tall, which leads to a sucking up of the gut at all times.

All activities of living should be converted into exercise. Ambulating around the house, without lifting the heels off the floor, can be called activity, but hardly exercise. The heels should be lifted. There should be a spring in the step and at least at first the walker should be conscious of the hardening and tensing of the calf muscles. This is such an important concept in the improvement in circulation that we recommend extension and flexion exercises of the foot maximally 500 times daily to all bed patients and those unable to walk or those taking a long automobile trip.

This concept of converting all activity to an exercise level applies to all other forms of activity. Shaking the hairspray can, or the cocktail shaker or the snow shovel or the lawnmower all should be done vigorously so each set of muscles involved gets a bit of a workout.

Waste not a minute of your waking hours but use each in the effort to keep the machine in as near perfect condition as possible. This is not only aimed at muscle tone but also at agility and flexibility of the respective appendages. A concert pianist who used to practice with finger motions his coming concert while riding on an airplane is a case in point.

In our office, we follow the patient in and out of the consultation room admonishing and exhorting him to stand up straight, walk tall, stride out, don't watch your feet—you never used to—walk with a broader base by keeping the feet a little farther apart and turning on the outside foot like the soldier does. It is surprising how often and how well these requests can be complied with. Then our problem is to get cooperation of the relatives so that the program can be carried on at home.

In the car or in the rocking chair at home mild isometric exercises are recommended not only for muscle tone but limberness and agility of the parts. We realize the dangers of the Valsalva type of exertion and advise against this type effort in an exercise program or straining at stool.

We are convinced that participation in this type of program increases the confidence and a feeling of well-being for the individual and staves off dependency by preventing or softening the shaky hand and tottery gait syndrome.

The haunting question which was there from the start—if all this works to a degree in the later years, when should we really start the regime?

The obvious answer is at day one. This type of body care should be part of everyone's lifestyle for the simple reason that you feel better, you do more, you enjoy life more and in the later years, you will be independent because you have escaped the shaky hand and tottery gait syndrome.

Mr. Chairman, this concludes my statement.

I would like to add one sentence that may add a degree of credibility to what I just said; because this has been my lifestyle since World War II.

I am on the job 12 or 14 hours, 7 days a week, and I just passed my 73d birthday.

Senator BEALL. Very good testimony.

What is Valsalva exercise?

Dr. SWARTZ. Take a big breath and bear down hard like this [indicating]. Do not do it.

Dr. FOX. We would like to call on Mrs. Radd.

Mrs. RADD. I am Anne Radd, representing the National Association for Human Development, with offices at 1750 Pennsylvania Avenue, N.E., in Washington, D.C.

The National Association for Human Development is a nonprofit organization designed to assist the aged and other segments of our society toward the fulfillment of their social, physical, economic and intellectual needs. The principals of the National Association for Human Development include three prominent gerontologists whose professional careers span lifetimes and whose health care through public and private service. We are concerned about the lack of health education and information emphasized the importance of physical activity for the elderly. This has been a serious impediment to improved health for this population and, in most instances, they are the population needing it the most.

We believe that there is a need for greater understanding of what lifestyle factors contribute to sickness and death and for identifying courses of action which may be taken to improve health. The goal, of course, is to increase the number of disability-free days in the lives of older Americans through health enhancement activities.

If we are to reduce the growing numbers of chronically ill and disabled older persons, it is critically important that we also raise the awareness of those with responsibility for carrying out programs on behalf of older persons to the role which health education can play in upgrading health and in reversing the degenerative process for older persons.

To do this, the aging population, along with the general public, must be made clearly aware of the profound difference between health information—disseminated facts—and health education—persuading people to change their lifestyles.

Most people tend to confuse health information with health education. Health information is simply facts. And facts are widely available. Health education is the process which bridges the gap between health information and health practices. Health education motivates the person to take the information and do something with it—to keep himself healthier by avoiding actions which are harmful and by forming habits and lifestyles which are beneficial.

Given their relative effectiveness in effecting change, health information has grown year by year in volume, while health education has developed much more slowly. For older persons, and in particular those who are suffering chronic ailments, the need is critical for a nationwide effort to change personal attitudes toward health and activity and to influence them to take more individual responsibility for the health of their minds and bodies by making important changes in their lifestyle factors. Unfortunately, the important and often crucial role which regular physical activity can play in maintaining health has rarely been clearly explained or adequately dramatized in the past.

Based on loss of motivation and interest, and to a large extent because of the fear psychosis against exercise and exertion, older persons reduce their physical activities still further upon reaching age 60, and with especially damaging results since atrophy of disuse accentuates their lessened capacity to react to stress and contributes, as a factor in the death of older persons subjected to accidents, shock, operations, deprivation, and prolonged illness. Unless older persons are motivated through health education concerning the importance of physical activity as a therapeutic measure, they are unlikely to experience any improvement in functional capability.

Studies at Duke University Center for Studying of Aging, and elsewhere, reveal that if aging persons maintain a meaningful social role, it keeps them physically active and intellectually stimulated—they are motivated to take care of themselves.

These studies indicate that physical activity was the predictive factor, and that fewer illnesses and significantly fewer early deaths were noted among those who were on their feet and moving. The studies concluded that moderate disabilities can be controlled and reversed. They also emphasized that aging appeared to be more a product of sedentary lifestyles than it was of age.

In accordance with National Association for Human Development concepts which translate research findings into action-oriented programs, we suggest that physical activity projects for older persons can be applied at the grassroots level by utilizing existing mechanisms already available and serving the needs of older persons.

Specifically, we suggest that social service activities of the 400 planning service areas be broadened to encompass regular programs for physical activity. Similarly, the approximately 600 nutrition projects could be enhanced by providing health education and a physical activity program on a regular basis.

We believe that through this approach the introduction of lifestyle changes in older persons can be effected in an amazingly simple manner; and even more important to older persons, it can fit comfortably into the normal routine of their lives. Thus, a program of physical activity for older persons properly supervised can and should benefit both the individual and society as a whole.

We propose that the language of the Older Americans Act should emphasize the importance of physical activity in social service programs for the aging, and that such programs would include regularly prescribed physical activity. We suggest that this might be accomplished by adding a subparagraph under title III, section 302(1) to read "health education designed to encourage and assist older persons to attain physical and mental well-being through regular physical activity."

I thank you, Mr. Chairman, and members of the committee, for this opportunity to testify on this important subject.

Senator BEALL. Thank you very much.

I thank all of the members of the panel.

Dr. Fox. Thank you, Mr. Chairman.

I would like to add one point that I think is quite important and well known to you. It is, we believe, important to indicate that only 4 percent of the Federal expenditures for health care go into the provision of preventive services, and we are speaking about preventive services here. We believe sincerely that the expense of efforts of the

type that have been outlined would be returned to the country and the citizens by more than the expenditures involved in their implementation.

Dr. Swartz. May I add one thing, Senator?

In the items in title III, we have transportation, nutrition, this sort of thing. I think one has to put on a pair of glasses of physical fitness on these particular problems; because it seems to me that in providing too much transportation, we are also taking away a method of exercise. I will quote just briefly the sample of what happened to me.

A lady in a particular family lost her husband. She was sitting at home alone. She got meals on wheels offered to her. So a couple of weeks after that, I was called to the house to see her; and she had swollen ankles clear to the knees. I could not find out why she had the swollen ankles at home. She was complaining. Her daughters had to come from New York and Chicago. This was an added expense. They put her in the hospital. They found that physically she was intact. But by providing meals on wheels she stopped doing any activity. She developed swelling of both ankles.

And I think that we should look at this type of thing with glasses because sometime we may be offering something that is doing them harm. In physical fitness programs, it is extremely important in considering older Americans that we use methods that emphasize continued activity.

Senator BEALL. One of the things that concerns us as we legislate in this area, is the concern about whether we have the competence on the area agency level to make sure that proper professional guidance is being given to those who are going to be beneficiaries of this service. I am wondering what kinds of safeguards do we need to make sure that the senior citizens get the proper advice and are not asked to do things they should not be doing? Do we have the manpower properly trained across the country to implement a program, at the area agency level, that will enable us to have the proper safeguards?

Dr. Fox. I think Dr. deVries stated in his opinion, which I share, that we do not. I believe there is a large pool of interested young men and women who would find this to be a career of great interest to them. We must set up the mechanisms for training programs, workshops, and facilities, exercise evaluation, without going to the extreme that we use for the qualification of aircraft pilots, for instance, in commercial aviation; but appropriate exercise tests to be undertaken, made available, at reasonable prices, to reassure people that the programs being recommended are indeed of a very low probability of hazard.

Dr. Swartz. I am on the commission for the Governor from the State of Michigan which has to do with services for the aging; and I think before we get trained people, we cannot wait for trained people; I think somewhere along the line we have to start very simply. We have been trying to do this with the American physician to get him interested in talking physical exercise to all patients he sees, well and sick, in his office. This will precede getting personnel to carry on the program. But I think we cannot wait. This is very important.

Senator BEALL. I am happy to hear that is done in Michigan. It has been my observation that most physicians confine themselves to providing traditional kinds of health services to the aged and do not necessarily get into recommending these other means that might be used to improve longevity or improve the general well being.

I am wondering, is there any organized effort within the medical profession to see to it that the kind of advice and recommendations you are making today get implemented?

Dr. SWARTZ. Yes. I think literature in Geriatric magazine talked to this point quite frequently. The latest one has an article on the senior olympics in California, which emphasizes the possibility of physical exertion on the part of older people, but this is an extreme case.

Dr. DEVRIES. I wonder if I may make another comment in that vein. I think it needs to be pointed out that heroic measures are not necessary, particularly for the older individual who is not in a very good state of fitness. The challenge for him need not be that great, and even such activities as walking have been well documented to bring about available training effect.

Furthermore, I think it is important to point out that there are other aspects of physical fitness which could be implemented almost immediately after training in what I call shop-type situations for improving an individual's ability to do a job at well, which again constitutes a part of the overall physical fitness.

Mrs. RADD. So far, the National Association for Human Development recently recommended to the President's Council, and they have been most receptive in establishing a series of workshops at an areawide level that would bring these people up to speed on what kind of exercise would be appropriate for older persons; so there is movement in that direction now.

Senator BEALL. Are medical schools involved in retraining programs?

Dr. FOX. They are, sir, but not at the level that many of us feel is appropriate. But I am happy to report that there is a great deal of enthusiasm, and I think you will see a burgeoning of interest and good programs so that in a short period of years, all physicians on graduation will have an understanding of these principles and how to apply them.

Senator BEALL. I notice that most physical education training programs are directed toward physical fitness for the young. Is there any emphasis being given to redirecting the physical fitness training programs so they are directed more toward the total population and particularly toward the elderly? Obviously if you start young, you can keep it as a life-style.

Dr. FOX. These two gentlemen represent indeed very worthwhile efforts in that regard.

Dr. DEVRIES. I would like to believe that we are coming to recognizing the need for the older population. Certainly there has been a great deal more effort at the middle age level. I think to really implement the philosophy that we have been talking about at the level of the older individual, designated as 60 and over, is going to require

some agency support for the training of the competencies that are needed to supervise this on the part of both physicians and physical educators to do the job safely.

Senator BEALL. To change directions, has it been your observation that those who now have responsibility for administering the area agencies and/or the other State programs of the elderly, have an interest in and willingness to cooperate with you in your efforts to develop and implement physical activity programs for the elderly?

Mrs. RADD. I think the Administration on Aging is responding to that need right now and the President's Council has been working very closely with them. I would have to answer affirmatively.

Senator BEALL. I would like to thank you all very much. Your testimony has been most helpful.

[The following material was subsequently submitted for the record as follows:]

EXERCISE AND THE AGEING PROCESS

SUBMITTED BY: Harold Elrick, M.D. to the Senate Sub-Committee  
on Aging

SUBMITTED TO: Senator Thomas F. Eagleton, Chairman, Senate  
Sub-Committee on Aging, April 23, 1975

The following statement is based largely on research done by members of the Foundation for Optimal Health and Longevity carried out during the year 1970 to 1975.

As a person gets older, many changes take place in the body and mind. In some the changes are great, in others they are minimal. Thus, there are individuals who remain vigorous, both mentally and physically, well into their 80's and 90's, whereas many become progressively more feeble in mind and body at a much younger age. Our Nursing Homes are filled with people aged 60 to 90 years who have deteriorated mentally and physically to the point of complete helplessness.

If we examine the changes that occur with advancing age, we find a characteristic clinical picture beginning in early middle age or earlier; progressive increase in body fat and loss of muscle and bone mass, gradual loss of physical vigor, increasing levels of blood cholesterol and triglycerides, and high incidence of hypertension and cardiovascular diseases.

During the past 5 years the Foundation for Optimal Health and Longevity has engaged in research on Exercise,

Diet, and Longevity to determine why some individuals and population groups are able to maintain vigor of mind and body with advancing age, whereas the majority follow the course of progressive deterioration cited above. These studies were done in Ecuador, the Caucasus, Hunzaland, and California.

Population groups in Ecuador, Hunza, and the Caucasus were chosen because they had the reputation of being exceptionally long-lived. In Hunzaland and the Caucasus scientific documentation of the ages was lacking. Nonetheless, it seemed clear to us that there were large numbers of older individuals (over 75) who were exceptionally vigorous in mind and body. In Vilcabamba, Ecuador, the documentation of age was considerably better because of existence of Baptistal Records. Here we found 46 men and women over the age of 75 in a village with a population of 819. All of them were unusually vigorous, both mentally and physically.

The long-lived people in the 3 population groups cited above had several characteristics in common:

1. They engaged in many hours of vigorous physical exertion daily; primarily farming, using hand tools, and doing much up and down hill walking in the course of their work. In addition, they frequently carried heavy objects for relatively long distances.

2. Their diet was in general much lower in calories, animal (saturated) fats, cholesterol, and salt than the usual American diet.

3. They were generally slender, well muscled, and had a vigorous, youthful appearance.

4. Blood cholesterols (115-185 mg%) and triglycerides (50-100 mg%) done on the Ecuadorian group were much lower than that of the average American of similar age group.

5. High blood pressure and cardiovascular diseases were virtually absent.

Our studies in the San Diego area were done on 2 groups of individuals:

1. Highly conditioned men between the ages of 40 and 75. These were long distance runners who were training and competing regularly the year round at distances of 1 to 26 miles.

2. A variety of unconditioned, but normal, individuals and groups; school girls and boys aged 9-10, individual men and women aged 17-69, and firemen and policemen aged 30-50 years. These groups were tested before and after 6-12 months of special exercise and dietary programs.

Summary and Conclusions: The research studies cited above have led me to the following tentative conclusions:

1. Daily, prolonged physical activity as a part of an individual's life style is a major factor in the maintenance

of physical and mental vigor many years beyond the usual retirement age (65 or 70 years) in the long-lived population groups studied.

2. A diet substantially lower in animal fat, cholesterol, calories, and salt than is present in the typical American diet is an important factor in the prevention of atherosclerosis (hardening of the arteries) and cardiovascular diseases, and thereby favors increased life span.

3. The older distance runners studied by us exhibit physical and blood chemical characteristics similar to those of the long-lived population groups; maintenance of high physical and mental vigor, low incidence of hypertension and cardiovascular diseases, low blood cholesterol and triglycerides, and slender, well-muscled bodies.

4. Mental and/or physical deterioration so commonly seen in older individuals in the USA is not a part of the normal process of ageing, and therefore not inevitable. It is due to specific diseases or is a consequence of many years of insufficient use of mental and physical faculties. The "Cardinal Law" of ageing is that any body function that is not used continually will gradually be lost.

5. Properly designed and supervised exercise programs based on endurance activities appear to be a practical substitute for the physical activities which are a part of the

life style of the long-lived population groups. Such programs combined with optimal diets (low in animal fat, cholesterol, calories, and salt) have been used extensively in unconditioned individuals by the Foundation during the past 5 years in achieving the physical and biochemical characteristics of long-lived population groups. The application of such programs to individuals of all ages under the supervision of properly qualified personnel is feasible, and wider use of the methods is recommended to increase the incidence of vigorous longevity, as well as decrease the incidence of cardiovascular diseases.

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STATEMENT ON  
PHYSICAL ACTIVITY  
AND  
OLDER AMERICANS

PRESENTED TO:  
THE SPECIAL SENATE COMMITTEE  
ON  
AGING

BY  
THEODORE KLUMPP, M.D.

APRIL 23, 1975

Theodore Klumpp, M.D., is Chairman (Emeritus), Winthrop Laboratories; formerly president, National Fund for Medical Education. Past chairman of the Committee on Rehabilitative American Heart Association; and member, Governor's Council Rehabilitation, State of New York. Was for eight years, a member of the American Medical Association's Committee on Exercise and Physical Fitness. Fellow, American Medical Association and New York Academy of Medicine. Has published numerous articles on longevity, medical research and the pharmaceutical industry. B.S., Princeton University; M.D., Harvard University. Dr. Klumpp is Chairman, National Association for Human Development.

engage in physical activity for the purpose of exercise. That's equivalent to the entire population of France - and it was once said that 50 million Frenchmen can't be wrong. Can 50 million Americans be wrong? I think they are, and that's why we are here. But the fact that there are as many heretics as the population of all of France must inevitably have a powerful influence on us. It means that we are not just playing games but dealing with a matter that is fundamental to the health and well being of our entire nation. It is only when one is in good health and has a reasonable life expectancy that the problems of the world acquire significance. Those older Americans who are sick or about to die couldn't care less about the social, economic and political problems of mankind.

We also have a great responsibility to be sure that we are right and to know why we think our position is correct.

When I first became interested in the subject of exercise and aging during the early 1930's, the physicians of this country were almost all promoting rest in bed as the panacea for everything. Among the gains that you and I can record, and maybe take a little pride in, is the conversion of the preponderance of heart specialists to the idea that exercise is important in the prevention and treatment of heart disease. They were Johnny-come-latelys, and some of them who can't see the woods for the trees are still dragging their heels, but they are at long last on our side privately and officially and moving in the right

direction. Along with this, it is gratifying to note that for the first time there appears to be a decline in the number of fatal heart attacks in the United States. This decline was recorded for the period from 1963 to 1971, coincident with the intensive public information programs of the President's Council on Physical Fitness and Sports, and the American Medical Association's Committee on Exercise and Physical Fitness.

The pursuit of physical fitness for older Americans is not only to look better and feel better. After all, there are cultures in which obesity is admired and sought. Our own Santa Claus is a model to many of what a jolly, healthy, senior citizen should look like. And as for feeling good, there are millions of non-exercisers who think they couldn't feel any better. If obesity were merely a matter of cosmetics, we wouldn't have much of a case. No we are primarily interested in the last analysis, in avoiding the degenerative disease which shortens our lives and prematurely infirms our older citizens. Our focus must turn from health care of the aged to helping them to understand and incorporate the health enhancement factors which result from appropriate levels of regular exercise. The pathological process of arteriosclerosis or atherosclerosis is the underlying cause of the most common and serious of the degenerative diseases with which we should be concerned.

In the remainder of my testimony, I propose to discuss the role of physical activity in relation to longevity, health, enhancement and atherosclerosis.

A century and a half ago, Horace Walpole wrote these lines:  
"About the time I die, or a little later, the secret will be  
found of how to live forever." Feeling that enough time had  
passed to warrant a reply, Helen Bevington answered:

"Horace, be comforted to die.  
One century has meandered by  
And half the next since, it was true,  
The temporal state eluded you.

Now as I read your pensive letter,  
I wish myself that times were better  
And I might boast how men contrive,  
As you foretold, to stay alive.  
By now we should possess the key  
To fleshly immortality  
And, if we wanted to, endeavor  
To live forever and forever.  
This, to my infinite regret,  
Is not a custom with us yet.

I write you, Horace, for good cheer  
Life is about as usual here."

Certainly a man as learned as Horace Walpole was not  
entirely serious when he forecast that someday the secret  
of how to live forever would be found. This no doubt is  
asking too much, and something that does not appear to fit  
into the biological scheme of things. Only the simplest  
unit of life, the cell, goes on sometimes indefinitely by  
division or budding. With this possible exception, all  
living things from century plants to elephants go through a  
cycle of growth, senescence and death.

Let us remember, the biblical three score and ten was  
written a long time ago, some 2500 years, before the dawn  
of man's scientific awakening. In this, what seems to me  
the greatest century of all time, we have suddenly burst the

bonds of darkness and ignorance that have tied men down as crawling creatures on the surface of the earth, and led them to early graves. We have learned to split the atom, regarded for more than 2,000 years as indivisible. We were once earth-bound, and now even the earth and gravity are powerless to contain man's ingenuity and imagination. For all the gains that have been made, do you suppose the last word has been said, and the last gain realized in man's fight against disease, disability and death?

Right now, in laboratories throughout the country, man's endurance and ability to stand adverse conditions are being tested. He is being subjected to oxygen deprivation, low atmospheric pressures, excessive acceleration and deceleration, wind blasts, prolonged confinement and darkness, and a host of other labors of Hercules. The previous measure of man's ability to endure adversity has been found to be false. In a similar way, what yardstick do we have to measure man's ultimately attainable life span? If man can't live forever, to what limit is it reasonable to expect that he might be able to survive? If anyone attempts to give a firm answer to these questions, he might find himself in the position of the Commissioner of Patents who stated in 1844, "We see the arrival at that period where human improvement is at an end."

However, we can at least approach it in another way. Let us take the age of the person known with assurance to have

lived the longest. This may be 117, or 146 for the Dane, Christen Jacobsen Bragenberg - or something even beyond that, as claimed by the Russians. From such an example, we can draw the conclusion that man has the biological capacity of living at least that long. It has been done once; why can't it be done again, and maybe again and again? That is the measure of man's endurance today. It should not be too difficult a trick ultimately for our scientists to reproduce similar external and internal conditions so that many more can be brought up to such a ripe old age - in sound body and mind. I've heard people dismiss the whole subject by saying it's heredity. Pick long lived parents. Heredity in this respect does nothing more than repeat internal physical or chemical patterns of action or reaction, or living habits, conducive to or inimical to longevity. These are also subject to modification without the necessity of invoking the Biblical injunction that "Ye shall be born again."

But prevailing records of longevity do not necessarily represent the limits of man's ultimately attainable life span. The cells of the body, with the possible exception of nerve cells, are being constantly replaced by new cells. The rate at which this occurs and its duration are determined by our glands of internal secretion. Encouraging progress is being made in our understanding of the functioning of this critically important control system of the body. There is at least a

speculative chance that it can be chemically so influenced, modified, or supplemented that the replacement of new cells will continue for a more prolonged period at the rate it occurs in youth. At the same time, we have the problem of, in some way, holding the cells of the central nervous system alive and active for a longer span. In the wondrously coordinated mechanisms of the body, the most awesome phenomenon in all of nature, it is not unreasonable to speculate that the endocrine forces that regulate the rate of cell division may also mediate the continued vitality of the cells of the nervous system, and that these controls go hand in hand, as a good engineer would have designed them to go. All this speculation has only one point, namely, to indicate to you that there is a basis for speculating that man's life span, in good health, can be extended. Indeed, as one who has been a participant in basic research for most of his life, I can tell you that people are working on facets of these very important problems. George Bernard Shaw may have been thinking of something like this when he said that modern man is not God's last creation.

While waiting for the arrival of the millenium, shall we sit by and do nothing, or shall we utilize and apply what we think we now know concerning the aging process. This is not so simple as it may seem, because in the present state of our knowledge, there are very few facts and observations that are beyond dispute, and differences of opinion even among the experts. In the study of problems in this field, we are badly handicapped

by the fact that the investigator doesn't live any longer than his subjects, and he doesn't have the advantage of observing even a single generation from beginning to end. In this respect the science of living and aging is at a particular disadvantage in comparison with other fields of medical endeavor. In order to save years and even generations of time, I believe we are justified in applying working hypotheses based on a reasonably high order of probability. This entails the risk that we may sometimes be wrong, but I have no question in my mind that it is far more desirable to give useful employment to knowledge as early as possible, and run the risk of being wrong occasionally, than to hold off until those distant millenia when everybody agrees. It was wisely said: Nothing will ever be attempted if all possible objections must first be overcome. Let's not forget that there are people who still believe that the earth is flat. When there is something we do not understand, the best thing we can do is to turn to basic biologic and physiologic principles for guidance. With all the conflicts of opinions and impressions, the history of medical science has demonstrated over and over again that those views in accord with such basic principles will eventually turn out to have been correct.

With these considerations in mind, I would like to consider certain factors that appear to have a bearing on physical fitness and the aging process.

Arteriosclerosis, or atherosclerosis, if you will, appears

to be the most important limiting factor in our life span. It is far more important than wars, famine, pestilence and the modern automobile. It appears to be the basic pathological process responsible for the occurrence of deaths due to coronary and cerebral thromboses, hemorrhage and adult kidney disease. It causes 500,000 deaths annually and the evidence indicates that it is increasing. If things don't change, two of every three middle-aged males will die of atherosclerosis. While atherosclerosis appears and develops as man ages, there are good reasons for believing that it is not in itself the basic aging process. It is merely a death-dealing hitch-hiker that goes along for a ride. It does not occur at all in certain animals. It appears not infrequently in children, particularly in the Jews, and at times there is remarkably little evidence of it in older persons who have died of some other unrelated condition. It appears most pronouncedly in association with obesity, diabetes, severe hypothyroidism, xanthochromia and other lipid metabolic disturbances, and (we are now beginning to recognize) physical inactivity. I had a patient, a friend who was immobilized in bed for 25 years with a broken back. If anyone was protected from stress and physical wear and tear, it was he. He died, not of his broken back, but from atherosclerosis.

To throw up our hands and say that atherosclerosis is merely something that is inherited is to say nothing. The mere observation that the same change may take place in related individuals is interesting, not at all surprising and of no

consequence in getting at its fundamental nature. There is a physical or chemical change that is responsible for this phenomenon, and this is what we are primarily interested in identifying.

It is a strange circumstance that disability and death from atherosclerosis should be on the increase coincident with the phenomenal advances in our civilization and standard of living, a period marked by so many other gains in health, comfort and human well-being. Some of this apparent increase is due to more accurate diagnosis and the fact that other causes of death, which have claimed young lives, have been reduced. Nevertheless, most students of the subject are convinced that the increase is real in both a relative and absolute sense. Some have ascribed this situation to the anxieties and tensions of the modern world. Unfortunately, I cannot find this explanation convincing. Since the dawn of civilization, every age has had its tensions and anxieties which, I have no doubt, have always seemed the worst ever to those living at the time. By what standard, by what instrument of precision, are we qualified to conclude that now has come the ultimate. I rather suspect that the lurking dangers of the jungle, the savage terror of the unknown, the looming threat of pestilence and famine were just as real worries in times gone by as the atomic bomb, wars, inflation, Watergate and the energy crisis are today. But more important than national or international tensions as sources of anxiety, are the personal everyday problems of the individual.

His own individual disappointments, frustrations, losses and bereavements are the more potent, real and immediate sources of anxiety, and these have been present as long as man has enjoyed the mental and emotional attributes of a human being. The so-called swift tempo of modern living has significance only in how we adjust or react to it. One man can drive at 2,000 miles an hour and feel little if any emotional stress. Another rolls along with a horse and buggy and feels as if he were flying. Indeed, were strain, tension and anxiety the critical factors in the etiology of vascular accidents I see no reason why they should not occur more commonly in young individuals, where these forces are often at their maximum intensity. On the other hand, there is good evidence that vascular accidents are the result of atherosclerosis, and I have found no convincing explanation of the role of anxiety in the pathogenesis of this process.

But perhaps there are other factors in our civilization and way of life that should be considered as possibly having a bearing on the increased incidence of arteriosclerotic heart and vascular disease. Perhaps not all the products of technological gain have been beneficial to man. It would be surprising if they were. Our scientists and engineers have been and are increasingly on a mad rampage to develop not only labor-saving devices but every conceivable gadget to enable man to avoid effort, exertion and activity, whether it saves labor or not. We no longer tend the furnace or carry out the ashes; we drive

a block for a newspaper, instead of walking, and for even this we no longer need the muscles to steer, apply the brakes or open the windows - and we are more tired than our fathers and father's fathers used to be when they ran, walked, chopped wood, shoveled snow, dug ditches, pitched hay, stoked the furnace, and did all the physical chores so abhorrent to the last third of the twentieth century.

A story illustrates my point: A father sent his son to the cellar for a screwdriver. Son: "I found the vodka, but I didn't see any orange juice."

Have you ever seen anyone take a single step on a moving escalator? If you have, it was probably some oddball like Hans Kraus of New York or Ted Klumpp. Heart attacks are not the result of shoveling snow or running for a train, as popularly believed. On the contrary, they are the product of a lifetime of not doing things like shoveling snow and running. It is true that an attack may occur coincident with exertion, but more than 50% of heart attacks happen while the victim is asleep in bed. And if he isn't asleep, whatever he happens to be doing at the time or in the recent past gets the blame. We are imbued with the idea, without the benefit of scientific rationale that physical exertion, particularly in the older American, is harmful. This has taken the form of a national psychosis that has swept the country like an ancient plague. We are afraid to live for fear of dying.

It was Theodore H. White who said that the history of contemporary civilization is the story of the displacement of food as the principal source of energy by coal, petroleum,

water power, gas, and I may add atomic fission. But we go about on stoking our human furnaces as we did when brawn and muscle power made the wheels of the world go round. Does all of this carry with it a penalty in terms of the degenerative diseases, heart disease and arteriosclerosis? Fortunately, more and more of us are becoming convinced that it does. We have more labor-saving devices in this country and the highest incidence of heart attacks. Is there any doubt that there is a connection between the two?

Two important fundamental biological principles appear to have application to what we are talking about. The first is this: Tissues and functions that are not used, atrophy. There is no argument about the application of this principle to muscle tissue. The functional capacity of the heart and blood vessels is derived from their muscular structure, and the manifestations of atrophy are clearly evident at all ages in the shortness of breath and reduction in work capacity that results from disuse. To me one of the most striking demonstrations of this is the astonishing rapidity and extent of the physical and circulatory deterioration that takes place as the result of a short period of immobilization. In my way of thinking, this has been one of the most important scientific revelations of our space flights. We did not really realize before how quickly this physical deterioration occurs. In addition to the manifest effects in terms of circulation and muscles, we know that the bones lose their calcium contents and then clots form in the

blood vessels, stones in the urinary tract, digestion is impaired, and the bowels and organs of excretion lose their functional efficiency. I have no doubt that the endocrines, in their delicately balanced interrelationship, suffer also. Immobilization in bed and in space, and its effects, differ only in degree from the immobilization resulting from our so-called labor-saving devices and present day attitudes toward physical activity.

Based on loss of motivation and interest, and to a large extent because of the fear psychosis against exercise and exertion, our older Americans reduced their physical activities still further, to the same effect, and with what I believe is especially damaging, if not disastrous results.

In addition to the consequences previously noted, atrophy of disuse accentuates the lessened capacity of older persons to react to stress. I have no doubt that such avoidable atrophy is a contributing factor in the death of older persons subjected to accidents, shock, operations, deprivation, stress and prolonged illnesses.

Aside from its functional aspects, it is a depressing thing to see what can happen to the human figure - a thing of most exquisite beauty until misshapen by fat, atrophy, bulges, swellings, protuberances, pendulocities and hernias. These are not necessary concomitants of the aging process, as the fine physically active figures of many elderly ladies and gentlemen without corsets, girdles, belts and trusses bear witness.

So much has been said and written about the harmful effects of stress that I am afraid we have been left with an entirely lopsided view of its biological role. It has not been made entirely clear that extremes of stress, from the standpoint of intensity or duration, are harmful. In this connection it is safe to assume that extremes of any kind are harmful. Like potent medicines, the proper dosage is beneficial and even life-saving; too much is poison. In a similar way, I look upon moderate or graded stress as necessary to the maintenance of good health, vitality, and an adequate reserve against the extremes of stress that in one way or another befall all of us. Functional capacities of all systems of the body can only be augmented through moderate stress. From this point of view, exercise may be regarded as the most beneficial form of graded stress. I have no doubt that it applies to the mind and emotions as well as to the rest of the body. This principle has, I believe, particular application to the aging process. After the prime of life, the peak of which comes at different times for the various functions of the body, a decline occurs. In my opinion this decline will proceed more slowly if the bodily functions are fully employed and, through moderate and unfortunate descending stress, they are held to their maximum capacities.

What I consider to be one of the most important biological principles has a bearing on this subject, and it is this: "Nature tends to eliminate those who have relinquished their functional usefulness."

Unfortunately, nature does not appear to favor mind over matter, and the full utilization of only our mental capacities does not appear to be enough. I believe that we must do everything we can, as we grow older, to resist the inclination to slow down the tempo of our living. I am convinced that if you will just sit around and wait for infirmity or death to come along, you will not have to wait so long.

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STAY YOUTHFUL AND FIT  
Presented by  
LAWRENCE E. LAMB, M.D.\*

To The  
Senate Subcommittee on Aging  
April 23, 1975

Despite the obvious capacity to live well past 100 years most individuals from industrial societies do not. At birth the life expectancy for a white woman in the United States is 74.9 years; for a white man it is only 67.5 years. For nonwhites the life expectancy is 67.5 years for women and 60.1 years for men. The average life expectancy of a man who has already reached 50 in the United States is 70, but on the island of Cyprus 50-year-old men have a life expectancy of 83; in Iceland, 79; and in Sweden, 78. Since these are averages, many have longer or shorter lives. In the United States in a population of 100,000 white males aged 40 to 44 years, 1877 die each year of atherosclerotic heart disease, a complication of atherosclerotic blockage of the arteries. Atherosclerosis is responsible for many changes often ascribed to old age.

For the vast majority of individuals, the first hurdle in lengthening life is doing away with heart and vascular

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disease and cancer. It is generally believed that if satisfactory solutions to these major medical problems of modern society are found many individuals can live in good health to the centenarian mark. One should emphasize that the interest here is in increasing the active middle years of life--that is, delaying the onset of old age. Many individuals who die before their time really begin to have the things we associate with old age sooner: heart attacks in their 40's and 50's, strokes, loss of physical ability, impotence, and other manifestations of sexual decline accompanied by loss of physical prowess.

Living with all of one's faculties, health, and vigor, with the full joy of living, is one thing, but to be disabled, isolated, unloved, and ill is another.

There are social problems to be solved as well as medical and health problems, if one is to enjoy a long life. Even so, it is not possible to deny the rewards of being able to live longer in good health with full vigor and as a meaningful part of one's society and environment. Aside from dreams for the future, there are solid facts to support what the individual can do to help achieve this goal now: specifically, understand the changes that occur with the process of aging, and learn how to delay the adverse changes, and maintain youthfulness and energy. It is entirely possible for most people to add years of healthy vigorous living

to their life span. Usually a change in some living patterns is required, as well as the development of a disciplined personality. But the person who loves life and wants to live while he lives can do something about it.

#### Acquired Versus Time-Dependent Aging

Many of the health problems, disability, and the deterioration now associated with age are "acquired changes" rather than simply the result of the passage of time. A social attitude has evolved that because of a person's age he is expected to have these changes; therefore, they can be disregarded. The simple truth is that most older people in our society are not just old. They are sick and have as much right to society's concern as infants or adolescents.

At age 70 a person may have reached only the halfway mark of the possible life span if the 50 maximal cell doublings were achieved. Many disabilities of the 70-year-old person are from acquired defects that we have not learned to prevent or cure rather than from time-dependent aging. The first step in managing these problems is recognizing that they are illnesses--not just the ravages of time.

For example, fatty deposits may plug the arteries and interfere with circulation, causing, in turn, heart attacks, strokes, and other diseases. The resulting dead heart cells, brain cells, and cells of other organs are dead because of a disease process, not because of time. Death from cancer

in older people occurs because something has gone wrong in the body, not because of time. It is true that increasing age seems to decrease the body's ability to withstand these disease processes and other environmental challenges, but even that observation isn't absolute. Doctors may examine the heart of a 26-year-old man and note that it "is as old as a 70-year-old man's," and what they mean is that the changes in the arteries are as advanced as those often seen in older men; but in neither case are the changes caused by time. The occurrence of heart attacks and cancer and even early osteoarthritis in young people reminds us that we are dealing with "acquired changes."

Because the end results of aging and of common diseases are the same, no doubt there is an overlapping between the effects of "acquired changes" and "time-dependent changes."

#### Disuse Factor

Certainly many of the problems noted in older people which we attribute to aging are the direct result of disuse. There is clear evidence of loss of muscle cells and decrease in size of muscles if they are not used, just as there is evidence that the amount of muscle mass can be increased with appropriate exercise, as long as the blood supply for the developing muscle is adequate. Disuse of bodily systems not only affects skeletal muscles but can affect the heart

muscle, decreasing the heart's capacity. It can affect the lung's capacity and almost every bodily system. Nature seems to follow a simple principle: "If you don't use it, you lose it."

A good example of this principle is what happens in the formation of red blood cells. Everyone destroys a certain number of red blood cells every day by normal physical activity. The simple mechanical process of circulating blood causes mechanical wear and tear on blood cells and brings about this destruction. The older cells apparently are the weaker ones and are the ones usually destroyed. If an individual maintains a relatively constant level of activity, the bone marrow will form enough red blood cells each day to replace those that are destroyed. In this way the necessary balance of red blood cells is preserved within narrow limits. If a person becomes inactive, the cells are not destroyed so rapidly and the bone marrow stops producing as many. It literally becomes inactive and may take as long as three weeks to be fully reactivated when one resumes more vigorous physical activity.

There are countless examples, whether reference is to chemical systems or more obvious mechanical systems like bone and muscle, to show that the range of capacity of the human body's functions is dependent upon using it. Physical

strength comes from using the body; chemical ability, from exercising the chemical system of the body. Loss of the normal range of these functions is not genetic aging; it is the body's response to disuse. Perhaps lack of activity in some way turns off some of the basic cellular mechanisms, but this is theory. In any case disuse is an important component in the weakening, loss of function, and loss of the full range of capacity of function seen so often with increasing years. Most of these changes are within the voluntary control of the individual.

#### Atherosclerosis

Atherosclerosis is the accumulation of fatty deposits in the arteries. This can occur anywhere in the body. If it affects the arteries to the heart muscle, it causes heart disease; to the brain, it causes strokes; to the legs, it interferes with walking; to the genitals, it can interfere with a man's capacity to have erections or affect his testicular function; to the kidneys, it can alter their normal function. Because atherosclerosis leads to blockage of the arteries, it interferes with circulation. Cells will then be deficient in oxygen and nutrients and accumulate end products of metabolism like carbon dioxide. These adverse effects on the cells limit their capacity to regenerate and hinder their growth and response to use, thereby contributing to the disuse problem. In their extreme form they can result in cell death.

Through causing heart attacks, strokes, and kidney disease and its multiple problems, atherosclerosis accounts for approximately half of the deaths in the United States. It occasions untold numbers of cases of senility because of brain damage and a host of other medical problems. The amount of fatty deposits in the arteries clearly increases with age, and it was therefore once assumed that atherosclerosis was an aging phenomenon. This is obviously a false assumption since atherosclerosis also occurs in young people, particularly in the arteries to the heart in men as young as 22 years of age and in sufficient amounts to cause heart attacks in these individuals. Nevertheless, because it increases with age, the changes it brings about are often considered as aging. They are, of course, acquired changes.

#### The Musculoskeletal System

We commonly think of youth as being associated with supple bodies with good muscles and strong bones capable of a wide range of physical activity and endurance. We think of age, by contrast, as being associated with loss of muscles, weak and brittle bones, and loss of body suppleness. Certainly within our framework of living patterns these concepts are true. Yet in many parts of the world older individuals continue to be physically vigorous with strong muscles, strong bones, and supple bodies. One need look no farther than the 70- and 80-year-old Africans who are tribal dancers. Many changes noted in the muscles and skeleton with age can definitely be prevented.

#### A System of Opposing Forces

One of the interesting things about the musculoskeletal system is the arrangement of the muscles and their attachment to the skeleton. For the most part there are opposing sets of muscles. This feature is very important in appreciating what happens to the musculoskeletal system with advancing years. Examples of opposing muscles are everywhere. The biceps in the upper arm contracts to bend the elbow. The triceps muscle on the back of the arm contracts to straighten the elbow. The actions of these two muscle groups oppose each other. Opposing muscles bend or straighten the joints in almost every region of the body, or rotate parts of the skeleton in opposite directions. Muscles along the back help us sit or stand upright. They are opposed by muscles from the other side of the trunk which allow us to bend the spine forward. There are muscles which help us rotate the spine to the right and other muscles which rotate the spine to the left. Large muscles in the front of the neck let us rotate the head to the right or to the left. Muscles between the shoulders help us keep our shoulders back in a normal position. Muscles across the front of the chest contract in an opposite direction and tend to roll the shoulders forward, producing the rounded-shoulder effect. The state of contraction and general position of all these muscles in relation to each other are responsible for optimal posture and movement.

The commonly observed decrease in the size of muscles with increasing age is not all time related. The muscle mass can be influenced by the amount and type of physical activity. A person with relatively small muscles can develop large muscles with a properly carried-out weight training program. Exercise which causes the muscles to have to contract firmly or against force will gradually increase the size of the muscles. Older individuals who have continued forms of physical activity that constantly work the muscles often have retained a larger muscle mass than much younger individuals who follow no physical fitness program. The range of possibility of development of muscle mass is so great that there is a very obvious overlap between the physically active older person and the inactive young person. Not that the very old person by physical activity alone can retain the maximum amount of muscular development that the human body is able to achieve. But physical activity is a major factor in maintaining muscle mass, ~~and~~ its absence is a major ~~factor in failure to develop~~ maintain muscle mass.

Because physical activity progressively declines in individuals with increasing years or sometimes with material success, there is a tendency toward a gradual change in body composition so that a large portion of the muscle mass is replaced with fat tissue. This is a main reason for the change in body configuration attributed to aging. It is often said that as a person gets older his chest falls. The largest

dimension ~~is~~ longer around the chest but around the waist and buttocks.

It is intriguing to observe the decrease with age of steroid hormones generated by the adrenal gland and the sex glands that parallels the decrease in muscle mass. The measurable amounts of these eliminated in the urine decrease with age, but correlation with muscle mass shows that the same amount of the hormones is formed per pound of muscle in both the young and the old. While there is probably some inherent decrease, the question is whether or not the decrease in the hormones is associated with age or lack of physical activity. Since muscle size can be increased with exercise at almost any age, there remains the possibility that physical activity which increases size and function of the muscular system can in turn influence the master genes of the body that control the time sequence of the various cells and in so doing be a youth factor.

#### The War with Gravity

The commonly observed loss of muscle mass in advancing years affects some muscle groups more than others. Muscle tissue is typically lost between the bones in the hand, leading to the development of the "bony hand" of older individuals. By appropriate hand exercises these muscle groups can be at least partially maintained. Similarly, the muscle

fibers in the arms and legs tend to shrink, so that the size of the muscles in the extremities is decreased. The loss in size and strength of the abdominal muscle results in the relaxed abdomen which is a major factor in the familiar "bay window."

The muscles along the entire spine are likely to weaken, as are those between the shoulders. These and other changes are responsible for the posture and physical appearance of the body of older people. There is a constant battle against gravity to maintain upright posture. As the muscles weaken, the battle is lost and the body begins to sag. Just as an old tree gradually bends to the earth, the human body bends more and more; its muscles can no longer keep the skeleton in its optimal, upright position.

As the muscles become less and less able to maintain the constant state of semicontraction necessary for proper alignment of the spine, the spine bends forward, decreasing the normal tension on the abdominal muscles. Visualize a bow and its string. The bow is the spine; the taut string, the abdominal muscles. If you seize the bow by both ends and bend it or curl it, the tension on the string is released and the string becomes slack. So it is with the abdominal muscles. As the spine inclines forward, it relieves the tension on these muscles and they become slack.

Abdominal muscles that remain strong add support to the spine and reduce a great deal of the wear and tear of weight on the spine and spinal muscles. Thus in this sense they work together.

As the weak muscles between the shoulders lose their tone, they remain stretched even in the resting state. The muscles across the front of the chest (pectoral muscles) then contract or their fibers shorten, so that the shoulders roll forward. The end result is a combination of muscles in the front of the chest which are contracted, unable to stretch to their usual length, and muscles across the back of the shoulders which are weakened and overstretched. Clearly, correction of this type of problem involves treatment of both muscle groups, the relaxation and lengthening of those across the chest and the strengthening of those between the shoulders to provide normal shoulder position.

In addition to the changes observed in the spine, the joints begin to bend at hip and knee just as if they were giving slightly under the constant load of carrying the weight of the body. The flexed positions of the hips and knees contributes to the loss in height associated with increasing years. Maintaining the optimal range of capacity of the muscles will go a long way toward maintaining proper positioning of the hips and knees for optimal body posture. The tendons at the joints also shorten as the muscles remain contracted. The Achilles tendon in the ankle, for example

shortens, decreasing the mobility of the ankle. Regular stretching of a joint helps retain normal tendon length.

The elbows and wrists also tend to be slightly bent, and keeping their full range of motion is likewise an important aspect of preserving youthful vigor. The body makes constant adjustments to maintain balance as it loses the battle against gravity. Factors which influence the legs and spine gradually reach up to affect the neck and head, since the head must balance on top of the spinal column. The changes in the musculoskeletal system just described cause the head and neck to thrust forward a little. The face itself changes. If the muscles are not used frequently, the face may become impassive, and there is likely to be frequent blinking of the eyes.

The changes in body posture are not solely muscular. Degeneration of the spine, associated with the degeneration of the disks between vertebrae and actual dissolving of the bones, causes fractures of the spine, deformities of the vertebrae, and other derangements which magnify the problem. It cannot be emphasized too strongly that once these changes have become extensive it is impossible to reverse them. Therefore a preventive program for the musculoskeletal system must be established early in life. Since the formation of bone--and, indeed, its destruction--is frequently a long-term process, such a program should be initiated early and followed vigorously.

As skeletal changes occur, underlying medical problems often become more important. These include such things as having one leg shorter than the other (which causes the pelvis to tilt and the entire spine to be canted out of position) and old injuries of any type which have affected the skeletal system. The loss of normal muscle strength alone is a major factor in the frequent occurrence of backaches, and these of course are common even in young people, who also may have weak muscles. The overall preventive program for the musculoskeletal system is invaluable even in the early years in preventing backache.

#### Exercise

There is a lot of truth in the saying "If you don't use it, you lose it." Exercise or physical activity is a means of preventing disuse. Disuse is a major factor in causing many of the changes in the body we call aging. Physical activity is essential to maintain the strength and function of the musculoskeletal system, including bone and muscle mass. Bones that are not used tend to decalcify. If a leg is put in a cast, the leg bone loses calcium, and, of course, the size of the muscle also decreases.

As muscle mass shrinks, the amount of vital hormones declines. The amount of steroid hormones from the adrenal gland and sex glands diminish with age, but in proportion to the decrease in muscle mass. It is not definitely known whether increasing

the muscle mass will increase the amount of hormones and what the overall effect will be upon the body. It is known, however, that the muscle mass can be increased in middle-aged, inactive people by appropriate exercises. With an exercise program, there are many medical indicators of improved health and well-being. It is possible that the level of physical activity is a significant factor in maintaining optimal functions of the endocrine glands to provide lifegiving hormones for continued youth and vigor.

Patterns of muscle movements are integrated with the nervous system. The finely coordinated movements of the concert pianist, for example, respond to a memory pattern in the brain or to a visual stimulus which is processed through the brain. Or again, if a leg is removed, the nerve cells related to its function undergo changes. There are numerous other examples to illustrate the interrelations between the musculoskeletal system and the nervous system. It is well known that a stroke or damage to the central nervous system can cause a leg or any portion of the musculoskeletal system to cease functioning properly. Conversely, the functions of the musculoskeletal system affect the memory organization and fundamental patterns of response, ultimately

musculoskeletal system and its function are linked to the functions of both the nervous system and hormone production. The nervous system and endocrine system likewise influence each other. Thus, the musculoskeletal, nervous, and endocrine systems are synchronized, and physical activity influences all three.

#### Work for the Heart Muscle

Exercise assists in maintaining optimal function and health of the heart and circulation. It must be used properly. Physical activity requires that more oxygen be delivered to the working muscles. Transporting this greater amount of oxygen is the job of the heart and circulation. It's easy to understand, then, that physical activity makes the heart pump more blood or work harder. The capacity of the heart to pump blood is increased by working it, just as the strength and size of any other muscle in the body are improved by using it. A distance runner needs to develop not only the muscles in his legs but the strength and capacity of the heart muscle to pump enough blood for him to run. Individuals who undertake very little physical activity do not allow the optimal capacity of their heart

and circulation to be achieved.

#### The Vital Artery Network

Proper Physical exercise increases the circulation to the heart muscle by developing the network of small arteries between the two main arteries to the heart. This network is important in providing adequate blood flow to the individual muscle fibers. In the healthy physically fit individual the network is extensive, and during vigorous physical activity it enables large amounts of blood to be circulated to the working heart muscle fibers. In the absence of a well-developed network, the amount of blood siphoned to the heart muscle, and hence the work capacity of the heart is limited. A well-developed network also helps to protect the heart from the effects of blockage in any one branch of the artery system by a buildup of fatty deposits. In fact, if an artery is blocked in one spot and the individual survives, the network to detour blood around the blocked artery is further developed to provide a new blood supply to this area of the heart muscle.

The increased circulation to the heart muscle brought about by exercise not only helps protect one from a heart attack but also improves his chances of surviving a heart attack if it occurs. The greater vascularity of the heart muscle is comparable to that noted in the skeletal muscles. If these are exercised and developed, the circulation to them is increased.

Increase in Volume Capacity of the Heart

Adequate amounts of proper exercise will also increase the volume capacity of the heart. Remember that the heart is a muscular organ and acts as a reservoir for blood between beats. If the heart has to pump more blood, it actually starts enlarging its chambers so that more blood can be stored for each beat. This is a normal healthy response. It is similar to the increase in volume of the lungs that can be induced by breathing exercises. If a heart has a very small capacity, its ability to increase the amount of blood it can pump is limited, and consequently the amount of oxygen that can be delivered and the amount of physical activity that one can do are limited too. Clearly, the volume capacity of the heart is an important factor in a person's ability to perform strenuous or lengthy exercise. In individuals who are free of significant blockage in the arteries to the heart muscle it is probably the single most important factor controlling the amount of physical work that can be done.

The heart does sometimes enlarge with disease, but this is a compensatory mechanism to try to overcome some mechanical defect in the heart. For example, if a valve to the outlet of the heart is partially obstructed, the heart has to work harder to eject blood past the obstruction. In essence the heart is worked and it enlarges accordingly. The normal increase in size and capacity of the heart with physical

exercise in healthy people is a healthy finding and shows optimal heart function. An indicator of this is the heart rate. The individual with a relatively rapid resting heart rate is likely to have a small heart with limited capacity. The healthy individual with a normally slow heart rate probably has a heart with larger capacity and a greater range of function.

#### Circulatory Efficiency

Physical fitness increases circulatory efficiency. That is, the heart and circulation of a person in good condition do less work for a given physical task than those of a person in poor condition doing the same task. Both may use about the same amount of oxygen if the task really requires the same amount of energy, but to deliver that oxygen in the unfit individual the heart has to pump a great deal more blood; thus there must be an increased blood flow to the heart muscle. The reasons are not entirely clear but are undoubtedly related to the small arteries that channel blood to the different parts of the body. In the well-conditioned athlete a major portion of the blood pumped by the heart is sent directly to the working muscles and a smaller portion of it is sent to muscles that are not being used. In this way the maximum amount of oxygen can be withdrawn from the blood pumped by the heart. Many complex mechanisms exist in the body that provide for transporting the increased amount of blood pumped by the heart directly

to where it is needed as opposed to sending it equally to all parts of the body.

#### Exercise and Atherosclerosis

Of course exercise influences the heart and circulation indirectly through its metabolic effects. To the extent that exercise decreases obesity and lowers the amount of fat particles in the blood, it helps to prevent the build-up of atherosclerosis which causes blockage of the arteries. It therefore improves the circulation all over the body-- in the legs, the kidneys, the testicles, or wherever. Since atherosclerosis can even affect the balance and hearing mechanisms, to the degree that exercise prevents atherosclerosis, it can help maintain optimal function of the ears. Whenever one loses body weight, he also finds it easier to engage in a lot of normal physical activity without overloading his heart. The excess fat that a person carries around is truly an extra weight. Obviously the man who walks a mile carrying 50 pounds of excess fat must work harder, and his heart must pump more blood and work harder too. If the heart has a limited capacity because of disease or other factors, getting rid of the extra 50 pounds of fat means the body has to work less during that mile walk and the heart has to work less. Even an individual with limited capacity of the heart can walk more after he has lost excess fat than he could before and still not overload his heart.

To the extent that exercise induces fat loss, it will improve exercise capacity whether or not the work capacity of the heart is increased.

#### Blood Pressure

Exercise tends to affect the small arteries throughout the body which are important in regulating blood pressure. Either through the exercise activity itself or through associated fat loss, changes occur in a number of individuals that result in a lowering of their blood pressure at resting conditions. During exercise the blood pressure normally goes up. In individuals in poor physical condition it usually goes up more rapidly than in those in optimal physical condition. Thus, exercise is often a useful adjunct in treating people with elevated blood pressure.

#### Breathing Capacity

Just as exercise requires the heart to pump more blood, it also requires the lungs to provide more oxygen. Increased breathing exercises the lungs and helps maintain lung capacity. Not only are the lung sacs themselves filled and emptied rapidly during moderate exercise, but the muscles in the chest wall that are responsible for expanding and contracting the chest cavity are also put to more vigorous use. There is a considerable body of evidence to suggest that regular, adequate amounts of exercise help keep up the functional capacity of the lungs.

Blood Formation

The level of physical activity influences the body's capacity to form red blood cells. Each day a small number of red blood cells are destroyed as they succumb to the wear and tear of being tumbled through miles of blood vessels. The greater the physical activity, the more rapidly the blood circulates, and consequently the more red blood cells are destroyed each day. These are replaced regularly by the bone marrow and blood-forming organs of the body. With regular levels of physical activity the blood-forming organs produce the same amount of red blood cells that the body destroys. Thus the number of red blood cells is kept in fairly constant balance.

During periods of long inactivity, red blood cell destruction decreases and the blood-forming organs cease to produce as many red blood cells. They become relatively inactive and sluggish compared to their state in a very active individual. I observed this effect in studying many healthy young men placed at bed rest to evaluate the probable influence of weightlessness during space flight. When the men got out of bed and resumed normal physical activity, the old red blood cells which had accumulated were suddenly destroyed. The bone marrow had become accustomed to producing a small number of red blood cells and was unable immediately to replace the destroyed cells. As a result most of these young men tended to develop a sudden anemia caused by resuming normal physical activity. In the course

of three to four weeks of normal physical activity the bone marrow would regain its level of productivity and a new balance would be established. At this point the anemia would disappear.

In other studies--of dogs--the bone marrow was found to be yellow, filled with fat, and inactive in caged dogs not allowed to exercise. Dogs exercised regularly developed a rich, red marrow characteristic of active blood cell production. Exercise is apparently important in maintaining optimal bone marrow function.

#### Summary

I am pleased to have the opportunity to present this statement because I am sure that the government can help a large number of older people to see the values they can gain for their health with a good fitness program. I am confident that if older Americans could be educated about the healthful aspects of exercise the demands for health services could be sharply reduced. We have a lot of smart older people, and they are capable of helping themselves, if given the knowledge. If our society can learn to live better and maintain fitness in its broadest sense, people will not suffer from many of the medical problems we attribute to old age.

IMPORTANCE OF PHYSICAL ACTIVITY FOR THE ELDERLY

SUBMITTED BY: \*Allan Ryan, M.D. to the Senate Sub-Committee  
on Aging

SUBMITTED TO: Senator Thomas F. Eagleton, Chairman, Senate  
Sub-Committee on Aging

Physical activity brings life and inactivity leads to death. This is hardly a new concept, but one which we as a nation seem to have to be reminded of at least every 50 years. We talk about physical fitness as if it were something we invented rather than a quality that we had almost lost sight of 20 years ago. Thanks to a series of sharp reminders from the President's Council on Physical Fitness and Sports, and from the dedicated physicians and others who have supported the Council's work, we have steered a sizable proportion of our people back on the track towards keeping themselves more physically fit.

In the rush to get on the bandwagon however, we have left a significant group of our people -- the great majority of our senior citizens -- somewhere behind. True, we have "Masters" and "Seniors" programs going on now in a number of sports, and we see some outstanding examples of men and women in their seventies and on up who are remaining active in vigorous and demanding physical activities. But these

are only a small portion of the millions of older persons who could benefit from being involved in active physical exercise but instead are languishing in apartments, rest homes and other dwellings where they seldom get any vigorous activity at all.

Why should it be important for older persons to exercise vigorously? Haven't they run their course, and don't they deserve a rest? When a man or woman stops working, we say that he or she is "retired," signifying a withdrawal from occupation, but too often it means a withdrawal from life. Physicians know that the body functions decay when they are not called upon regularly. Herodicus, who preceded the great Hippocrates 2500 years ago, exercised his patients vigorously to restore their health when they had been ill and advised them to exercise regularly to keep from falling ill again. It is easy to measure the decrease in the size of a muscle when it is deliberately or accidentally immobilized. The heart enlarges and strengthens itself when stimulated by vigorous exercise but shrinks and weakens in its force when its owner become inactive for too long.

But shouldn't the elderly be more cautious against over-exertion, since many have some chronic infirmity which might be aggravated by too vigorous exercise? Galen warned his fellow physicians 1800 years ago that it was meaningless to

speaking of a perfect state of health, since no one of us could be said to enjoy it. Rather, he said, we should think in terms of our ability to be active and to be useful to ourselves and others as a measure of our state of health. Even the physically handicapped person need not be considered in poor health if he can participate actively in life. In fact, there is no better way for him to improve his health.

Rather than encouraging the senior citizen to a life of vigorous activity, our society has tended to push them out of the mainstream and into the backwaters where they drift in a desultory fashion, lapsing into a gradual decline which leads inevitably to a hospital, a convalescent home and eventually to a death which may be untimely. They pay the price with their lives, and society pays in hundreds of millions of dollars for medical and ancillary care services.

It is a mistake to assume, however, that the elderly have an entirely free choice as to whether they will remain vigorously active or not. Besides these barriers of ignorance and lack of motivation which they set for themselves, there are others even more formidable which many of them are in no position to overcome. Lack of funds, an inhospitable environment, lack of facilities, inadequate transportation, and lack of trained supervision and leadership are the chief of these. Localities and states, already heavily burdened with costs for educating the young and providing welfare and

medical assistance for people of all ages, have not met and perhaps cannot meet, the costs of surmounting these barriers to greater physical activity for the elderly. Here is where the Federal Government may play a role.

What is needed is to put to work the knowledge and experience of those in the fields of health, physical education and recreation. We must have sufficient funding to make available to older persons the programs, leadership and facilities which will enable them to become involved on a year-around basis in physical activities which will help to keep them healthy and mentally alert, thus increasing their independence and perhaps even prolonging their lives.

Outdoor programs should be available throughout the year, and in many cases this would not necessitate new facilities. In the northern tier of states, however, there would be a great need for large multi-purpose indoor facilities whose use would be restricted to the older age group.

The Federal Government could forward these purposes by making grants to localities, states and other public and private agencies who would agree to plan, staff and maintain such programs and facilities. Within a relatively few years, such grants would more than pay for themselves by reducing the heavy expenditures for medical and para-medical services for which the Government is now liable. The medical evidence

that this could be so is already available but will not be cited here in the interests of brevity. Failure of the Government to act in this matter will only result in the costs of care for the elderly continuing to mount steadily.

\*Dr. Ryan is professor of Rehabilitation Medicine, University of Wisconsin, Madison. Formerly practiced general surgery in Meriden, Connecticut. Past chairman, American Medical Association's Committee on Exercise and Physical Fitness; Fellow, American College of Sports Medicine; member, Wisconsin Governor's Council on Physical Activity and Sports for Fitness. Editor-in-Chief, "The Physician and Sportsmedicine"; participates in symposia and seminars throughout the world on athletic injuries and sports medicine. B.A., Yale College; M.D., Columbia University.

PHYSICAL ACTIVITY AND AGING

by Merritt H. Stiies, M.D.\*

To The  
Senate Subcommittee on Aging  
April 23, 1975

The relationship between physical activity and the aging process has long been recognized. Many physicians have noted that their healthier older patients, particularly those in their late seventies, eighties and nineties, are almost without exception, unenthusiastic persons who are still young in spirit. It is a moot question whether they are active because of their enthusiasm, or enthusiastic and interested because of their activity. The two characteristics unquestionably go hand in hand. It may be significant that if one of these healthy older individuals is compelled to remain inactive for a prolonged period, by accident or illness, deterioration will set in and a steady downhill course will ensue unless the individual can be stimulated to return to the greatest degree of activity possible.

Studies have shown a gradual but progressive deterioration in physiologic function associated with chronologic age. This applies to the maximum oxygen uptake, the maximum heart rate, the vital capacity, the metabolic rate, and numerous other functions. Yet there is some question as to whether these changes are the result of age alone. One study suggests that the decline in maximum heart rate is related to the decline in metabolic rate, rather than of age itself. Other observations have suggested that if an active exercise program is pursued, the maximum oxygen uptake does not decline, or declines much more slowly.

Granted that exercise may be a factor in slowing the deteriorative changes of the aging process, how vigorous should exercise be? While we lack a definite answer, there is a growing feeling that the "moderation" which the medical profession has preached so long, may not be the final word as far as exercise in the conditioned individual is concerned. Professor Wildor Hollman

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\*Internist, cardiologist - born Sep. 10, 1899. Attended Univ. of Wash. 1916-17, 1919-20; M.D., Univ. of Penn. 1924. WW I, Sect. 570, U.S.A. Ambulance Service, Italy, France; WW II, Chief of Medical Svc, Baxter Gen Hosp., Spokane; Commanding Off., 116th Gen. Hosp., Leyte; 1st pres. of the Spokane Soc. of Internal Medicine and the Wash. State Soc. of Internal Medicine; former president and 1st Board Chmn., and lifetime trustee of Wash. State Heart Asso; former Director and V. Pres. of American Heart Association; Pres. of U.S. Ski Asso. (1961-65); Director of U.S. Olympic Committee (1961-69); has published approx. 50 articles in various journals, coauthor of SKI AT ANY AGE; has received many awards from the above organizations and in 1975 was elected to Ski Hall of Fame.

of Cologne University has recommended five minutes of daily exercise at from seventy to seventy-five percent of capacity, a degree of exercise hardly to be called "moderate." Dr. Thomas K. Cureton, of the University of Illinois, believes the average adult should get from 300 to 500 calories worth of exercise a day, equivalent to from 30 to 50 minutes of jogging or skiing, again hardly moderate.

What type of exercise is best? Suffice it to say, there is general agreement that the most important forms of exercise are those which stress the heart and lungs. To accomplish this, the body's largest muscle masses, the legs, must be used vigorously. Brisk walking, climbing stairs, hills, or mountains, jogging, running, cycling, swimming, and skating, are all excellent, particularly if practiced vigorously and regularly. Even dancing, if practiced with sufficient vigor and frequency, and for long enough periods, may be beneficial. Gardening, particularly if digging is involved, can be beneficial too.

Sports such as tennis, squash, kayaking, sculling, horseback riding all provide excellent exercise, and are enjoyable. Skiing qualifies as an unusually desirable form of exercise. Being both vigorous and sustained, it is particularly beneficial to the heart and circulation. Yet the effort required is usually only 25 to 40 percent of maximum, with frequent interruptions to view the scenery, converse with a friend, rest one's legs, pick one's self up after a fall, or ride a lift to the mountain top for another run. In addition, it is fun, so much fun that exercise becomes a pleasure and not a duty.

Since exercise on a lifelong basis seems essential if a person is to enjoy life to the fullest, it behooves him to pick out a sport or form of exercise which he enjoys, and then practice it regularly as long as he is able. Should his choice be a seasonal sport, like skiing, he will need to find substitute activities for other seasons. Resistance exercises weight lifting, and muscle building exercises in general, do little for the heart and lungs, however, they do have a positive role in muscular development and in specific athletic skills. When used in conjunction with other training programs, they may serve a useful purpose, such as in training for competitive skiing. When used unwisely, however, by inadequately conditioned individuals, unfortunate consequences have sometimes developed. It should also be stressed, however, that it is not advisable to go from a life of relative inactivity to any form of active exercise without going through a gradual period of training during which the tempo and vigor of exercise are gradually increased.

In summary, it may be stated that, unfortunately, the average American of mature years, male and female alike, has allowed himself or herself to deteriorate into a state of physical unfitness. The young adult male often works under too much stress, with prolonged hours, with too little recreation and with no exercise, frequently associated with heavy cigarette smoking, too much alcohol, over-eating and resultant overweight. Can such a person reverse this unfortunate downward course? I believe it is possible, providing he has sufficient desire, and providing he is willing to restore himself and devote as little as one percent of his time to regular, healthful exercise.

The rewards to be gained by those willing to exercise vigorously and regularly are great. Physical inactivity is a most important factor in the development of what has been called the Twentieth Century Epidemic, coronary heart disease, responsible for nearly 40 percent of all deaths in the United States. Physical inactivity is also a primary factor in development of overweight and obesity, and to some of us, at least, it seems to be a primary factor in the premature onset of the aging process. Cardiologists recommend a low fat diet, weight control, abstinence from cigarettes, and control of high blood pressure, in addition to exercise as means of controlling coronary heart disease; many cardiologists feel that active regular exercise is the single most important factor; and cardiologists in general are possibly the nation's most regular and dedicated exercisers. It seems reasonable to believe that these same factors which help control coronary heart disease, may also be important in delaying the onset of the unhappy consequences of the aging process.

To be truly effective, exercise must be most vigorous and sustained, and, once the individual is in suitable condition, part of it perhaps should be close to the individual's maximum ability. It must also be regular, the more regular the better. During building up and improvement phases, exercise should, if possible, involve from thirty minutes to an hour daily. Once an optimum stage has been reached, fitness can be maintained by a lower degree of activity, possibly as little as sixty minutes a week. Any form of exercise or sport sufficiently vigorous to fulfill the conditions outlined above should prove satisfactory. It must be remembered, however, that a person who has gotten soft from inactivity, or from illness, should not plunge immediately into a full blown exercise program.

If I may introduce a personal digression, with twenty years of active exercise behind me, I am, at seventy-five, in infinitely better health as well as fifty pounds lighter than I was at fifty-five. During the winter months, if I can get in two or more days of skiing per week, I feel that no additional exercise is necessary. During the spring, summer and fall, when skiing is out of the question, I jog two miles daily, three or more days each week. Kind friends occasionally ask me if, at seventy-five, I am still skiing. My answer is, of course, I was late in getting started, and I have a lot of missing years to make up for. Besides, I am trying to follow in the footsteps of Herman Smith-Johannsen, better known as "Jackrabbit Johannsen." Jackrabbit is still an active cross-country skier at the age of one-hundred, and I have another twenty-five years to go before I can equal his present records.

MEMORANDUM TO: Senate Sub-Committee on Aging  
Senate Committee, Labor & Public Welfare

FROM: Robert N. Butler, M.D., Research Psychiatrist &  
Gerontologist, The Washington School of Psychiatry,  
Consultant: Health, Social Retirement, Research  
Planning and Services.

SUBJECT: The Psychological Importance of Physical Fitness

Seneca, the Roman philosopher, said, "Man does not die, he kills himself." There is no question but that much of our behavior over which we can exercise some degree of control is influential both in the quality and length of our lives. Yet we do not take personal responsibility either for ourselves individually or collectively as a society by shaping our lives into the kind of regimen that would enhance both the character and length of life.

Poor diets, overeating, smoking, physical inactivity, excessive drinking, the overuse and misuse of drugs, accidents, stress and life-endangering life styles are all targets of preventive medicine. One can see interrelations between these elements and many physical conditions. A graphic example is found in the work being done on the influence of personality and life styles on heart attacks.

"Exercise is the closest thing to an anti-aging pill now available. It acts like a miracle drug, and it's free for the doing," writes researcher Josef P. Hrachovec. Yet about 45 per cent of adult Americans -- 49 million of 109 million men and women are sedentary, not engaging in physical exercise.

Substantial evidence supports the value of exercise in maintaining health, improved circulation and respiration, better sleep and diminished stress. Exercise reduces the risk of heart attack and enhances survival following an attack. Swimming, walking,

running and bicycling are especially good and inexpensive forms of exercise, since they actively strengthen the circulatory and respiratory systems.

Age need not be an impediment to bicycling and other forms of exercise. Tolstoy learned to ride a bike at age sixty-seven. Paul Dudley White, President Eisenhower's physician, urged bicycling as a preventive and curative exercise. Nineteen seventy-two saw the sale of 13 million bicycles in the United States, exceeding the sale of American and foreign automobiles by some 2.4 million. It is estimated that about 18 million Americans now ride bicycles, both as recreation and as a form of transportation. By 1973 there were at least five bills before Congress to appropriate money or land or both to provide safe and separate bicycle paths, special lanes in traffic, shelters, parking facilities and traffic control devices. Bicycles with side wheels can be used by older people who worry about balancing but want the exercise. A basket on the back makes it easy to carry packages, and the bicycle can be used for going distances too long to walk.

Spectator sports hold a large place in American life, with college and professional sports centering upon a few well-exercised athletes.\* The same money might better be spent on programs and facilities that encourage physical exercise for the population as a whole. Health clubs and the YMCA and the YWCA could offer programs tailored to older people. The large amounts of public park space presently gobbled up by golfers could be more equitably divided among hikers, swimmers and other sports enthusiasts.

\*Ironically, athletes may have shorter life spans than average. See, for example, "Longevity and Cause of Death among Harvard College Athletes and Their Classmates," Geriatrics, October, 1972.

Exercise must be planned on a routine daily basis. One simply must take time for it. In addition, advantage must be taken of spontaneous opportunities for physical activities. Emptying the trash, mowing the lawn and walking upstairs instead of taking the elevator should follow a redefinition of what is called drudgery and what is exercise. So-called labor- and time-saving devices may reduce physical fitness. Gardening is a fine hobby as well as an attraction that gives pleasure to others. It saves money to garden, cut the grass, pull weeds, do household chores. Purchase of a handyman guide for work around the house can lead to exercise and save repair costs too.

Dancing is an activity that combines social, intellectual and physical pleasure. Folk dancing, square dancing and ball room dancing should be part of the available repertoire. The rugged outdoor life -- hiking and trail blazing -- is also valuable for older people.

Medical monitoring of exercise is important in later life. Regular physical exams and discussions of appropriate exercise with a doctor can lessen the chance of overdoing or miscalculating one's abilities. Treadmill electrocardiac surveillance (including testing under stress) is very valuable. Education around common dangers is another imperative. For example, in 1970 the Federal Trade Commission warned the elderly and infirm to be careful about sauna and steam baths because of adverse effects of rising body temperature, blood pressure and pulse rates. There is evidence also to suggest that isometric, static or overly sustained exercises may elevate blood pressure to the point of provoking a heart attack.

Sexual activity is a useful form of exercise for the relief of tension, mild tuning-up of circulation and muscles and for emotional well-being. Massage is another very helpful technique, especially crucial for the bedridden, but relaxing and stimulating for all.

The Administration on Aging and the President's Council on Physical Fitness have collaborated in an excellent booklet on maintenance of physical fitness, "The Fitness Challenge in the Later Years" (1968); (Reprinted, 1973).

As a physician, psychiatrist and gerontologist, I urge continued federal efforts in this vital aspect of the health care of older Americans -- physical fitness. I regard this subject of such importance that I included its discussion in a chapter The Gift of Life in my book Why Survive? Being Old in America (1975).

Robert N. Butler, M.D.  
Robert N. Butler, M.D.

THE VALUE OF REGULAR EXERCISE PROGRAMS  
FOR SENIOR CITIZENS

Presented by

RAYMOND HARRIS, MD\*

To The

Senate Subcommittee on Aging

April 23, 1975

As a physician actively engaged in the treatment and care of medical problems of older Americans, I am firmly convinced that regular physical exercise can play a major role in preventing the onset of premature aging. I find that more than half of the patients who consult me complain of symptoms and other difficulties which they mistakenly attribute to the aging process. However, as a geriatric cardiologist researcher and physician, I find that the majority of their problems are the result of a chronic state of muscular and cardi vascular unfitness. Hypertension, hardening of the arteries and other circulatory disturbances are evident in patients with a long-standing history of physical inactivity and emotional stress and

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\*President of the Center for the Study of Aging; Clinical Associate Professor of Medicine, Albany Medical College; Chief of Cardiology, Sub-Department of Cardiovascular Medicine, St. Peter's Hospital and former Vice President of the Gerontological Society. Dr. Harris is the author of The Management of Geriatric Cardiovascular Disease, a member of the Physical Health and Education Committee of the National Jewish Welfare Board, and President of the Albany Jewish Community Center.

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tensions that could have been relieved by regular physical activity.

Properly taught and prescribed physical exercise programs are particularly valuable and practical for delaying the changes of aging and the progression of organic musculoskeletal and circulatory diseases. People who have become habitually sedentary in their living and thinking often overeat, thereby laying the groundwork for conditions which stimulate the development of organic disease. I refer specifically to complaints of aches and pains in joints and muscles, low back strain and transient illnesses of the cardiovascular system such as labile high blood pressure and coronary spasms.

Impaired mobility in middle-aged and older people, often the result of poor physical fitness, leads to social isolation, personality and emotional deterioration and poor mental health. Physically inactive people past 50 perceive their bodies to be broader and heavier than they really are and they experience bodily activities as increasingly strenuous. Kinesthetic pleasures which young people derive from motor action are steadily reduced in habitually sedentary elderly subjects who eventually become reluctant to move at all. Muscular degeneration, distinct physiological changes and distortion of the body image resulting from restriction of physical exercise lead to greater clumsiness, increased fear of physical activity and

the development of faulty feedback mechanisms between movement and body image. Inactive older people develop increased internal tensions and pent-up aggressions.

Physical activity is valuable in promoting the health of older people. Regular physical activity increases the outlets for the discharge of aggressive energy and neuromuscular tensions. Such activity aids mental health by improving the older person's self-image and the relationship of one's self with the environment. By improving muscular tone, circulation, energy, work performance, mental and physical work capacity, physical stamina and body weight, physical fitness programs initiate a process of adaptive rejuvenation which can reverse much of the atrophy of muscles, joints and other organs and tissues caused by disuse. Such disuse atrophy probably causes some of the signs of apparent early aging.

Physical activity is particularly important in preventing the effects of hypokinetic disease, often mistakenly attributed to aging rather than the true cause--lack of physical activity. As people age and become physically inactive and unfit, their flexor muscles shorten and anti-gravity muscles supporting the body and straightening joints weaken. Such weakness of the back and shoulder muscles produces a humpbacked appearance which further limits the amount and type of physical activity which older people can perform.

Properly performed exercise can delay and retard a major portion of these changes in the musculoskeletal, respiratory and cardiovascular systems. Exercise and training programs started in youth and continued throughout adulthood may delay or prevent these changes. However, even when these changes have occurred, partial improvement in posture and organic function may be obtained by older people if supervised exercise routines are followed conscientiously for extended periods of time.

Physical activity also opens up new challenging interests, goals, skills, experiences and abilities. It increases the independence of older people. Physical activity performed in groups also permits an experience which changes people's attitudes and behavior and improves their interpersonal relationships.

Proper calisthenics and stretching exercises have been shown to improve vigor, vitality and zest in middle-aged and older people when they are done under properly supervised and qualified instructors. Such types of exercise are valuable medically to improve the musculoskeletal system and eliminating the complaints so frequently found in elderly inactive people.

Programs should also include jogging, walking and sports which improve the cardiovascular fitness of middle-aged and older people and which have been shown to improve the circulation to the brain, heart and other organs.

Physical exercise and relaxation programs can do much to improve the mental and physical health of older Americans by increasing the flexibility of their thoughts as well as their muscles. Being in better shape mentally and physically, the older individual will be able to better meet the stresses and strains of daily living and the socioeconomic problems of old age. Exercises that increase the fitness of older Americans also increase their quality of life. There is no reason for our citizens to become physically debilitated and confined to wheelchairs and beds so early in life.

In my practice as a physician and geriatrician, I have found it useful to demonstrate and describe various types of exercises to improve the functional conditions of aging Americans. Of particular help are exercises to build up antigravity muscles and improve posture to prevent functional deformities. Increasing numbers of studies attest to the value of physical exercise in improving simple reaction and discrimination time and other slowed central nervous system responses, many of which have been attributed to the aging process but which really represent the growing physical unfitness of older Americans because of inactivity. Elementary as it seems, too many older people have forgotten what it is to walk properly and be aware of the feeling of good health. They have come to accept as inevitable the feeling of tension, stiffness and pain as an accompaniment

of the aging process. Whereas, in reality, most of these changes are due to the shortening of muscles, fibrotic changes and decreased function of joints and muscles as a result of not being adequately used or used incorrectly. As a result, functional postural changes eventually produce the false stereotype of the older person as a stooped, kyphotic, shuffling, senile individual.

Physical exercise programs that encourage older Americans to be more active, independent and mobile, provide economic benefits by reducing medical problems and hospital costs. Group exercise programs at all ages assist people to acquire new friends, new interests and lead to better mental and physical health.

Physical activity and exercise furthermore provide a structured time relationship for older people that enables them better to cope with a potentially threatening environment. Physical fitness that improves their kinesthetic sense, self-image and reduces psychologic tension is essential for their good mental health. The rationale of exercise and activity programs in geriatric day care centers is based upon helping older people to rejoin society and thereby to feel better mentally and physically. Ludotherapy (treatment by games) is useful to help the aged person who exhibits a tendency to disengage from the world and society. Kinesitherapy, associating the mobilization of the muscles

with a psychological stimulation of recovered movements, tends to renew the body image and improve physical relations with the environment.

There is need, in my opinion, for the expenditure of federal funds for non-profit programs in physical exercise and activity to motivate normal middle-aged and older Americans to begin programs which pay attention to their physical, emotional and social needs. Furthermore, funds are necessary to provide continuing education for physical educators and other professionals concerned with exercise in aging Americans. They need to be more aware of the needs of normal older Americans and how to conduct programs to keep aging Americans in good physical fitness and normal mental health. There is also a need for the accumulation of scientific data from physical exercise programs to determine the best way of retarding the symptoms and signs of the aging process and improving the quality of life and health of older Americans.

In summary, it is my position, as a physician concerned with diagnosing and treating older people, that proper physical activity has a great deal to contribute to the health of people. These programs afford great opportunities to reduce the emotional tensions, lack of physical fitness and personal crises that afflict many older people after retirement. Physically fit elderly people can care better for themselves and

remain more active in the community and stay out of institutions. Effective patterns of physical activity established during youth and middle-age and followed into old age provide a structured time relationship for older people. Physical activity and exercise programs leading to physical and cardiovascular fitness are useful preventive measures that will keep aging people healthier and happier and reduce the ever-mounting costs of growing old.

April 23, 1975

MEMORANDUM

TO: Senate Committee, Labor and Public Welfare  
Sub-Committee on Aging

FROM: Hans Kraus, M.D.  
465 Park Avenue  
New York, N.Y. 10022

It is an honor for me to have the opportunity to present a statement for your committee and I wish to commend you for taking the time to consider the important topic of physical activity for elderly people. There is no more important aspect of life nor one which has been more neglected than physical and mental vigor through exercise.

Studies in the field of therapeutic exercises have convinced us that many disabilities and neuromuscular tension syndromes are due to underexercise.

The mechanized way of our lives has created the "substrength individual" who, at the same time, becomes the "supertense person."

The substrength individual compares to the well-exercised one as follows: The physically active individual has low neuromuscular tension, low absolute and relative weight, low blood pressure, low pulse rate, greater adrenocortical reserve, greater vital breathing capacity.

The physically inactive individual shows signs of aging earlier in life. He exists physiologically at a lower potential and is less well equipped to maintain homeostasis and to meet daily stresses. This low level of function, combined with enforced suppression of the "fight and flight" response, enhances the incidence of disease. If physical activity drops below a certain minimum, weight increase becomes unavoidable unless caloric intake is stringently restricted.

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Dr. Kraus, an internationally recognized orthopedic physician, from New York has been an Associate Professor of Physical Medicine and Rehabilitation at New York University. He is the physician whose research on youth physical fitness and report to President Eisenhower resulted in the establishment of the original President's Council on Youth Fitness

We are the victims of our ecology. From the quiet of the countryside where we had to use our bodies in hard work for our daily bread we have moved to overcrowded cities with persistent noise and irritations and mostly to an entirely sedentary way of living. Lack of exercise, combined with over-irritation, are disease producing factors. Not only do we get weak through lack of use of our bodies, but we get tense and stiff by sitting and by being unable to respond to the constant irritations by bodily action. Our cardiovascular system and our lungs deteriorate in the measure they are not used. It is for this reason that the interest in physical fitness has become of increasing importance. We are here referring to the faculty of body and mind to meet the daily demands of living and still have some reserve for possible emergencies.

Good physical fitness work should actually start in childhood and should include daily exercise classes of at least an hour in every elementary school. These should continue throughout the whole school and academic life. Business and industry should set aside time for exercise breaks rather than for coffee breaks. Reconditioning centers should be established as has been done abroad for many years-where people who are getting "deconditioned" and prone to one or more of the chronic degenerative diseases have an opportunity to rest, get reconditioned, and return with healthier bodies and a more placid frame of mind.

Such reconditioning centers have shown excellent results. In one study it was shown that morbidity two years after one month of reconditioning was cut in half as compared to two years before. In spite of this and a steadily mounting proof of the value of systematic reconditioning particularly for older citizens, not one such center has been established by state or federal government in the country. No pilot efforts to explore the effectiveness of such programs.

This need is becoming more critical as an increasing percentage of the population is in the over 60 age group. There must be education for these citizens to understand the need for regular physical activity in their lives and motivation for them to want to be active. Ofcourse,

the vital need is the availability of programs in which they can participate. These opportunities must be convenient for them and must be conducted by exercise leaders with adequate training and with an understanding of the older citizen.

PHYSICAL FITNESS FOR THE ELDERLY

Statement by

C. Carson Conrad  
Executive Director  
President's Council on Physical Fitness and Sports

Submitted to

Subcommittee on Aging  
Committee on Labor and Public Welfare  
United States Senate

May 6, 1975

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Regular exercise can significantly delay the aging process by inhibiting the losses of vital capacity, muscular strength and joint flexibility which are characteristic of the middle and later years. It is a fundamental law of physiology that the functional efficiency of an organ or system improves with use and regresses with disuse.

Regular exercise may deter the onset of degenerative diseases which are among today's major killers, and it may improve the ability to survive and recover from heart attack by promoting the development of collateral circulation in the heart muscle. The growing conviction that incidence of disease may be reduced among physically active persons is supported by the commonplace observation that enforced idleness often is the prelude to early incapacitation for the elderly.

A state of physical fitness enhances the quality of life for the elderly by increasing their independence. The ability to "go places and do things," without being dependent on others, provides a strong psychological lift which is conducive to good mental health.

Physical fitness programs approved on an individual basis by physicians can and should play an important role in efforts to improve preventive health care for the elderly. Many forms of exercise involve

little, if any, expense for participants, and it would be a relatively simple matter to improve the availability and accessibility of exercise facilities in most communities.

The medical profession accepts a strong role in preventive medicine for physical fitness programs. The recent transfer of the President's Council on Physical Fitness and Sports to the administrative apparatus of the Public Health Service is in its recognition of this fact. The PCPFS, the American Medical Association and the American Heart Association conduct joint programs designed to inform physicians and the public at large about the relationship between exercise and health.

The public's perception of physical fitness as an aspect of health, and changes in the Council's perception of its role, also support a role in preventive medicine for fitness programs. The Council was established 19 years ago as an agency concerned exclusively with youth fitness, but its major emphasis now is on physical activity for middle-aged and older Americans. This emphasis has had an effect. When questioned in a recent national survey, more than one-half of those adults who exercise said they do so "for reasons of health."

In terms of physical fitness, the elderly are a "needy" segment of our population. They grew up during a period when it was expected that one's work would provide all the exercise that was required, and when there was no national emphasis on physical fitness. Relatively few of the elderly have extensive experience in physical education and/or sport, and fewer still possess the skills to enjoy swimming, tennis, golf and other popular participatory activities. And they have little understanding of the human need for physical activity.

The problem is one which merits attention and we believe we have an obligation to deal with it. Doing so will strengthen both our nation and our national health care system.

There is authority at the present time for the Department of Health, Education and Welfare to encourage and/or establish programs of physical activity for

the elderly. Some emphasis has been directed to this concern through the Administration on Aging and the President's Council on Physical Fitness and Sports.

I. What can be Done under Present Legislation and Regulations

The authority to develop needed programs in Physical Fitness for the Aging exists at the present time under the following two agencies:

A. Title III of the Older Americans Act of 1965, as amended

1. Title III is a Federal-State formula grant program, which has as its overall objective, the development or strengthening at the sub-state or area level, of coordinated, comprehensive service programs for older persons. A wide range of services are identified in the law which may be provided or coordinated under this program, including the following which could include physical fitness components:

- health related services
- preventive services
- recreational services
- any other services determined to be necessary for the general welfare of older persons.

2. Section 308 - Model Projects

The purpose of this discretionary project grant program is to enhance the scope and quality of services provided to older persons, and in general to demonstrate ways of promoting the well being of older people. The law provides that the program emphasize certain areas of concern, including meeting the needs of the physically and mentally impaired elderly. Therefore, a model project designed to demonstrate how physical fitness programs could improve the well-being of physically or mentally impaired older persons could be funded under this program.

B. The President's Council on Physical Fitness and Sports (PCPFS). Executive Order 11562

established the Council and determined its responsibilities under the Assistant Secretary for Health, Department of Health, Education and Welfare. The Council is charged with the promotion and improvement of the Physical Fitness of all Americans by the following:

1. Enlist the support and assistance of non-governmental individuals

6. and groups in efforts to promote and improve physical fitness and sports.
2. Stimulate, improve and strengthen coordination of Federal services and programs relating to physical fitness and sports.
3. Encourage state and local governments to enhance physical fitness and sports participation.
4. Seek to strengthen the physical fitness of American children, youth and adults.
5. Develop cooperative programs with medical, dental and other similar societies to encourage and implement sound physical fitness.
6. Stimulate and encourage research in the areas of physical fitness and sports performance.
7. Assist educational agencies in developing quality programs to encourage innovation, improve teacher preparation and strengthen state and local leadership.

## II. What is Being Done at the Present Time

As noted, physical fitness programs can be supported under Title III of the Older Americans Act, but State and Area Agencies on Aging must determine if such activities fall within the priorities established by the needs surveys that are required as part of State and Area Plans on Aging. For example, West Virginia initiated a physical fitness project for the elderly under Title III in Charleston in 1970, and the project was so successful that the program (which is now supported through a variety of sources), operated by the Laurence Frankel Foundation, has expanded until it is now offered statewide, in Senior Centers, Nursing Homes and State Hospitals.

The PCPFS and Administration on Aging prepared the booklet, The Fitness Challenge...in the Later Years, which was published by the Administration on Aging. There has been a heavy demand for this booklet.

The PCPFS is charged to promote and improve the physical fitness of all Americans. In carrying out this mission, the PCPFS through its own resources and with no relation to the Older Americans Act has:

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- A. Included leadership training through workshops in each of the six Regional Clinics on Physical Fitness and Sports conducted by the Council each year. Such workshops will be conducted in Toledo, Ohio; Newark, Delaware; San Juan, Puerto Rico; Las Cruces, New Mexico; Lexington, Kentucky; and Detroit, Michigan during FY '76.
- B. Provided emphasis on exercise and physical activity for older Americans as part of the on-going public information/advertising campaign. For example, Lowell Thomas was recently featured on six radio spot ads which went to 4,000 radio stations.
- C. Produced the film, Physical Fitness for Older Americans, in which the Council's Executive Director interviewed Lowell Thomas on the subject of the importance of exercise programs for the aging. The film is available on free loan for use in training sessions for exercise leadership.
- D. Provided State leadership training workshops on physical fitness for the aging.

- E. Co-sponsored each year with the Center for the Study of Aging, Albany, NY, the national conference on "Fitness After Fifty."
- F. Provided articles on exercise programs for the aging for popular magazines and professional journals.
- G. Conducted the Presidential Sports Award program which is offered in 39 sports and through which adults, including older Americans, are encouraged to participate regularly in their favorite sport.

#### SUMMARY

The Department of Health, Education and Welfare has a strong commitment to support the concept that the older people of America have a right to opportunities and benefits similar to those available to other segments of society. Many of the concerns for the elderly are the same as for other groups. However, the elderly do have unique characteristics, needs and interests which necessitate different programs and emphasis. These facts are particularly prevalent when considering the health aspects of physical activity.

The efforts described above have been well received and have had some influence, but have only touched the

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surface of the potential for improving the health and well being of the elderly through physical activity. There are economic values in addition to the personal physical and psychological value of improved health through improved physical fitness. Any efforts by the federal government to lessen the cost of medical care or other social services should be vigorously pursued and the Department will continue to explore these avenues under existing authority.

Exercise Program for Senior Citizens  
(A Model Project of National Aged)

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by  
The Nat'l Assoc. for Human Development  
The President's Council on  
"L. A. Pilot Demonstration"

P " ...approximately 49 million men and women do not engage in physical activity for the purpose of exercise. These sedentary Americans tend to be older, less educated, and less affluent than those who do exercise. Due to the failure of these aging citizens to participate in physical and mental impairment... In the opinion of medical gerontologists, much of this impairment can be prevented by a schedule of exercise activities."

Exercise Program for Senior Citizens  
(A Model Project of National Aged)  
Opinion Research Corp.  
The Nat'l Assoc. for Human Development  
The President's Council on Physical Fitness

P "The only antidote for aging that I know (for a person) is to continue to function mentally and physically in every respect. Proper nutrition for older persons is important. But it is not enough and of itself will not achieve optimum health and wellbeing for the aged. Equivalent in importance is the necessity of opposing decline and atrophy at any age through mental and physical activity and exercise. Atrophy of disuse is the greatest enemy of the aged."

Dr. Theodore G. Klumpp  
(cardiologist and advisor  
to The President's Council  
on Physical Fitness and  
Sports)

P "...a study of cardiovascular disease showed that there are reductions of blood supply brought on by aging: and more so, in those who are physically inactive. Both exercise and dietary corrections are linked to lessened cardiovascular system, it balances energy cycles within the body and is a benefit to organ and endocrine function in addition to the obvious conditioning of the muscles and connective tissues. There is still a myth that mental activity invariably decreases rapidly throughout adult life, as a consequence of aging... I hold that this is not caused by aging but by inactivity."

Dr. Hardin G. Jones  
University of California  
at Berkeley

P "The talk used to be all diet and exercise. Today it is exercise and diet."

Dr. Frederick J. Stare  
Harvard

P "While the need and demand for improved health services have been using (the report states), health education by either the public or private sector has been shockingly neglected---a failure to heed the opportunity

to help themselves to have better health. The aging population along with the general public must be made clearly aware of the profound difference between health information (disseminating facts) and health education (persuading people to change their lifestyles). The distinguished members of the President's Committee Health Education strongly emphasized the need for a nationwide effort to change personal attitude toward health and physical activity."

Report of the President's  
Committee on Health Services

Certification of Instructors for Geriatric Services

p. 61  
"The only risks and/or discomforts (to participating human subjects) will be those involved in physical exercise. We have not experienced any negative effects with regard to the subject's physical, psychological, sociological wellbeing as a consequence of such activities in six years of project work along these lines."

p. 62  
"... exercise and testing programs we used resulted in a mean improvement in aerobic capacity of 29% which was accompanied by other improvements in health status such as lowered blood pressure and better ability to relax as measured by resting muscle action potential level. This improvement in health and vigor was accomplished without so much as a syncope episode over the four years of our experience in this area."

HEALTHY ADDED YEARS

Edward L. Bortz, M.D.  
(President, American Geriatric Society) 1961  
*Reported from the 1961 Britannica Book of the Year (complete nature)*

"...medical science does know with a high degree of certainty that these (cardiovascular) diseases are susceptible to control through prevention and practice of proper diet and living habits and through regular and thorough medical checkups."

"It has been estimated that more than 12,000,000 persons in the United States, an overwhelming percentage of whom are in the over-45 age group, are stricken with arthritis or rheumatism. Medical science had no certain clues to the causes of these ailments, but again researchers are convinced that to a large extent they will prove finally susceptible to control through sensible health habits and precautions."

"The cellular activity of the skeleton is dependent on endocrine function, nutriment and osteoporosis as the result of disuse has been widely observed. Evidence now at hand indicates that the brittleness of the aging skeleton can to a large measure be controlled by diet, exercise and glandular supplements."

"Physical fitness can be defined as the ability of the body to take strenuous exercise with a minimum change in body dynamics from the resting state."

"While performance capacity diminishes with advancing age, these experiments show that training can improve performance in older bodies. The more a muscle is kept alive, the better its ability to perform. These observations point to the advisability of aging people maintaining their muscular equipment in good tone. Lack of exercise, it would appear, invites atrophy, a condition synonymous with decrepitude of old age."

BUSINESS WEEK

"The New Rx For Better Health"

January 5, 1974

p. 1 "Exercise strengthens the heart's collateral circulation. And exercise has been proven to reduce blood cholesterol levels."

Dr. Warren Guild  
Harvard Medical School

p. 2 "Four to six outings a week, of at least 30 minutes each, is a reasonable level of activity to be attained and continued by an over-40 executive, the specialists say. A gradual buildup, of course, is mandatory."

BEYOND DIET - EXERCISE YOUR WAY TO FITNESS AND HEART HEALTH

Lucas R. Lehman, M.D. 1977

p. 6 "Physical fitness, actually cardiovascular fitness, is an observable and predictable benefit of exercise training. The fit individual has endurance or stamina, and he is able to supply more energy to his muscles so that they can work harder and longer, and with less effort, than when he was not physically fit. Thus, when fit, the exerciser puts less strain on his cardiovascular system. He feels better, sleeps better and supposedly has improved digestion and disposition."

p. 7 "... populations maintaining a customary high level of occupational and recreational physical activity and avoiding excessive amounts of saturated fats, have low heart attack rates. Research in progress also documents mounting, although not yet conclusive, evidence that an exercise training program can probably decrease your chances of sustaining a heart attack or having another if you have already been stricken. Furthermore, if you have a heart attack at all, it will probably be milder if you are physically fit. The American Heart Association has taken the position that it is at least "prudent" to exercise."

p. 7 "Some risk factors are actually diminished by exercise training. For example, there may be a beneficial lowering of both blood pressure and heart rate so that the heart needs less oxygen. Exercise also changes the clotting power of the blood so that it is less likely a clot will form on the lipid plaques in the coronary arteries (heart attack)."

p. 7 "...Despite the fact that exercise training does not seem to stop hardening of the arteries, it does appear to render the arteriosclerotic process less apt to lead to a heart attack."

WHY EXERCISE?

Theodore G. Klump, M.D., *Director, U.S. National Heart, Lung, and Blood Institute, Sept. 27-28, 1971*  
p. 19 "...an attack (heart) may occur coincident with exertion, but more than 50% of heart attacks happen while the victim is asleep in bed."

p. 24 "Functional capacities of all systems of the body can only be augmented through moderate stress. From this point of view, exercise may be regarded as the most beneficial form of graded stress. I have no doubt that it applies to the mind and emotions as well as to the rest of the body. This principle has, I believe, particular application to the aging process. In my opinion this (physical and emotional) decline will proceed more slowly if the bodily functions are fully employed and, through moderate and unfortunately descending stress, they are held to their maximum capacities."

NEWSWEEK  
CAN AGING BE CURED?

*Newsweek, April 16, 1973*  
p. 63 "Dr. Herbert A. DeVries of U.S.C. found that exercise increased oxygen-carrying capacity--the best single measure of vigor - reduced body fat and nervous tension and improved heart and blood-vessel function as well as arm strength. DeVries' exercise program includes calisthenics, jogging and swimming. He insists that the elderly begin exercising with caution and that a physician should prescribe the appropriate regimen with the same care and certainty that he uses in choosing drugs for his patients."



Prepared by the President's Council on Physical Fitness  
and Sports  
John W. Brantner, Chairman  
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THE FITNESS CHALLENGE... IN LATER YEARS

p. 2 "Physically active individuals are less likely to experience a heart attack or other forms of cardiovascular disease than sedentary people. And apparently an active person who does suffer a coronary attack will probably have a less severe form and will be more apt to survive the experience."

p. 2 "For many individuals, frequent involvement in some sort of physical activity helps to reduce mental fatigue, tension, strain, or boredom produced by our highly technical and sedentary way of life."

p. 2 "Perhaps the greatest benefit of maintaining physical fitness is the degree of independence it affords. This is a quality to be most prized in the later years."

p. 3 "Exercise of the joints also helps slow down the onset or the development of arthritis, one of the most common and painful diseases associated with old age."

p. 4 "Programs that promise "fitness" in a minute a day are more than inadequate in their effect on circulation. So, too, are the traditionally recommended activities for the elderly, such as pattering in the garden or taking a leisurely stroll."