Guidelines for Establishing a Water Exercise Program for Post-Polio Participants

By Lanny Taschuk and Patrick Fleck

Post-Polio Awareness and Support Society of British Columbia

This document is published by:
The Post-Polio Awareness and Support Society of British Columbia
#2 - 2630 Ross Lane
Victoria, BC, V8T 5L5, CANADA
Tel. (250) 477-8244; Fax (250) 477-8287
E-mail: ppass@ppass.bc.ca
Web site: www.ppass.bc.ca

Table of Contents

Preface

In the early 1980s, articles began to appear in medical journals describing symptoms of new muscle weakness, increased levels of fatigue, muscle and joint pain, and a variety of other alarming physical changes in persons who had contracted and survived paralytic poliomyelitis 30 or more years previously. These symptoms, initially referred to as the "late effects of polio" or "post-polio sequelae", came to be known collectively as post-polio syndrome or PPS. After its discovery, the condition was diagnosed in increasing numbers of polio survivors as the last of those infected in the great epidemic years before the introduction of anti-polio vaccines continued to age. It was a devastating blow to those who had long since survived the initial illness, undergone rehabilitation, and proceeded to live active and productive lives.

As the incidence of PPS spread, organizations such as the March of Dimes were reactivated, and new organizations were established to provide a focus for research, education, and support services for those experiencing PPS. In British Columbia, the Post-Polio Awareness and Support Society (PPASS) was founded in 1986 and began to offer a range of services to its members, including a bimonthly newsletter, the establishment of Area Groups and Contact Persons throughout the province, periodic conferences and symposia, and information programs for doctors and other health care professionals.

In 1995, as a logical extension of its support program, PPASS established the first water exercise program in British Columbia designed specifically to meet the needs of polio survivors. This highly successful program in Victoria is still in operation.

This handbook is not a definitive technical manual. Although it includes a number of technical details, it is intended primarily as a resource to assist the development of water exercise programs modeled on the PPASS program in Victoria. Many persons who once had polio have not yet developed the symptoms of PPS, and hopefully, may never do so. We do believe however, that the exercise program described here can be beneficial for all post-polio persons, known among ourselves as polio survivors, or simply, post-polios.

Patrick Fleck
Sidney, British Columbia – August, 2006

Acknowledgments

The preparation of this booklet has had a lengthy history. In 2001, the Board of Directors of PPASS, in response to suggestions from several Area Groups in B.C., agreed to commission the writing of a handbook or set of guidelines for the establishment of a post-polio water exercise program based on its highly successful program at the Esquimalt Recreation Centre in the Greater Victoria Area. After several unsuccessful attempts to establish a collaborative writing team of experienced aquatics instructors based in Vancouver as well as on Vancouver Island, Lanny Taschuk, then the lead instructor for the program at the Esquimalt Recreation Centre, agreed to take on the task of preparing a draft manuscript. Working in his spare time over the next few months while employed full-time as a kinesiologist, Lanny wrote a draft that covered about two thirds of the present content.

For several years, the draft manuscript was set aside for lack of available time by others to complete the work. A year ago, I accepted a request by Sharon Gelling, President of PPASS, to undertake the completion of the text. This has entailed considerable editing of the original draft and the writing of a number of additional sections. It has been a daunting but enjoyable task, inspired by the thought that if this document is in any way instrumental in helping to establish even one new water exercise program that brings benefits to polio survivors, it will all have been worth while.

On behalf of PPASS, I express thanks to Lanny Taschuk for his thoughtful work on the original draft. It provided an excellent starting point. I also wish to thank Peggy Bran, a charter member of the PPASS water exercise program at the Esquimalt Recreation Centre, for her perspectives and information on the early history of the program. Thanks are due also to Angela Iverson, a kinesiologist at the George Pearson Centre in Vancouver, and her colleague, Anne Scott, a physiotherapist, for forwarding a list of useful references for inclusion in this booklet. Lastly, I thank our instructors and my fellow participants in the Esquimalt program in which I have participated for the past eight years. They have given me encouragement, as well as inspiration. Several of them have offered perceptive and useful comments on earlier drafts of the text.

P.F.

About the Authors

Lanny Taschuk was born in Saskatchewan and grew up in British Columbia where he graduated with a Bachelor of Science degree in Kinesiology at the University of Victoria. He is a Registered Kinesiologist with the British Columbia Association of Kinesiologists (BCAK) and has worked in the rehabilitation field since 1997. He was directly associated with the PPASS Water Exercise Program from 1997 to 2003 and for a considerable amount of this time period, was senior instructor for the program. Lanny has since moved to Vancouver were he works for Orion Health and finds balance consulting for and working with Jeff Compton and Compton Sports Training Systems to assist in a program of long term athlete development serving amateur and professional athletes of various sports. The pursuit of knowledge and connecting with each person is deeply rooted in his treatment and life philosophy.

Patrick Fleck was born and grew up in Ontario. He contracted paralytic polio at the age of 15, but completed high school and went on to an Honours Bachelor of Arts degree in Science and a Master of Education degree at the University of Toronto. He obtained his teaching certificate at the Ontario College of Education, taught high school science, became an education administrator and joined the staff of the Ontario Ministry of Education. For the latter 16 years of his professional career before retiring, Patrick was Executive Director of several Ministry Branches including Curriculum and International Education. He has also served on various committees as well as on the Boards of Directors of the Ontario March of Dimes and the Post-Polio Awareness and Support Society of British Columbia. For the past four years, he and fellow participant, Garnet Jackson, have shared the coordination responsibilities for the PPASS Water Exercise Program at the Esquimalt Recreation Centre in Greater Victoria.

A Brief History

As mentioned in the Preface, the Post-Polio Awareness and Support Society of British Columbia (PPASS) established its water exercise program for polio survivors in the Greater Victoria Area in 1995. The program was developed under the guidance and supervision of Dr. Alan Bass, a physiatrist at the Gorge Road Hospital who was also associated with a rehabilitation aquatics program at the Esquimalt Recreation Centre. Although several polio survivors had participated in the rehabilitation program, they and Dr. Bass realized it was not well suited to the special needs of post-polio participants. As a result, Dr. Bass developed a program with guiding principles and a range of suggested exercise routines particularly suited to the needs of polio survivors.

Following a tentative beginning in a pool at the apartment complex where one of the charter participants lived, the new program found a permanent home at the Esquimalt Recreation Centre under the guidance of instructors trained by Dr. Bass. Funding to support the program was secured from the British Columbia Provincial Employees' Community Services Fund, and that support has continued to the present day. The Board of Directors of PPASS and the many participants who have benefited from the program are deeply grateful for this ongoing financial support without which, the program could not survive.

Over the years, there has been turnover in the instructional staff, but current staff still consult with Dr. Bass from time to time. As vacancies have occurred, experienced staff have sought out and trained new recruits, most of whom have been graduates of the kinesiology program at the University of Victoria. At any given time, the instructional team usually consists of two or three kinesiologists, of which one or two are on duty at each session depending upon numbers attending. Although instructors were originally contracted through the recreation centre, they have been contracted directly by PPASS since 2003. In its early years, the program operated from September to June only, but it is now offered on a year-round basis.

Advantages of Regular Water Exercise

Water provides a supportive medium in which the pull of gravity is dramatically reduced. Thus, the risk of injury while exercising in an aquatic environment is also reduced. An added advantage of water exercise is that water can increase the resistance experienced while moving in it. The faster and harder one works against the water, the greater the resistance encountered and the more difficult the exercise. The opposite also applies. The slower one moves through the water, the lower the resistance and the easier the exercise.

Potential benefits of water exercise include: improved flexibility; an increase in range of motion; an increase in strength; decreased spasticity; better relaxation; an increase in caloric consumption; and, improvements in balance, coordination, and posture.

Physical Benefits

Water offers an excellent exercise environment for the individual coping with PPS. The buoyancy, hydrostatic pressure and submersion in a warm aquatic medium present a versatile environment that can be utilized to suit each individual regardless of level of fitness or ability. A reduction in muscle spasm, relaxation of tense muscles, an increase in mobility, nourishment of joint capsules, re-establishment of correct movement patterns, as well as an increase in strength, muscular endurance and improved posture can all result from a properly designed and monitored water exercise program.

Water provides an environment which reduces perceived body weight by almost 90 per cent when standing at shoulder depth and it greatly decreases the musculoskeletal stress or impact the body experiences in a non-aquatic environment. Using the buoyant property of water, one can float or support limbs that otherwise have limited function, and with little effort that limb can be moved and can increase its range of motion, strength and control.

Water also provides an excellent medium in which controlled cardiopulmonary endurance activities can be performed. Keeping the exercise continuous but non-fatiguing provides effective cardiovascular conditioning with minimal stress to muscles and joints. As a direct benefit of improved cardiac efficiency, many individuals who exercise regularly report significant

improvement in their sleep pattern.

Metabolic changes can also occur with water exercise, and these are especially beneficial for post-polios. Any decrease in body mass or body fat will reduce mechanical stress due to gravity on weight-bearing joints. As well as increasing the heart rate with exercise, one benefits by burning extra calories. Balancing calorie intake and calories expended can be difficult for those who have pain and/or fatigue problems and as a result, tend to avoid exercise.

Social Benefits

The primary social benefits of a water exercise program, or any group program for post-polios, are meeting and enjoying new friends as a result of social interactions, increasing one's social network and learning about the experiences of others who had polio and may be coping with PPS. Learning how other persons have dealt with a particular problem or challenge may lead to the acquisition of new approaches and coping strategies.

Other social benefits include increased self-confidence. The participant is put at ease in the buoyant aquatic environment and can feel relatively free of the risk of falling that is their constant preoccupation on dry land. As one progresses with the exercise program, a sense of accomplishment and an improved self-image from achieving fitness goals leads to greater self-confidence and self-awareness.

Group support can be one of the best re-enforcers of exercise behavior. The participant who sincerely wishes to make positive lifestyle changes with exercise is far more likely to attend regularly and achieve progress with the support of peer friends. As well, they are more likely to attain and maintain desirable activity levels for years to come.

Following the exertions of exercise, it is beneficial to have a period of rest and to reestablish normal hydration levels. A refreshment session following water exercise provides such an opportunity and also allows for beneficial social interaction. To facilitate this, it is recommended that a meeting room at the pool facility be available to water exercise participants immediately following each session. Bottled water, coffee, tea and cookies can be arranged on a shared rotating basis among the participants themselves as they meet together in a pleasant atmosphere, chat

about the day's exercises, their challenges with PPS, or whatever else is of interest.

Facilities and Equipment

Ideal facilities and equipment will not be available in every community. Although compromises may have to be made, recommended facilities and equipment are listed below with (in some cases) a range of alternatives.

1. An exercise pool that can accommodate up to 20 participants. One complete lane (preferably 1.5 lanes) of a standard 25 metre municipal recreation pool is adequate, assuming there is a gradual variation of water depth from about one metre to three metres or more. For more than 20 participants, proportionally larger space will be required. Be sure to rent the lane or lanes on the side of the pool adjacent to the lift or ramp (see # 10).

2. Water temperature should be in the range of 85 to 86 deg F. (29 to 30 deg C.) Note that most recreation pools maintain water temperatures ranging from 78 to 84 deg F. (26 to 28 deg C.). Although suitable for able-bodied swimmers, these temperatures are too cold for most post-polio participants. Bear in mind that normal body temperature is 98.6 deg F. (37 deg C.). Warm-water therapy pools in some health care facilities can be used if that is the only choice, but they are usually not big enough or deep enough to perform the recommended exercises. (Caution: Note that hot-tubs in which the water temperature is kept above 90 deg F. (32 deg C.) can be highly debilitating after only a few minutes of immersion for persons with muscles already weakened from polio.)

3. A variety of flotation devices and resistance equipment. Floatation devices should include flutter boards, belts in different sizes, noodles, water dumbbells, hydrocuffs and vests. Resistance devices should include rubber bands (such as Thera-Band®), hand paddles, aquatic shoes and flippers. Such equipment is usually available at recreation centre pools.

4. A building, change rooms and pool facility that are fully accessible to wheelchairs and scooters. Adequate parking with designated spaces for handicapped drivers or passengers. Automatic opening doors at the main entrance and at entrances to change rooms.

5. Change rooms and locker areas with sufficient floor space for wheelchairs and scooters to maneuver. Lockers that are accessible from a seated position. Adequate bench space in change rooms with bench-height at least at standard chair height.

6. At least one "family" change room providing privacy to those who may need the assistance of a spouse or other caregiver.

7. At least one shower stall, or shower head location in an open shower room, that is safety-bar equipped.

8. At least one toilet-stall in or near male and female change rooms that is wheelchair accessible and fitted with a raised toilet seat and safety bars.

9. One or two waterproof wheelchairs supplied by the pool for participants who can enter the facility with the aid of canes, crutches or a walker, but would be at risk on the slippery tile floors of change rooms, shower rooms and pool deck.

10. A manual or electric chair-lift at poolside to transfer from wheelchair or scooter into the pool. An alternative would be a gradual ramp into the pool that accommodates a waterproof wheelchair.

11. A meeting room in the recreation centre for use by the participants for up to an hour following each water exercise session.

Supervisory and Instructional Requirements

It is preferable to establish water exercise programs targeted to the needs of post-polios and those with PPS in consultation with a physiatrist (doctor of rehabilitation medicine) experienced in the diagnosis and treatment of PPS. Such physicians are well versed in the clinical presentation of PPS symptoms and in appropriate forms of healthy exercise consistent with the limitations of the condition. If the services or advice of such a medical specialist are unavailable to those wishing to organize a program, a variety of helpful medical abstracts, articles and pamphlets can be obtained from the PPASS office in Victoria. As well, an extensive reference list of articles, books and web sites is included at the end of this booklet. *The Polio Paradox*, the most recent book by Dr. Richard L. Bruno, founder of The Post-Polio Institute in the United States, is also an excellent general reference (see References).

All sessions of the water exercise program should be under the direct supervision of one or more instructors who are qualified physiotherapists or kinesiologists and well versed in the theory, methodology and application of aquatic exercise to post-polios. As well, they should be registered members of either the Physiotherapy Association of British Columbia (PABC), or the British Columbia Association of Kinesiologists (BCAK). Both organizations maintain web sites and have offices in Vancouver. They can be contacted to seek out local members in B.C. communities if these are unknown to program organizers. The association web sites are as follows:
PABC: http://www.bcphysio.org
BCAK: http://www.bcak.bc.ca

As a general rule, one instructor should be sufficient for groups of up to 10 participants. From 10 to 20, a second instructor is recommended. If it is thought that one instructor will suffice for the expected average attendance, it is advisable to operate with an available team of at least two instructors so that both can be on duty when a number of new participants are entering the program and require more individual attention, and also to ensure that illness and vacation schedules do not disrupt the program.

University or college students in physiotherapy or kinesiology may give part-time assistance to a lead instructor who meets the above requirements. In situations where several instructors are

associated with the program with only one on duty at a time, again, a workable arrangement would be to have the instructional team led by a registered professional who acts as a supervisor and tutor to the less experienced non-registered assistants.

If a registered physiotherapist or kinesiologist is interested in supervising the program but lacks background in post-polio and PPS, the PPASS office can recommend sources of information, the names of practicing physiatrists in the area, or other professionals willing to assist by sharing their experience and knowledge of exercise programs designed specifically for post-polio participants.

Qualified and knowledgeable professional instructors are essential to the success of a post-polio water exercise program. They will provide immeasurable benefits to the participants by introducing and customizing suggested lifestyle modifications for each individual, and by applying important concepts of pacing and energy conservation.

Instructional Practice

The group exercise approach used at many water exercise or "aquatints" programs is generally unsatisfactory for post-polio participants and can potentially be harmful. Despite the commonality of having survived polio, post-polios will have considerably varied exercise needs related to their individual medical histories and unique patterns of muscle paralysis. Thus, an individualized exercise program is strongly recommended. Instructors should take the necessary time with each participant to establish and monitor their exercise routines. Thereafter, individual monitoring can be done on a spot basis as the instructor(s) observe the group performing their individualized programs.

Referral Process

It is preferable to have participants referred and recommended for participation in a water exercise program by their family doctor or a physiatrist. Based on the physician's knowledge of their patient's medical history, this provides reasonable assurance that the participant can be expected to benefit from the program. As well, such referrals may specify certain limitations for the participant which must be observed by the instructors. Physician referrals also provide a level of assurance to the administrators of the program from a liability perspective.

Referrals may also be accepted from physiotherapists or chiropractors. It would be prudent to suggest to prospective participants who arrive without a professional referral, that at the very least, they seek permission from their family doctor to participate in the program. To this end, a one-page description of the program for them to show to their family doctor would be helpful.

Initial Assessment

Assessment by the instructor is an important initial stage in each participant's program. The instructor should be aware of the participant's medical history, how he or she was affected by the original polio infection, and about more recent changes in muscular strength and mobility. Medications the participant is currently taking should be noted, and the instructor should make him/herself aware of their impact on the participant in order to avoid potential complications or adverse reactions to exercise. To ensure the participant's comfort during the initial assessment, the setting should be reasonably quiet, and if possible, private (perhaps in a room adjacent to the pool if a second instructor is also on duty, or on a bench at the side of the pool out of hearing range of those in the pool).

Participants must be assured of the confidentiality of their personal information as would be the case for medical records in a physician's office. Under no circumstances should this information be made available to a third party unless written consent to do so has been given by the participant.

A reasonably simple assessment and evaluation form should be developed. It should include

questions about the type of paralytic poliomyelitis the participant experienced. The three main types are: spinal (trunk or extremities), bulbar (swallowing, voice, tongue, face), and bulbospinal (respiratory difficulties). Limbs or muscles that were affected and to what degree should also be noted. The participant should be asked to identify limbs and specific locations where they have recently experienced sporadic or chronic joint or muscle pain, twitching, muscle fatigue, a decrease in strength or range of movement, and whether or not they have been experiencing gradual muscle weakening. They should also be asked if they have experienced recent difficulties with walking, a decrease in the distance they can walk comfortably, difficulty with stairs, difficulty with the use of their arms, or performing any other daily activities in which they participate.

In addition to the history directly related to polio, the instructor should discuss the participant's other medical conditions that may or may not have been mentioned in a referral letter, but which could affect their ability to participate in an exercise program. Here are a few examples of questions to ask of each participant prior to the design and implementation of their individual exercise program: "Has a limb been recently immobilized, for example following a fracture?", "Have you had surgery recently?", "Do you have a known heart condition?", "Are you taking medication for high blood pressure?", "Do you experience difficulty with breathing?", "Can you swim, and approximately how far?", "Do you have a fear of being in water beyond a certain depth?", etc.

If the answer to any of these, or similar questions raise an issue of safety with respect to a person's participation in the program, especially if it has not been mentioned in a referral letter, or in the absence of a referral letter, it would be prudent to suggest that the person not participate in the program until the issue is addressed in a letter from a physician.

Waiver of Liability

Even if liability insurance is in place for the program organizers, all new participants in a water exercise program should be asked to sign a form releasing the instructors and the sponsoring organization of the program from any and all liability that may arise from the program. While it can be expected that a municipal recreation authority will carry substantial liability insurance covering its facilities and staff, the use of a waiver of liability form is common practice in situations where responsible individuals or organizing groups are not directly covered by such policies. While participants in the program can reasonably expect that every effort will be made and appropriate precautions taken to ensure their safety, unfortunate incidents or circumstances can occur that are not the result of any obvious negligence.

Monitoring Progress

An accurate, confidential log should be maintained of each participant's attendance and progress in the exercise program. Over time, it is easier to see trends using this log and it enables the instructor to better assess progress. Structure and sequence of exercise should be developed and the participant should understand and appreciate why specific sequences and exercises are recommended. Also if the participant is experiencing significant difficulties or an adverse reaction to any particular exercise, the instructor should modify the exercise or suggest an alternative.

In the early stage after a new participant joins the program, the instructor should monitor the participant at each exercise session for quality and quantity of movement. Significant observations and answers to questions should be recorded in the participant's log. The instructor should ask if any difficulties have been experienced during the interval since the previous session that may relate to participation in the program. Pain and fatigue levels should be monitored, and any trends noted will help the instructor to adjust the participant's program accordingly. The number of repetitions of each exercise movement performed at each session should be recorded. This serves as the instructor's road map for adjusting the participant's program. It can be particularly useful when the participant has missed several sessions, in which case it may be necessary to reduce the level of activity for a while before returning to the previous activity level.

As participants gain experience in the program and appear to have established an appropriate balance between their exercise program and a desired conditioning level, they may not need to be monitored at every session. They should by this time, have a clear understanding of the principles of the program and be thoroughly familiar with their individual routines, but should be encouraged to let the instructor know if they experience any problems. Even so, the instructor should do random spot monitoring of a selected number of participants at each session.

As part of the monitoring process, the participant should be asked questions such as: "How did you feel after the last exercise session?", "Did you have any muscle pain that lasted more than a day or so after the session?", "Did you have a restful night's sleep after the last session and did sleep longer than usual?", "Are you experiencing, over time, any general or specific increases in weakness or fatigue?", "Did you have any mechanical or health problems during the week such as an infection, a fall, or an injury?", etc..

Adjustments may be necessary every few months for individuals that become bored with the same exercise routine. For example, if a participant is a competent swimmer, they may wish to vary their exercise routine by swimming several lengths of the pool in a lane reserved for such swimming adjacent to the exercise program's reserved lane. Static stretching in the water can be added, particularly after the exercise session. Progressions of exercise time or number of repetitions should be made only on a gradual basis. Keep in mind that while water exercise has a serious and beneficial purpose, it should for the most part be an enjoyable experience for the participants. The instructor should be positive and encouraging at all times and commend participants on their progress.

Specific Goals of Conditioning

Studies have shown that a person with a history of polio can improve muscular strength and endurance with an appropriate exercise program. The key is to determine how much exercise is needed and appropriate for the individual participant. Normally functioning muscles should be noted before exercise begins, as well as muscles that have been affected by the initial polio infection and by PPS. Muscles that appear not to have weakness due to polio can be used and trained as one would in a normally able person. Thus, these muscles can be programmed to be the dominant exercising muscles for cardiopulmonary work. Muscles that are slightly or even

severely weak may, at the same time, be in a relatively stable condition. However, these muscles should be exercised with caution and light intensity. Fatigue of clinically stable polio-affected muscles should be avoided. Light resistance exercises that are non-fatiguing may be implemented, and frequent rest breaks should be used when training these muscles.

Increasing weakness in any polio-affected muscle groups should be a signal to the instructor to modify, decrease or omit the exercise altogether. At most, active exercise of such muscles must be very limited and closely monitored. Energy conservation, pacing and rest are extremely important for these muscles since damage from overuse can occur.

Participants should be taught to self-monitor their fatigue level during exercise sessions. Fatigue can be a signal of overworked muscles. The participant needs to clearly understand that they should not work through or past indicators of fatigue. Lifestyle modification techniques are extremely important for post-polios. The instructor should set aside time, in addition to exercise prescription and monitoring, to discuss with participants their regular daily activities that could be factors causing general fatigue and pain. Research has shown conclusively that post-polios should avoid pushing through discomfort; they must shun the "no-pain-no-gain" philosophy of exercise which, for them, can be destructive.

A further goal for the water exercise program should be the improvement of the participant's strength and endurance. For strength development, an exercise can be performed at a faster tempo, with rest periods between sets of repetitions. For endurance development the tempo can be reduced but the exercise continued for longer periods. Hence similar movements in the water may be modified to enhance both strength and endurance.

The goal in the first four weeks of a water exercise program should be to encourage mobility in each participant and not to particularly tax muscles with strengthening or endurance exercises. The emphasis should be on the use of water as a supportive medium allowing gentle movement that will have a positive impact without causing undue fatigue, weakness, or pain. Keep in mind that moving in the water through even simple exercises that involve previously untrained and underutilized muscles can still result in a delayed onset of muscle soreness. It is therefore important to know the participant's current activity level, and to warn against potentially harmful exercise-caused fatigue.

Pacing should be part of the exercise routine. The instructor should assess the new participant's tolerance to a brief program of say 15 to 20 minutes' duration. If fatigue or pain results, shorten it by 50 per cent and slowly increase the duration of the exercise as tolerated. The exercise program devised needs to address and should be geared towards training the participant to adapt and utilize interval training. Interval training involves rest breaks between exercises and cycling through exercises for different muscle groups. Interval training helps the participant realize that even with potentially beneficial exercise, a pacing approach should be used.

Adequate hydration prior to and during exercise is important. Participants should be encouraged to drink several glasses of water before sessions. This will help to avoid stress from overexertion. Adequate hydration ensures that the body's natural cooling system works optimally to maintain normal body temperature.

An appropriate number of repetitions of several exercise movements are preferable to a program with many different exercises, at least at the beginning of a participant's experience. With experience, the number of repetitions can be increased or decreased as needs dictate. Timing each set of exercises may be more useful for the advanced participant and removes the concentration required to count repetitions for each movement. To this end, municipal pools usually have a large time-clock on an end-wall with several sweep second hands constantly rotating. The problem with timing a beginners program is that a similar tempo will not be attained each time, and if problems arise, it can be difficult to determine which part of the exercise routine is causing the problem.

Individual Exercise Programs

Warming up reduces the potential risk of injury when starting any exercise program, even in an aquatic setting. Initially each participant's program should begin with a few minutes of very light and slow exercise requiring a minimum of effort. The pace and intensity can then be increased gradually. Slowly increasing range of motion and light stretching can be incorporated after the initial warm up.

Walking in the pool while partially submerged can be a good basic warm up activity. It involves

working the lower and upper extremities and can usually be done by most participants utilizing the buoyancy of the aquatic medium. The resistance of the water makes it almost impossible to do this too quickly, ensuring that it is a safe warm up exercise. If the individual has difficulty with this or is unable to simulate walking even with the buoyancy of the water, a warm up involving vertically oriented light swimming or treading water may be used as an alternative. Warming up will prepare muscles for more vigorous exercise and increase the temperature of working muscles and the body in general.

The instructor should ensure that participants not overdo exercises. Doing more or doing it faster is not always better and participants should be aware that even a few minutes of overdone exercise might cause delayed onset muscle soreness or fatigue that is potentially damaging. The sense of support in the aquatic medium can give a feeling of exhilaration to participants, tempting them to continue recommended exercises for too long. They should be warned to avoid this temptation. Progressive tempos and reasonable time limits should be observed when starting and developing a water exercise program.

At the end of each exercise session, and while still in the water, the participant should undertake stretching movements recommended by the instructor. Exercising generally shortens muscle tissue; hence it is important to stretch after exercise in order to lengthen and restore muscle tissue to its resting state.

Some Examples of Exercises

Lower Extremity Exercises:

Cycling

Posture for Cycling:
Maintain an erect posture with abdominal muscles contracted or tensed. A flotation vest, belt or noodle should be worn. The depth of water should be such that the participant is slightly beyond being able to touch bottom. This exercise can also be done in slightly shallower water while standing on one leg and exercising the opposite one.

Performance of Cycling:
Cycle with the feet and maintain moderate range of motion keeping the angle between the upper leg and the torso at greater than 90 degrees. If the participant feels insecure in water beyond their depth, they can hold on to the wall of the pool for this exercise. However, provided they can maintain balance and coordination, it is preferably done while floating freely in deeper water.

Progression of Cycling:
Using shoes will increase the difficulty and resistance of this exercise.

Marching

Posture for Marching:
The same as for "Cycling".

Performance of Marching:
The knees should be slightly bent but held firm at a reasonably fixed angle during this exercise. The movement should mimic marching with a moderate stride in the water with one leg moving forward and the opposite leg moving backwards. Keep the foot in a neutral position, with neither the toes pointing up or down. Do not extend the leg backwards too far as it can be uncomfortable and put the lower back into extension.

Progression of Marching:
Using shoes will increase the difficulty and resistance of this exercise.

Splits

Posture for Splits:
The same as for "Cycling".

Performance of Splits:
The participant should hold on to the pool's edge during this exercise, as one may tend to bob up and down during this movement. Start with the legs together and move them both apart to the

sides to slightly beyond shoulder width to start.

Progression of Splits:
Using shoes will increase the difficulty and resistance of this exercise.

Kicking an Imaginary Ball

Posture for Kicking an Imaginary Ball:
The same as for "Cycling".

Performance of Kicking an Imaginary Ball:
Draw one foot up towards the buttocks to approximately a 90 degree angle at the knee. Extend and straighten that leg as if kicking an imaginary ball. While the one leg is straightening the other leg should be bending. This will provide balance and protect the back better than one at a time when floating.

Progression of Kicking an Imaginary Ball:
Using shoes will increase the difficulty and resistance of this exercise.

Walking Forwards

Posture for Walking:
Stand erect in lower-chest-deep water. Imagine someone pulling up on the crown of the head and hold in the abdominal muscles.

Performance of Walking:
The arms may move at the sides forward and backwards within a range of 6 to 12 inches (15 to 30 cm) while walking. Walk landing on the heel and rolling through to the ball of the foot. Stop at the end of the lane or lane rope, then turn and continue to walk. Avoid twisting while walking.

Progression of Walking:
Hold a floatation board against the stomach and partially submerged in the water while walking.

Walking Side to Side

Posture for Walking Side to Side:
Stand erect in lower-chest-deep water. Avoid going deeper than this level as the buoyancy of the water will not permit correct posture to be held. Imagine someone pulling up on the crown of the head and hold in the abdominal muscles.

Performance of Walking Side to Side:
Walk with the foot leading to the side about 1 to 2 feet (30 to 60 cm). Land on the ball of the foot, then the heel and bring the other foot together. Stop at the end of the lane or lane rope, and then move in the opposite direction while facing in the same direction.

Progression of Walking side to side:
Hold a floatation board against the side, under an arm, and partially submerged in the water while walking.

Upper Extremities Exercises:

Flying

Posture for Flying:
The participant should stand in water of moderate depth or brace him/herself against the wall in shoulder-depth water. When bracing against the wall of the pool the participant should ensure that the position is comfortable prior to commencing the movement.

Performing Flying:
The participant should start the movement with both arms at the sides and keeping the palms facing each other, move the arms up. Arms should not be brought up to where the elbows are above the shoulder level. The instructor should ensure that the range of motion is pain free.

Progressing Flying
The exercise can be progressed by moving quicker through the water. Resistance devices such as hand paddles, water dumbbells or wrist weights can be used to increase the difficulty and

progress the exercise. The preferred method would be to use hand paddles, which evenly increase resistance, whereas floatation devices make it difficult through one phase of the movement and easier on the opposite phase of the movement.

Chest Flyes

Posture for Chest Flyes:
The participant should be braced against the pool wall for this movement to ensure that excessive rocking and spinal movements are avoided. Start in water at lower chest level and as if sitting in a chair, slide the back down the pool wall and brace shoulder blades and buttocks to the wall. Feet should be positioned a foot or two (30 to 60 cm) comfortably away from the pool wall.

Performing Chest Flyes:
The participant should start with the arms submerged again with elbows below shoulder level. Hands should be placed palms together to start. Arms are then drawn parallel to the surface of the water to approximately 90 degrees or directly out to the sides. Again ensure that the range of motion is pain free.

Progression of Chest Flyes:
The same as for "Flying".

Front Arm Raise:

Posture for Front Arm Raise:
The same as for "Chest Flyes".

Performing Front Arm Raise:
The participant should start with arms lowered against their sides in the water. Arms are then kept locked, raised to the front of the body near the surface of the water, and are then brought back to the starting position against the sides of the body.

Progression of Front Arm Raise:
The exercise can be progressed by moving more quickly through the water. Resistance devices

such as hand paddles, water dumbbells or wrist weights can be used to increase the difficulty and progress the exercise. The preferred method would be to use hand paddles as they evenly increase resistance, whereas floatation devices make it difficult through one phase of the movement and easier on the opposite phase of the movement.

Abdominal resistance using flotation devices:

Posture for Abdominal Resistance:
The same as for "Chest Flyes".

Performance of Abdominal Resistance:
Start with arms outstretched and locked to the front near the surface of the water. This exercise should be performed slowly. Breathe out as the floatation device is forced down to the thighs while holding in the stomach. Resist the floatation device to the top of the water and breathe in.

Progression of Abdominal Resistance:
The exercise should be started with minimal resistance. A flotation noodle can be cut into quarter, half, and three-quarter lengths. As the difficulty for the participant decreases, a larger noodle can be used. As well, dumbbells can be used.

Example of a Beginning Level Exercise Routine:

Lower Extremities (floating):
10 repetitions of Cycling
10 repetitions of Splits
10 repetitions of Marching

Upper Extremities
10 repetitions of Flying
10 repetitions of Front Arm Raise
10 repetitions of Chest Flyes

2 to 3 minutes of Walking

After the responses of the participant to these exercises have been assessed and found favorable (i.e. no increase in baseline levels of pain or fatigue), then others may be added to the program progressively.

Scheduling Issues

Maintaining a regular schedule of water exercise is important. Existing schedules at the pool facility may limit choice, but ideally, sessions should be planned at the same time of day, twice per week in a pattern that provides two or three off-days between sessions, e.g. Mondays and Thursdays, Mondays and Fridays, or Tuesdays and Fridays. As discussed earlier, sessions should be from one to 1.5 hours in length, the longer time providing greater flexibility for setting aside the first half hour exclusively for new participants to have more one-on-one time with instructors.

Time of day is a matter of personal or group preference. However it is recommended that sessions not begin too late in the afternoon. For example, if the start-time is as late as 2:00 pm, the after-swim social time could last until 4:30 pm. At that hour in most urban communities, rush-hour traffic is underway and in the winter months it is almost dark, making for driving conditions that many post-polios would find unpleasant. Sessions beginning in the forenoon or early afternoon would be preferable.

Program Management

To successfully maintain a post-polio water exercise program, a minimum amount of administrative organization is required. At least one member of the local group or sponsoring organization, preferably a program participant, should be designated as the program coordinator. Having two persons share the coordination duties is an even better arrangement. In addition to sharing the workload, they can spell one another off when either is absent.

Before a new program is officially launched, a community or regional area must be surveyed to assess the level of interest in a water exercise program and the number of participants likely to attend. Notices may be placed free-of-charge in PPASS News, community newspapers, or on community cable channels with a name and telephone number to be called to indicate interest.

Flyers advertising the prospective program can be left in doctors' offices, walk-in medical clinics, physiotherapy, massage therapy, and chiropractic clinics and at the intended pool facility.

It is difficult to set a minimum threshold of expected attendance before launching a new program. If ten or more people appear committed to attend on a regular basis, it is probably worth while to proceed with formal plans and commitments. Lesser numbers will make it problematic. Keep in mind however, that once a program is launched, the successful experience of those attending will spread by word-of-mouth and more will likely register for the program.

The necessary organizational and administrative tasks are as follows:

- Select a suitable pool facility at which to conduct the program (see Facilities and Equipment).
- Negotiate a weekly schedule with the pool facility for lane rental, rental of a meeting room for after-swim social gatherings, and the fees for such rentals (see Scheduling Issues).
- Arrange a contract with the pool facility for lane use and meeting room rental. The contract should specify days, times, and pool equipment to be used, as well as costs. (Caution: For a new program and depending upon available funding, sign the initial contract for a limited time period (say 2 to 3 months) in case expected attendance does not materialize.)
- Seek advice and assistance from a local physiatrist about program design and an appropriate exercise program for post-polio participants. In the absence of a physiatrist, a physiotherapist or kinesiologist experienced with such programs can offer helpful advice.
- Interview prospective instructors, select a lead instructor and any others needed to form the initial "instructional team" (see Supervisory and Instructional Requirements).
- Arrange a contract with the instructor(s) specifying the schedule, hours of duty, tasks, hourly rate of pay, and expected process for instructors to submit invoices and to be paid. (Note: It may be possible to contract for instructors through the pool facility or recreation authority. In other words, the pool facility employs the instructors and includes these costs in its contract for lane use and a meeting room. However, this arrangement may preclude the program organizers from selecting instructors that they feel are most suitably qualified.)

- Ensure that either through the pool facility/recreation authority or the sponsoring organization that an appropriate level of liability insurance is in place for the program.
- Notwithstanding the protection afforded by liability insurance, it is advisable also to develop a waiver of liability form. Ensure that all participants sign the form and that signed original copies are kept on file by the instructors or the organizing agency.
- Develop and maintain lists of participants and instructors including names, addresses, telephone numbers and e-mail addresses.
- Establish procedures for collecting fees from participants (if such applies), issuing receipts, keeping track of payments, and maintaining a bank account of proceeds.
- Send regular notices by e-mail to participants and instructors concerning program status: special events, cancelled sessions due to Statutory Holidays, startup dates following major holidays or pool closures, etc. Telephone those that do not have e-mail.
- Organize a schedule and rotating roster of participants to arrange for tea, coffee, cookies, etc. at the after-swim social gatherings. Offset refreshment costs by collecting a fee of say 75 cents from each person per session. (Arrangements can usually be made to store a coffee maker, supply of coffee and filters, tea and a kettle, styrofoam cups, etc. in a cupboard at the pool facility.)
- Prepare periodic reports on the program and its financial status, as required, as well as an Annual Report for the sponsoring agency or agencies.

Estimating Costs

The annual costs of operating a water exercise program for post-polios can vary considerably depending upon factors such as: rental rates at the pool facility; number of sessions per week; length of sessions; fees paid to instructors; and whether the program is offered ten or twelve months per year . There can also be ancillary costs such as equipment rentals if such apply and printing costs for pamphlets promoting the program.

Recognizing the variables that apply, total costs could range from $4,000 to $8,000 per year. While rates may vary considerably in different communities, the fee for lane use in municipal pools can range from $8 to $12 per hour. Fees for instructors can range from $16 to $25 per hour depending upon their experience and professional qualifications. Most pool facilities include the cost of lifeguards in fees for lane usage if other parts of the pool are simultaneously in use for

other programs or rentals. If the post-polio water exercise program is exclusive (i.e. the only program in the pool for the specified time) then the cost for a lifeguard may be added. In B.C. this would be in the range of $13 to $20 per hour.

If sessions are held twice weekly and we assume an average attendance of 10 participants, the above range of total costs work out to be anywhere from $4.50 to $9.00 per person per session, and could be more if average attendance is lower than 10. This can be prohibitive, and if participants' fees had to pay the full program costs, it would most likely discourage attendance, rendering the program nonviable. Thus, potential sources of subsidy must be investigated in addition to a reasonable participants' fee (see following section).

Potential Sources of Funding

It is unfortunate indeed that water exercise programs for post-polios, providing the outstanding health benefits that they do, are not considered a fundamental health service within the B.C. Medical Services Plan (MSP) and funded as such at least in part, as is done in the case of physiotherapy. It would be wonderful if they were, but we would be dreaming if we thought this would happen any time soon. Thus, we must seek funding sources outside the mainstream health care system.

PPASS has indeed been fortunate to receive annual funding from the B.C. Provincial Employees' Community Services Fund (PECSF) for its water exercise program in the Greater Victoria Region for the past 10 years. PPASS itself, or one of its Area Groups anywhere in the province could theoretically apply to the PECSF for funding for a similar program elsewhere in the province. However, to be realistic, the Fund has been under considerable pressure in recent years to expand its support for many existing and very worthy community programs. In the face of uncertain contribution totals from a diminishing provincial public service staff, the Fund has been forced of late to adopt a policy of not accepting new proposals.

Local groups or organizations wishing to initiate a post-polio water exercise program should canvass their community for sources of funding. The federal and provincial governments sometimes have funds available for local health, educational or community service initiatives. These tend to be one-time-only grants and cannot be depended upon for ongoing funding.

However, they are worth exploring at the outset of a new program. To find out what might be available, contact your local M.P. and M.L.A.. Ask at your municipal office or city hall if any funding might be available from the municipality.

Service clubs such as Rotary, Kiwanis and Lions are often seeking community based initiatives to fund that provide valuable services needed by various segments of the population that would not otherwise be provided. Historically, Rotary Clubs especially have taken an interest in polio, particularly from the perspective of eradicating the disease. Since 1987, Rotary International has donated over $500 million through its PolioPlus program to immunizing children against polio in third-world countries. As a spin-off from PolioPlus, many local Rotary Clubs have also assisted post-polio support organizations through their community based initiatives.

Beyond the traditional international service clubs with local chapters, there may be similar service organizations unique to a community which would also be willing to assist a program for polio survivors. Local businesses often fund local charities or specific services as a means of showing that they are caring corporate citizens.

Lastly, there may be private charitable foundations in your community or region that are open to proposals for funding worthy causes for which there are no other logical sources of support. Listings of such foundations may be found in the yellow pages of the telephone directory or in reference lists in public libraries. Librarians are skilled at assisting you with any sort of information search. Be sure to ask at your local public library.

In addition to outside funding support, participants in a post-polio water exercise program should expect to pay a reasonable fee to help offset the costs. For the PPASS water exercise program in Greater Victoria, new participants attend for their first two months free of charge. After that, they pay a fee of $15 for each two-month period (about $1.00 per session). For 10 regular participants, this would raise about $900 per year toward program costs. If the fee were raised to $40 ($2.65 per session) it could raise $2,400 per year. Greater numbers of participants could of course raise proportionately larger sums of money.

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