

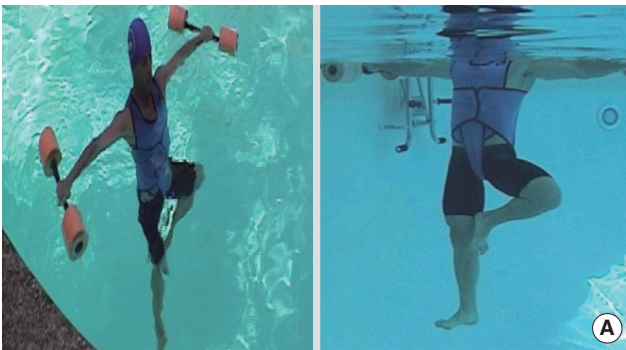
SUPPLEMENTARY MATERIAL

Exercise Description for Fig. 2. T-shirt off and on exercise (water)



- **Starting position:** Supine, with arms straight down near the hips.
- **Directions:** While maintaining floating body position, move arms from hips to the shoulders, then straight above the head, while keeping toes pointed up. Return to starting position.
- **Tips:** Keep legs straight together with toes pointing up. Visualize taking off and putting on a T-shirt.
- **Essential quality used:** Balance, with postural alignment and trunk control.

Exercise Description for Fig. 3A. Heel slide exercise (water)



- **Starting position:** Vertical in deep water, with arms out to the sides at shoulder level using aquatic hand bars, and with buoyancy vest as needed.
- **Directions:** Slide one heel up opposite leg as high as possible, keeping leg parallel and knee in front of body. Then rotate knee out to side of body. Extend leg, keeping toes up. Bend knee back, returning heel of foot to opposite knee. Rotate knee to front of body and lower leg straight down. Repeat with other leg.
- **Tips:** Keep toes pointed upwards. Visualize the movements and precision of a ballet dancer.
- **Essential qualities used:** Coordination and balance.

Exercise Description for Fig. 3B. Squat and touch exercise (land)



- **Starting position:** Standing tall on half foam roll with one leg placed after the other, heel to toe. Arms straight out to sides at shoulder level.
- **Directions:** Step forward, placing back foot in front of the other while simultaneously reaching with opposite hand to touch the foot/ankle. Stand up straight while returning arm to starting position. Repeat, stepping forward with other foot and touching with other hand.
- **Tips:** Squat as deep as possible without causing pain. Maintain head position looking straight ahead while touching foot.
- **Essential qualities used:** Coordination and balance.

Exercise Description for Fig. 4A. Step over sequence exercise (water)



- **Starting position:** Vertical in deep water, with one aquatic hand bar centered across chest and close to shoulders, and hands on top of Styrofoam ends, with buoyancy vest as needed.
- **Directions:** Push bar down with both arms, while simultaneously stepping over bar with one leg. Return to starting position by stepping back over with same leg. Perform with both legs to increase difficulty.
- **Tips:** Keep arms fully extended while pushing down bar and stepping over with legs.
- **Essential qualities used:** Flexibility, coordination and balance.

Exercise Description for Fig. 4B. Step over sequence exercise (land)



- **Starting position:** Supine on exercise mat, with head on mat, arms straight above head, hands holding the half foam roll, and legs straight together.
- **Directions:** Simultaneously bring arms towards waist while stepping over the half roll with one leg. This motion involves bending, then extending the leg straight up between arms, while lowering arms down towards waist. Return to starting position, then repeat with other leg. Perform with both legs to increase difficulty.
- **Tips:** Fully extend knee and point heel towards sky.
- **Essential qualities used:** Flexibility, coordination and balance.

General tips for implementing water exercises

Beginning in the deep end of a warm water pool is recommended, including for these exercises. It is important for the client to wear a buoyancy device, as this will assist in achieving and maintaining a vertical position, with head out of the water in the deep end. A buoyancy vest, also referred to as a flotation or wet vest, is ideal when beginning. However, if this is not available or if the client is advancing in therapy and requiring less support, a flotation belt that distributes buoyancy around the whole body (and not just the back) may be used with or without arm cuffs.

There are no precise temperature specifications, and it may be difficult to control conditions in community pools, but a range between 32 to 35°C (89.6 to 95°F) is suggested. More passive methods mentioned in Table 1 (WATSU) may be performed at higher temperatures versus more active methods (Burdenko, Halliwick) at lower temperatures within this range. Similarly, water depths may vary between pool settings. The deep end of a pool may range from 1.5 to 5.5 m (5 to 18 feet); a suggested depth for exercises in deep water is 2 to 3 m (approximately 6.5 to 10 feet). Starting depth may need to be adjusted based on factors such as client comfort and anxiety, and clients can gradually transition using slopes from the shallow to deep end.

The physical properties of water contribute to a margin of therapeutic safety exceeding that of almost any other treatment setting. However, as with any modality, there are contraindications, including incontinence, open skin wounds or infections, communicable diseases, uncontrolled seizures and severe epilepsy, untreated or severe cardiopulmonary dysfunction, excessively high, low, or labile blood pressures, and acute lung infection. Water therapy is safe and effective for a variety of conditions that may have further limitations on land, such as multiple sclerosis, fibromyalgia, Parkinson disease, chronic obstructive pulmonary disease (COPD), congestive heart failure, and muscular dystrophy in children. For example, water therapy can be performed safely while maintaining oxygen saturation even in clients with severe COPD (McNamara et al., 2011).

Nevertheless, clients should closely monitor themselves and inform their practitioner if they feel faint, lightheaded, or any other irregularities. The use of a proper buoyancy device further reduces risk of adverse events and facilitates access in and out of the water. Clients should be supervised both while in the water, and before and after being in the water. Although learning flotation and introductory exercises involving balance in deep water is safe for cli-

ents with cardiopulmonary issues, more strenuous exercises such as those intended to build strength can be performed at shallow or medium depths if client safety is a concern. Other precautions include clients with multiple sclerosis who may be less tolerant of water temperatures above 88°F, so care should be taken that their fatigue is not exacerbated by water warmth. Those with diabetes should have their sugar levels carefully monitored before and after sessions. With history of controlled seizures, clients should wear flotation devices at all times regardless of experience level.

Finally, the duration of exercise in the water should also be a consideration. A combined water and land program should begin with approximately 20–30 min in water, and 20–30 min on land, for a total time of 45–60 min per session for most clients. This time may need to be adjusted down based on individual factors such as fatigability due to cardiopulmonary conditions discussed above. Exercise should be performed at least 2–3 days per week, and can be built up to 5–6 days per week over time. The number of exercise repetitions can also be increased over time, as clients progress through rehabilitation, conditioning, and training. In rehabilitation, application of 10 repetitions for each movement learned is recommended. Repetitions should be performed in “3’s,” meaning three slow, three medium, and three fast, then concluding with one slow. In conditioning, the same formula can be used with 21 repetitions in “7’s,” meaning seven slow, seven medium, and seven fast for each exercise. In training, each exercise should be repeated thirty times in “10’s,” meaning ten slow, ten medium, and ten fast. Rehabilitation is focused on restoring functional ability of the body. Conditioning is intended to maintain and build functional ability of the body for health in life and recreational sports. Finally, training is intended to enhance the functional ability of the body for those seeking to engage in competitive sports.

Additional resources and exercises

Readers may benefit from more active visualization of water exercises. An example animation is provided below, as well as a link to exercise videos.

Link to exercise videos: https://www.youtube.com/playlist?list=PLpEJ0kNnyu_felCyj4nC7rTqNS8ac9Nm-

REFERENCE

McNamara RJ, Alison JA, McKeough ZJ. Water-based exercise in chronic obstructive pulmonary disease. *Phys Ther Rev* 2011;16:25-30.