

Cardiac Conditioning in the Post Polio Individual

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Acute Poliomyelitis



“Those Passing Years”

by Larry Schneider

It's now 40 years since I contracted polio at 17...During the past few years, I find myself being able to do less and less and tire far too easily. This led to my early retirement when I was no longer able to stand from my wheelchair by myself and no longer able to walk with crutches or get out of bed alone.

From the Rehabilitation Gazette, 1979

Criteria for the diagnosis of the post polio syndrome

- Prior paralytic poliomyelitis with evidence of motor neuron loss.
- A period of partial or complete functional recovery after acute paralytic poliomyelitis, followed by an interval of stable neurologic function.

Criteria for diagnosis of the PPS (continued)

- Gradual or sudden onset of progressive and persistent new muscle weakness or abnormal muscle fatigability (decreased endurance), with or without generalized fatigue, muscle atrophy or muscle and joint pain. (Sudden onset may follow a period of inactivity, or trauma or surgery.) Less commonly, symptoms attributed to PPS include new problems with breathing or swallowing.

Criteria for diagnosis of PPS (continued)

- Symptoms persist for at least one year.
- Exclusion of other neurologic, medical and orthopedic problems as causes of symptoms.

Source: Post Polio Syndrome: Identifying Best Practices in
Diagnosis and Care.

March of Dimes, 2001

Adverse Effects of Limitation in Physical Activity

- Deterioration in cardiovascular efficiency.
- Reduction in muscular strength and endurance.
- Reduction in flexibility.
- Metabolic disturbances.
- Difficulty in maintaining normal body weight.
- Disturbed sympathetic nervous system activity.
- Possible emotional disturbances.

Bedrest effects

- Ferretti found that after 42 days of bedrest:
 - VO_2 max was reduced 16%
 - Cardiac output was reduced 30%
 - O_2 delivery was reduced 40%
- Muscle cross sectional area reduced 17%
- Mitochondria density reduced 16%, volume fell 28%
- Oxidative enzyme activity fell 11%
- Strength reduced 10 to 15% per week, 35 to 40% in 4 weeks
 - With minimal exertion, strength reduced 25 to 40% in 2 to 3 weeks.

Cardiovascular Issues and the PPS

- The actual incidence of CVD in individuals with the PPS is not known.
- However, there is reason to suspect the individuals with the PPS might be at increased risk of CVD. Physical inactivity deconditioning, obesity, dyslipidemia (66 % of men and 24% of women had HLD with men also having low HDL cholesterol (Agre et al, APMR, vol 71, May 1990)as well as respiratory compromise causing hypoxia.)
- There is no significant dysfunction of autonomic nerves despite progressive muscle atrophy (Borg et al, Acta Neurol Scand. 1988:77:402-408).
- Average maximum metabolic capacity of a post polio individual is 5.6 mets (stair-climbing or walking 5 mph).

Is exercise safe in the PPS individual or will it do more harm?

- Jones et al: Cardiorespiratory Responses to Aerobic Training by Patients with Post-polio Sequelae. JAMA 1989;261:3255-8.
- Kriz et al: Cardiorespiratory Responses to Upper Extremity Aerobic Training by Post polio Subjects. APMR, Vol 73, January 1992.

Jones et al JAMA 1989 Study

- 16 subjects (21 controls) exercised on a bicycle ergometer at 70% of maximum heart rate for 2 to 5 minutes with 1 minute rest breaks in 15 to 30 minutes sessions, 3 times a week times 16 weeks.
- Significant improvement in total work per time (change of 7.5 vs 22 Watts), total exercise time (8.9 vs 69.1), max expired volume (V_{emax} 6.0 vs 15.6 L/min) and V_{O₂} max (59.7 vs 226.3 ml/min or 15%).
- No overuse symptoms.



Kriz et al APMR 1992

- Arm ergometry exercise 3 times per week times 16 weeks at 70% maximum heart rate.
- Significant improvement in power(12%), exercise time(10%), V_{emax} (17%), VCO_{2max} (20%) and VO_{2max} (19%).
- No problems with pain or overuse.



A Statement about Exercise for Survivors of Polio: PPH, Spring 2003

- Current evidence suggests that exercises are often beneficial for many polio survivors provided that the exercise program is designed for the individual following a thorough assessment and is supervised initially by knowledgeable health professionals.
- A judicious exercise program can enhance many polio survivors optimal health, range of motion and capacity for activity.

Statement about Exercise for Survivors of Polio (cont)

- The intensity of the exercise is low to moderate.
- The progression of the exercise is slow, particularly in muscles that have not been exercised for a period of time and /or have obvious chronic weakness from acute polio.
- Pacing is incorporated into the detailed program.

Statement about Exercise for Survivors of Polio(cont)

- The plan should include a rotation of exercise types, such as stretch, aerobic conditioning, strengthening, endurance and ROM exercises.
- Polio survivors who experience marked pain or fatigue following any exercise should hold that exercise until contacting their health professional.