



Dynamic Chiropractic – May 4, 1998, Vol. 16, Issue 10

Exercise Physiology Issues

By Kim Christensen, DC, DACRB, CCSP, CSCS

Many health care specialists think that regular physical activity, correctly performed, can be a safe means of improving health for both the young and elderly. However, they also believe that careful exercise rehabilitation is necessary for maximal therapeutic effects to be obtained with minimal patient risk.

Contraindications to an immediate exercise rehabilitation program include active carditis; heart failure; myocardial infarction in the previous six to eight weeks; and unstable angina.¹ Recent pulmonary embolism or deep venous thrombosis, uncontrolled hypertension and diabetes, uncontrolled epilepsy and acute febrile illness are also contraindications, as are such ECG abnormalities as ventricular tachycardia, second- or third-degree atrioventricular block, and sick sinus syndrome.¹ Graded cardiac testing is a useful screening procedure. Ideally, the submaximal oxygen consumption should be measured at the same time.

Exercise, initially at five days a week, is recommended in uncomplicated cases.

- Emphasis is placed on the duration rather than on the intensity of aerobic exercise. A long, relatively low-intensity regimen places less stress on the coronary circulation and reduces the risk of serious musculoskeletal injury.
- Muscle and flexibility exercises should be used in the warm-up phase before walking, jogging or cycling.
- Isotonic exercises using lighter weights for many repetitions are recommended initially for at-risk cases.
- Isometric exercises are avoided.
- The pulse should be checked during and after exercise; the working heart rate, determined on exercise testing, should never be exceeded.
- Adequate fluid replacement during exercise is important.
- Subjects should be taught to breathe correctly during static exercise.

Licensed supervision is necessary initially in patients at risk, such as those who have had myocardial infarction. With adequate precautions, exercise can be a useful and safe practice for properly selected patients.

There are not enough sophisticated exercise test systems in the world, or a sufficient supply of cardiologists, internists, family practitioners, or exercise physiologists to safely test the entire population at large. A lot of common sense and the preselection of the population at risk would seem to be the practical alternative.

What is at issue is the memorization of a list of given contraindications versus good clinical practice, and the inherent flexibility of practicing both the science and the art of rehabilitation. For many practitioners, emphasizing the importance of an adequate warm-up, submaximal pace of exercise, a cooling-off period, and a general awareness of the environmental pressures is far more appealing than recommending the obligatory checking of pulse rates and committing the healthy person to a checklist similar to that for a 747 preflight takeoff. Many health care professionals tend to be compulsive, but it may be equally important to be careful that they not inflict their compulsions on a passive patient population to an inappropriate degree.

Bedrest

Bedrest reduces cardiovascular tolerance for exercise in normal persons, and contributes to physical disability in patients recovering from myocardial infarction. DeBusk, et al.² attempted to determine whether exercise and conditioning is necessary to restore functional capacity after a period of bedrest. Twelve healthy men aged 45-55 rested in bed in the Stanford University Hospital for 10 days after a four-day in-hospital ambulatory control period, and were followed up for two months afterward. Six men participated in a home exercise training program consisting of riding a bicycle ergometer for 30 minutes a day for 60 days. The training heart rate was about 120-150 beats per minute, corresponding to 70-85% of peak rates as measured on the screening exercise test. All men reported having been "moderately" active in the months before the study.

Oxygen uptake values in both groups were significantly higher 30 days after bedrest than immediately after the bedrest period. The peak oxygen uptake at two months significantly exceeded baseline in the trained individuals only. The increase in test duration after bedrest was greater in the exercise group than in controls. Peak systolic blood pressure during exercise rose more in controls. Echographic parameters were comparable in the two groups one and two months after bedrest. Body weight increased in both groups at one month; the increase correlated with that in peak oxygen uptake.

Two classic training effects observed in the 60 days after bedrest were significantly greater in the exercise group than among the control group subjects. Heart rate declined appreciably in the exercise group, and peak oxygen consumption increased in that same group. The improved post-exercise level might have intrinsic merit in its own right, becoming part of the argument of whether physical training has validity in a preventive sense.

Geriatric Rehabilitation

Payton, et al.³ reports of the physiologic effects of aging and the response to rehabilitation. Gross muscle atrophy appears to be primarily an aging change, resulting from loss of both number and size of muscle fibers. Mitochondrial activity declines, and patchy degeneration of myofibrils is observed. Changes in the joint surfaces, ligaments, tendons and other connective tissues predispose elderly persons to the onset of overt pathologic change, as in the arthritides. The cellular changes and disuse result in decreased strength and flexibility. Age-induced cardiovascular alterations include a rise in blood pressure and a decrease in stroke volume. Reduced stress tolerance is the result. Neurologically, a functional slowing of response is observed, although the quality of response may increase. Perceptual changes, apart from those involving sight and hearing, include an increase in postural sway and decreased conduction time, both at the myoneural junction and along neurons themselves, predisposing the elderly to loss of balance and injury. Depressed endocrine function undoubtedly underlies the reduced ability of elderly persons to cope with physical stress and preserve homeostasis.

Many of the so-called "normal" changes attributed to aging might equally be considered changes caused by disuse. Alternatively, some interaction between the aging process and disuse may be operative. In either case, the results of studies on exercise in elderly subjects are encouraging. A number of investigators have reported significant improvement in functional capacity and performance after elderly subjects have undergone a period of training. Beneficial psychologic effects of exercise, including improved cognitive function, have also been described. Rehabilitation for elderly persons is designed to prevent or reverse the sequelae of disuse, combat the effects of disuse in ill patients, and reverse functional losses caused by trauma and disease. Procedures are similar to those used with other age groups, except the frequency, intensity and duration may need to be altered. Sensitivity to psychosocial factors is necessary for clinical success with elderly persons.

Exercise stress testing in geriatric patients has been somewhat controversial because of possible risks, but all patients should be individually evaluated, and there is no evidence that age alone increases the risk of stress testing.⁴ The most common indication is the possibility of ischemic heart disease. Many geriatric patients with valvular disease may qualify for a consideration of surgical correction, as do those with aortic stenosis. Exercise testing is of importance in establishing the level of activity that is safe relative to provocation of arrhythmias. The stress test is the key to prescribing training programs in the rehabilitation of patients with musculoskeletal and coronary disease. Exercise testing in patients with peripheral vascular disease can determine the degree of functional limitation.

Older patients may not be comfortable with standard treadmill protocols. A protocol starting at a lower workload and increasing more gradually may be more useful than standard protocols. Such flexibility in the use of testing is permissible without jeopardizing the standardization of results. A cycle ergometer may provide an alternative to some elderly patients who fear the treadmill or are unsteady. Early fatigue and lightheadedness due to deconditioning and vasoregulatory inefficiency must be kept in mind in testing elderly subjects. Significant calcific aortic stenosis may prevent an appropriate systolic pressure rise with exercise.

Geriatric patients should be considered for exercise testing on the basis of the same criteria as those used in any other age group, but particular attention should be given with regard to the flexible use of exercise protocols; coaching and reassurance; and maintenance of alertness for any difficulties. In this way, safe and informative testing can be performed on most elderly patients.

There was an initial concern that exercise testing for geriatric patients might increase complications, but this has not been the case if common sense, modified protocols and a certain flexibility are applied. This group of patients often has coronary artery disease, and testing is very positive and necessary for diagnosis and prognosis for recovery from coronary artery events.

Exercise stress testing is perhaps most important to identify the subtleties of activity that may be permitted for the elderly. It should be emphasized that a cycle ergometer can be a sturdier platform for some elderly people than a treadmill, especially in the setting of unstable back, knee or hip disease.

References

1. Gordon NF, et al. S Afr Med J 1982;62:47-49.
2. DeBusk RF, et al. Circulation 1983;68:245-250.
3. Payton OD, Poland JL. Phys Ther 1982;63:41-48.
4. Laslett LJ, Amsterdam EA, Mason DT. IM September 1980, pp. 53-61.

Kim D. Christensen, DC, DACRB, CCSP

Ridgefield, Washington

Click [here](#) for more information about Kim Christensen, DC, DACRB, CCSP, CSCS.

[IMAGE]

Page printed from:

http://www.chiroweb.com/mpacms/dc/article.php?id=37209&no_paginate=true&p_friendly=true&no_b=true