

Facilitating Gait in Individuals with Neurological Dysfunction

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Research continues to expand on the benefits of Body Weight Supported Treadmill (BWST) walking for individuals with Parkinson's disease, post cerebral vascular accident (CVA) and Spinal Cord Injury (SCI). Due to the limited access of the BWST equipment an alternative may be ambulating in the water. The weight bearing is reduced as with the BWST however additional challenges and possible benefits arise when dealing with buoyancy and drag forces. Successful gait facilitation in individuals with neurological dysfunction requires patient handling skills and knowledge of hydrodynamics. Using principles of PNF and NDT along with utilizing knowledge gained from body weight supported treadmill research the aquatic therapist can facilitate functional walking patterns in water. Because research specific to aquatic gait training for individuals with neurological dysfunction is limited the following description is primarily based on applying land based research to the aquatic environment and clinical observations.

Gait facilitation can include several techniques with various levels of assistance and support, dependent upon the patient's abilities. The outline included with this article describes the technique for an individual with a complete SCI, utilizing reflex to advance the limb during the swing phase. For individuals with complete paralysis this is challenging due to the level of support required but effective in strengthening trunk muscles. By decreasing support and hand holds one can apply the same technique to individuals with greater motor control.

Prerequisites for effective gait facilitation include the client's ability to obtain neutral hip position and ideally have 10-30 degrees of hip extension. Individuals with heterotrophic ossifications and contractures limiting hip motion would not be able to stand upright without compromising the lumbar spine and this gait facilitation technique would not be appropriate. Adequate ankle dorsiflexion range of motion is necessary so the client's feet can rest on the bottom of the pool where weight bearing is through the entire foot not just the balls of the feet. Some individuals will go into an extensor tone synergist pattern if the balls of the feet are stimulated, this pattern would limit advancing limb during gait.

Safety considerations include proper shoe wear to protect the feet especially in individuals with limited sensation. When the patient is instructed on prone and supine recovery techniques they are more relaxed knowing if they lose their balance they have control on getting their face out of the water. Even when a therapist reassures the client they will not leave their side, fear and tension can still take over hindering movement.

When utilizing this technique with patients with a complete SCI the appearance of walking and stepping can confuse individuals watching such as parents and family. The patient's tell me they feel it is a good workout for the "core" trunk muscles but they realize by feel it is more a reflex that is advancing the limb not volitional movement. I have not had any patient with a complete SCI be able to walk out of the pool after treatment; they do have improved sitting or standing balance and trunk control. For individuals with incomplete SCI and other neurological dysfunction some success can be obtained through the neuromuscular retraining.

The technique described was in part due to land research, manual techniques and trial and error with a willing patient. I encourage all to modify the technique based on individual knowledge and patient abilities to challenge the patient to reach their highest level of function possible.

FACILITATED GAIT IN CHEST DEEP WATER

- I. Key elements related to BWST locomotion
 - A. Weight bearing as much as possible
 - B. Hip extension
 - C. Limit weight bearing through UE
 - D. Reciprocal arm swing
 - E. Normal walking speed

- II. Candidates
 - A. Must have adequate hip ROM
 - B. Ability to stand foot flat on bottom of pool.
 - C. Fair trunk stabilization in the water to avoid excessive pushing or pulling on the therapist.

- III. Hand placement and facilitation points
 - A. At pelvis
 - i. Hip flexor of swing leg
 - ii. Glut maximus for stance leg
 - B. Locking out knee of stance leg
 - C. Moving to side to allow swing leg to advance

- IV. Visualization: encourage the patient to “walk” vs. “shift weight, lift foot etc.” Too many cues does not allow for the natural reflex/ motion to occur.

- V. Use of equipment
 - A. Ankle weights: for flaccid LE to assist in retuning leg to the bottom of pool
 - B. Wet vest: provides support anterior and posteriorly
 - C. Dumbbells: allows some reciprocal arm movement with some balance assist
 - D. Poles/ sticks: for higher functioning patients. The therapist and patient each hold one end of a pole in each hand, the therapist can then help the patient swing arms in the correct reciprocal pattern. (think of it as dynamic parallel bars.

- VI. Depth and temperature of the water
 - A. Too warm diminishes tone that may be needed Too cold spasms are difficult to control and fluid movement difficult to achieve
 - B. As trunk control improves and requires less support from the water, progression to shallower water is made to allow for greater weight bearing through the LE.

- VII. Progression

- A. Standing balance
 - B. Standing balance with reciprocal arm swing
 - C. Standing balance weight shift
 - D. Standing weight shift with hip hike
 - E. Ambulation with therapist facilitation patient hands on therapist's shoulders
 - F. Ambulation with therapist hands facilitation patient using short bars (dumbbells)
 - G. Ambulation with therapist facilitation at hips and patient performs natural arm swing
 - H. Patient/ client ambulation with reciprocal arm swing facilitated where needed (poles, at hips, knees or ankles)
 - I. Backward walking (can also be done primarily facilitated by therapist)
- VIII. Kneel walking
- A. Utilized for gaining strength in trunk and hips
- IX. Difficulties and problem solving
- A. Size of patient
 - B. Size of therapist
 - C. Size ratio (the closer in size the easier it is)
 - D. Tone
 - E. Water can give resistance but may give body too much sensory feedback
- X. Safety
- A. Water shoes/ knee pads
 - B. Lumbar spine
 - C. Rolling/ back float and supine/ prone recovery

References

Behrman, A. and Harkema, S. Locomotor Training After Human Spinal Cord Injury: A series of Case Studies. *Physical Therapy* 2002; 7

Burdenko, I and Biehler, S. *Overcoming Paralysis*. New York: Avery Publishing Group, 1999

Umphred, D. *Neurological Rehabilitation*. St. Louis: C.V. Mosby Company, 1990 p. 423-478.