

# Polio Network News

## The Role of Activity

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*"To exercise or not to exercise, that is not the question for polio survivors; rather, the questions are these: what amount of exercise is enough? what amount is too much?"*

There is no easy answer for all polio survivors, but we can make some general observations about inactivity and exercise.

### ADVERSE EFFECTS OF INACTIVITY

Limitation in physical activity results in progressive deterioration of cardiovascular performance and efficiency; metabolic disturbances; difficulty in maintaining normal body weight; disturbed sympathetic nervous system activity; reduction in muscular strength and endurance; and possibly emotional disturbances.

### BENEFICIAL EFFECTS OF REGULAR EXERCISE

In contrast, beneficial *physiologic* adaptations to regular exercise include reduction in heart rate and blood pressure; morphologic changes in skeletal and cardiac muscle resulting in improved physical work capacity and an enhancement of cardiovascular efficiency in delivering oxygen and nutrients to the tissues; increased muscular endurance; increased myocardial vascularity; reduced blood coagulability; reduction in adiposity and increased lean body mass; increased cellular sensitivity to insulin; and favorable changes in blood lipids and cholesterol.

Beneficial *psychological* changes from regular exercise include reduction in muscular tension;

improved sleep; and possible increased motivation for improving other health habits such as changes in diet (reduction in saturated fat consumption, for example) and cessation of cigarette smoking.

### EVIDENCE FOR BENEFICIAL EFFECTS OF EXERCISE IN POST-POLIO INDIVIDUALS

Studies have shown strengthening exercise, aerobic conditioning exercise, and ambulatory exercise to be beneficial.

**Strengthening Exercise** – In Feldman and Soskolne's study of six post-polio patients, the subjects performed non-fatiguing exercise three times per week for 24 weeks or longer. Strength either increased or remained the same in all muscles in all subjects except for one muscle in one subject that became weaker. The authors concluded that the strengthening exercise was, in general, very beneficial.

Einarsson and Grimby studied 12 subjects who exercised three times per week for six weeks. The subjects performed intervals of strengthening exercise interspersed with rest breaks. All subjects became significantly stronger in the six-week period.

Fillyaw and colleagues studied 17 subjects who exercised every other day for up to two years. The exercise intervals were interspersed with rest breaks. Over this period of time, all subjects gained significant strength.

At the University of Wisconsin, we conducted a 12-week study of muscle-strengthening exercise in seven post-polio subjects. Subjects exercised four times per week for 12 weeks at home. Exercise intervals were interspersed with rest breaks. After the 12-week program, the average increase in strength was 36%; also work capacity and endurance increased by 15% or more.

**Aerobic and General Conditioning Exercise** – Four such studies have been performed. Jones and colleagues studied 37 post-polio subjects: 16 volunteered for the exercise program while 21 served as control subjects. The exercise subjects performed stationery bicycle exercise three times per week for 16 weeks. They began with bouts of exercise of 2-5 minutes on the bicycle with 1-minute rest breaks, progressing up to 15-30 minutes of exercise per session. After the program, the exercise subjects were found to have significant improvements in their aerobic power and their capacity to exercise. The control subjects did not change in this same time interval.

Kriz and colleagues performed a similar study in 20 post-polio sub-

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jects (with 10 exercise and 10 control subjects); however, the exercise was upper-limb cycle ergometry (rather than lower-limb cycle ergometry). In this study, too, exercise subjects significantly increased their aerobic power and exercise capacity.

Grimby and Einarsson studied 12 post-polio subjects who performed submaximal endurance and strength training twice weekly for six months. Activity was interspersed with rest breaks. Except for one, all subjects were significantly improved from the training program. The exception reported excessive fatigue with the training program. Grimby and Einarsson concluded that combined endurance training and submaximal strengthening exercise can be generally positive in post-polio individuals, but that overtraining can occur.

Prins and colleagues studied 13 post-polio subjects. Nine performed a swimming and aquatic strengthening exercise program and four were controls. Intervals of exercise were interspersed with intervals of rest. The authors reported significant improvements in strength and flexibility in the exercise subjects and no change in the control subjects.

**Ambulatory Efficiency**—Dean and Ross studied 20 post-polio subjects. Thirteen were control subjects and seven performed tread-

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mill walking exercise three times weekly for six weeks. The exercise was low-level, non-fatiguing, and not painful. After the six-week program, the exercise subjects walked more efficiently, while the control subjects showed no change. The study concluded that regular exercise could improve movement economy.

Exercise studies have shown that *judicious* exercise can improve muscle strength, range of motion, cardiorespiratory fitness, and efficiency of movement in some post-polio individuals. These benefits appear to occur when they keep their activity and exercise within reasonable limits to avoid excessive muscular fatigue or joint or muscle pain. Post-polio individuals should avoid activities that cause increasing muscle or joint pain or excessive fatigue, either during or after their exercise program because the performance of activity at too high a level may lead to overuse/overwork problems. ■

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In a study conducted in The Netherlands, PPS subjects ( $n = 76$ ) showed higher scores ( $p < .001$ ) than non-PPS subjects ( $n = 27$ ) within the NHP (Nottingham Health Profile) categories of physical mobility, energy, and pain. On a 16-item Polio Problems List, 78% of PPS subjects selected fatigue as their major problem, followed by walking outdoors (46%) and climbing stairs (41%). The disabilities of PPS subjects were mainly seen in physical and social functioning. No differences in manually tested

strength were found between patient groups. PPS subjects needed significantly more time for the performance test than non-PPS subjects and their perceived exertion was higher.

PPS subjects are more prone to fatigue and have more physical mobility problems than non-PPS subjects. In former polio patients, measurements of perceived health problems and performance tests are the most appropriate instruments for functional evaluation. ■