

# POLIO NETWORK NEWS

International Polio Network

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## CDC Study Completed

**Frederick M. Maynard, M.D.** and a team of investigators from the University of Michigan Medical Center, Ann Arbor, Michigan, have completed their final report for the study *The Late Effects of Polio: A Model for the Identification and Assessment of Preventable Secondary Disabilities*. A summary follows:

### OVERVIEW OF THE STUDY

The major goal of this study was to develop methods for identifying and investigating preventable secondary disabilities among people who have already had a primary disability for many years. Project researchers studied 120 people with varied levels of disability caused by polio. Each person completed a 54-page Home Survey before coming to the University of Michigan Hospital for a five-hour series of medical examinations and tests. The information that was collected was then computerized and analyzed by project researchers. This entire study took 2-1/2 years to complete.

### RESULTS OF THE STUDY

Data analysis led to three categories of findings.

First, the overall group of study participants was described. The persons in this study were predominantly married, well-educated, and working, with a few in a low economic group. Eighty-two percent had a treatable musculoskeletal problem of some kind. Seventy-nine percent had weakened lower limbs. Seventy-seven percent had nerve problems of the hand or wrist. Thirty-five percent of the group were obese and 31% had another disease that further complicates their health status. Fifteen percent were depressed (which is lower than the national average). The rate of other secondary conditions were as follows:

#### CONDITION FREQUENCY

Hand/Wrist Arthritis .....	48%
Treatable Upper Limb Pain .....	55%
Treatable Spinal Pain .....	46%
Treatable Lower Limb Pain .....	50%
Treatable Walking Problem .....	68%
Stair Climbing Problem .....	55%
Hypertension .....	8%
Clinical Anxiety .....	19%

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## “Suggestions for Exercise”

### from Fifth International Polio & Independent Living Conference in Saint Louis

Polio survivor, **Nancy Caverly**, St. Louis, MO, introduced the topic of exercise and energy conservation by sharing her experiences. **Jacquelin Perry, M.D.**, Chief, Pathokinesiology/Polio Service, Rancho Los Amigos Medical Center, Downey, CA, and **Richard Owen, M.D.**, Medical Director, Sister Kenny Institute, Minneapolis, MN, then offered their thoughts and suggestions about exercise.

**NANCY CAVERLY:** About 15 years ago, with my youngest child securely placed in school, I decided to become a jock and take part in one of the major exercise programs in St. Louis. The first day of the class, I was impressed by my size, which was larger than all of the thin women who had signed up to become super-jocks. Also, I was impressed by my inability to perform most of the exercises. Nevertheless, on my little pad on the floor, I pursued all of the exercises I could possibly do. I went home after an hour of a rigorous workout, took a hot bath, and went to bed for the rest of the day. I did finish the six-week course, because I had paid for it, but after the first day I did only the exercises that my body would allow me to do comfortably and without strain. I chalked the experience up as one major mistake in my personal quest for how best to maintain my body for the years to come — this was not the way.

The other exercise I tried doing, because I had done it extensively before polio at age 17, was swimming. My first morning included walking down a long flight of steps, changing clothes and getting into the pool, and swimming with businessmen who came to do 50 laps on their lunch hour. That day, I did 36 laps, or 1/2 mile, and again went to bed for the day. This time I did not wipe swimming off of my list of acceptable exercises, because I knew that swimming had many positive points for exercising. I decided to start low and build up my laps to find out the reasonable number for my body. Now, I swim two days a week, between eight and ten o'clock in the morning. The reasonable number for me is 20 laps in the 100% accessible 25 meter pool at a local school. I do ten laps

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of freestyle or crawl stroke, two laps of back stroke, two laps of elementary back stroke, two laps of breast stroke, two laps of side stroke, and a few stretching exercises. For the last two laps, I do whatever makes me feel the best. I check my pulse rate after about ten laps and it usually is about 112 to 118 a minute, the minimum necessary for cardio-vascular conditioning. It takes me approximately 20 to 25 minutes to do that number of laps. The cardio-vascular stimulation that I am getting from swimming is great; I am unable to exercise in any other way (walking, cycling, etc.) for that length of time.

On the Tuesdays and Thursdays after swimming, my energy level during the day is much higher. I do not go to sleep at eight o'clock watching a movie on television. I am still moving at ten o'clock that night, not with energy that I should not have, but with energy that is available to be used.

After swimming for five years, I was telling our local pharmacist that I was having some low-back pain from an old diving injury. He suggested I try swimming with fins. With fins, I get faster movement so that it takes me less time and fewer strokes, but I get more resistance. The low back pain decreased within a three-month period and has not recurred. As a polio survivor, I know I am going to find a year-round swimming pool where I can swim at least two times a week, wherever I live in the future. That is where my body and I are with exercise. What we would like our professional staff to discuss is what exercise they feel may be appropriate for you.

**DR. PERRY:** Today I am going to focus on two aspects of exercise and energy conservation — life-

style modification and use of orthoses.

There are two kinds of exercise — aerobic and strengthening. Aerobic exercise is using the leg or arm muscles to make demands on the heart and lungs. This means that in order to do aerobics one has to have extremity muscles. Some people have strong legs and poor arms, so they walk or ride a bicycle. Some people have strong arms and poor legs so they swim.

The calf muscles are the hardest working muscles in walking, and they commonly wear out. Individuals with weak calf muscles should not walk or run, but bicycling is a possibility. I recommend that people use stationary bicycles unless they live in a community with nice level paths and not too many cars. On the other hand, one is using the thigh and knees during this type of exercise, and so it may or may not be useful. One can plan an aerobic program if one has muscles that will tolerate a 20-minute activity at a moderate pace without getting sore, fatigued, or losing strength. As Dr. Owen's group has described at Sister Kenny in Minneapolis, an interrupted aerobic program also can be effective. Each exercise interval of two-three minutes is followed with one minute of rest. This enables the post-polio survivor to get more exercise without overdoing.

The nice thing about water exercise is that anything from "puttery paddling" to real swimming is available. Again, one has to remember that swimming uses the shoulders and arms. Before pursuing a program, be sure they will take that kind of strain. The purpose of aerobics is to train the heart and lungs because they are the source of energy.

In general, activities below 50% of maximum capacity are non-fatiguing; above that level, individuals huff and puff. The goal of exercise is to keep the effort above what we do every day with some periods of

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activity, or otherwise we will continue to huff and puff. I live with an individual with severe arthritis. There is nothing to exercise, and so she huffs and puffs when she gets dressed. Every time she gets checked, her heart is just fine. Her aerobic exercise is the task of getting dressed.

The other type of exercise is strengthening exercise which is indicated for muscles which are not at their maximum capacity. Strengthening exercises are short duration, high-intensity activities focusing on the muscle tissue to improve its physiology. At Rancho Los Amigos, we use an intensity of about 60 or 70% of a single repetition maximum and have patients do five repetitions. When that gets easy, we increase the repetitions to ten, and later we increase the resistance.

Polio survivors have three major complaints: pain, weakness, or fatigue. There is no examination that can tell whether fatigue and weakness are due to underuse or overuse. Therefore, I try a period of exercise.

On the other hand, I consider muscle pain a sign of injury and overuse and will not give exercise in the face of any pain. In that instance, we modify the life-style to a pain free system, and then we can try some exercise. When we try exercise, we give three rules: if the exercise makes you feel better, continue it; if the exercise makes you feel worse, cut it in half; and if the exercise still makes you feel worse, stop because it is now doing damage.

If a person has enough strength to take some resistance, which means they are a Grade 3+ or 4+ or better, we work on the major muscle groups. (Weaker than that means there is not enough muscle mass to really respond because 3+ is about a 20 to 25% muscle.) If the person has enough strength, we exercise the quadriceps, the hip abductors, the hip extensors, the knees, and the calf muscles. We do it bilaterally and unilaterally.

We evaluate where the weakness is and make our exercise plan accordingly. In general, I have not found underuse of the arms as often as I have found some response to exercise of the lower extremities. The shoulders are hard not to use, and they tend to get overused in the polio population.

What has been our experience with this kind of exercise? We have found that it is not terribly effective, but one could say we did not do enough. Forty percent of the patients are better (more endurance or a strength gain of 1/2 grade), 30% of them experienced no change, and another 30% were worse. They could not tolerate the exercise, and their life-style was using their muscles to the maximum. When people have joint pain, exercise has not been very helpful. To those with strained ligaments and joints, it made essentially

no difference, and we have gone to other devices.

A weak calf is the most common problem because it is a muscle that is used all of the time. A tightness to five degrees forward of the vertical is a very useful way of substituting for a poor calf. Having a calf that will not come up to neutral the body weight or twists the foot is not good, but having a calf that is overly weak is also not good. We do not over-stretch the calf. The point is that there is selective tightness as well as selective weakness.

The penalty of the weak calf, and the reason it is always overlooked, is that in order to keep the body upright, one flexes the knee and the strain is on the quadriceps. People commonly complain of either a painful calf or a painful quadriceps, or both, and so we, at that point, provide stability of the knee. Some people solve the problem by loading with the foot down, so they have flat foot contact and no stimulus for knee flexion. If a calf had a contracture that came to five degrees of neutral, it would be solved that way.

The most common form of orthoses today for a weak calf is a plastic shell. Some are good and some are bad. The depth of the cut determines their flexibility. The big problem with a solid plastic shell is that it prevents the foot from dropping down at all. If it is cut way back (3/4 inch wide), it can be used just to pick up the foot for drop foot and that allows the foot to come down. However, if one has a thick or dense shell, when you load with a heel strike, it will drive the foot down causing increased knee flexion and increased strain on the thigh. So, if a person has normal quadriceps or can balance on the heel until the whole body rolls forward, it is not a problem. But if one has a sensitive quadriceps, it can be overloaded by this kind of shell. To correct that, a hinged plastic orthosis has been designed with a variety of stops. Some have a plastic strap that catches on a screw. We happen to use a flexible strap because it buckles and more readily allows the foot to go into free plantar flexion for easy loading. For better knee control we also have a light plastic shell molded to the thigh. When the back-knee posture used for standing stability becomes excessive and painful, an off-set knee joint can limit the knee position and still allow the knee to be free. If the patient lacks knee stability because there is both quadriceps weakness and flexion deformity, the joint has to be locked.

If the polio came in adulthood and the legs are equal length, we add a lift to the other leg to help toe clearance by the braced leg. Effective bracing has been very good for both the people who have overuse in the muscles, and the people who have strain in their ligaments and joints. Bracing has not made any of the

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joints worse. Once in a while with bracing, we have a little trouble getting balance among the different muscles and have had a few of our “muscle” people who do not like them, but in general, it has been a very successful program.

**DR. OWEN:** Last night I went to bed feeling rather comfortable about my preparation for today, and then at about three in the morning, I woke up with an odd feeling that I had not *listened to my body*. The admonition from some of the scientists talking to us yesterday was that we polio survivors should listen to our bodies. I then had an interesting thought. I tried to listen to my body, but we were not talking the same language!

Why do I bring this up? It is part of the caution that I would like to offer with regard to exercise and fatigue. We have been trained from the early days of the management of our polio to ignore what our body tells us. We ignore the fact that we are walking with very weak groups of muscles and ignore pain. We were taught by our physical therapist and by our parents that we were just as good as any of the other kids on the block, and that taught us to ignore the normal messages intended to warn us that we have gone one step too far.

Listen to our bodies. That is exactly what Nancy did with her exercise program. She exercised, experienced weakness, and had to rest all day. So, she modified her program. She swam many laps, recognized that she was overdoing, and modified her program once again.

Modification is one of the keys to an exercise program. In our exercise program at Sister Kenny in Minneapolis, Minnesota, we emphasize cardiopulmonary conditioning. We recommend an interval training technique of exercise. Our conditioning program suggests 20 minutes a day, three times a week. The result is as successful cardiopulmonary conditioning as a non-disabled individual doing a similar exercise.

Individuals exercise for two to three minutes building up the heart rate and then rest one or two minutes and then exercise again. (Nowadays runners use this technique to train for short distance runs.) Exercises have to be done with a chance to breathe in between, and aerobic exercise gives the muscles a chance to rebuild their oxygen supply between contractions. One of the objections I have to apparatus exercise is that enthusiasm to do a great job (and impress everybody) has people doing the whole program without one breath, and that is pretty silly.

Dr. Jacquelin Perry and Sister Elizabeth Kenny are on a similar track as far as the treatment of polio. They both believe that one should not exercise a painful muscle. They advise not to do exercise in the presence of pain, and not to do exercise that then causes pain.

I agree with these cautionary notes and would add — listen to your body. But, the challenge may be to find out what language your body is using.

Intentional exercise should be thought out, should be individualized, and should be cautiously done. That is why so many professionals at this conference dodge the major questions about what you should do for yourself. An exercise program should be individualized and should fit the rest of your life-style. If you are involved in very rigorous activity at work, an intentional exercise program may be time consuming, boring, and too much.

Another caution is that tight muscles should be stretched before exercising. The reason is partly to prevent pain and partly to prevent injury. Muscle strengthening should be goal-oriented and set in a framework of general health status. There are muscles that are important to strengthen from a postural standpoint. Abdominal muscles and some of the hip muscles can be strengthened after prolonged inactivity.

Many times people ask about losing a muscle in the leg if it is braced. There is an advantage to bracing the weakened muscles below the knee because the over-use effect there of walking is so great. (I have one leg braced and the other one not. It is partly habit and partly the fact that I still use my right foot for the gas pedal.) I think that some of the functional aspects of living determines whether or not we use a brace even in the face of good advice from experts.

Last week, I evaluated a man who walks in a most exaggerated hyperextended fashion. Muscle tests reveal he has nothing to walk with, but he refuses to use or wear a brace. He does not want to look “crippled.” If there is a way to get someplace faster, with less energy consumption, and at the same time enjoying it more, then we ought to take advantage of the fact even though we think we look “handicapped.”

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