

Introduction to Aquatic Therapy

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History of Aquatic Therapy

1. Has been used throughout the millennia in mineral pools, streams, oceans, etc.
 - a. Primarily passive modality
 - b. Techniques developed over the years as people discovered the benefits of warm water springs and active participation.
2. Aquatic therapy declined in interest in the 1940's and 50's as healthcare became centered on the hospital environment.

History of Aquatics (continued)

3. Resurgence began in the 1970's, however, due to the current demands of the third party payment system, aquatic therapy programs have found it difficult to obtain reimbursement for and space in clinics/hospitals is often limited.
4. AEA (Aquatic Exercise Association) established in mid 1980's to provide professional development, services and products related to aquatic fitness for allied health care professionals including aerobic instructors.

History of Aquatics (continued)

5. ATGRI (Aquatic Therapy and Rehabilitation Institute) developed multidisciplinary standards for aquatic therapy and hosts a variety of continuing education classes and an annual symposium for multidisciplinary approach.
6. ARN Aquatic Resources Network
7. APTA Aquatic Section formed in 1992.

Therapeutic Pool Environment

1. Need to decide what type of program you are implementing to decide on the design and temperature of the water.
 - a. Pediatrics requires shallow depth and specific entry requirements – lifts, zero entry.
2. Bad Ragaz and Halliwick require chest height water for the therapists.
3. Aerobic conditioning and sports med programs require cooler temperatures and varying depths (80 to 85 degrees).

Therapeutic Pool Environment (Continued)

4. Therapeutic pool temperatures 92 to 98 degrees.
5. MS Patients are not able to withstand warmer temperatures and will increase their symptoms therefore require temperatures no greater than 84 to 88 degrees.
6. Air temperatures depend on the population between 68 and 72 degrees for aerobic and 80 to 100 degrees for therapeutic.

Therapeutic Pool Environment (Continued)

7. Need drinking water accessible.
8. Need lift system in/out of pool or zero entry.



Therapeutic Pool Environment (Continued)

9. Need handicap accessible changing areas.
10. Storage is important for maintaining appropriate equipment/toys.



Physiological Benefits

1. Warm water can help to decrease spasticity, encourage relaxation of soft tissue, and decrease pain.
2. Increase circulation which in turn improves the condition of the skin and accelerates healing to injured areas by increasing the nutrients brought to the area.

Physiological Benefits (Continued)

3. Movement can be initiated earlier in water than on land post surgery due to decreasing pain, spasticity, and the support of water. This aids in helping to restore muscle function and range of motion thereby decreasing recovery time.
4. Obese and less motivated patients find aquatic therapy more stimulating and many times it is easier to motivate them to participate in a prolonged exercise program.

Properties of Water

A. Relative Density

1. Definition: Property of an object that determines whether object will float.
2. Ratio of weight of an object to the weight of an equal volume of water. If the value is greater than one, the object will sink and if less than one, the object will float.
3. If a person's relative density is .96, then 4% of their body will be above water.

Properties of Water (Continued)

B. Buoyancy

1. As the body is gradually immersed, water is displaced, creating the force of buoyancy.

2. Buoyancy: (a) reduces the gravitational forces making it feel easier to complete movements and activities in the water. (b) Allows patients to find positions of comfort allowing rehabilitation to occur that is not possible on land. (c) Allows for exercise to occur in a horizontal position that helps contribute to a reduction in heart rate during cardiovascular exercise as compared to land.

Properties of Water: Buoyancy (Continued)

3. Archimedes Principle
 - a. When a body is fully or partially submerged in a fluid at rest, it experiences an upward thrust equal to the weight of the fluid displaced.
 - b. Influenced by volume and density-influenced by hydrostatic pressure.
 - c. Relative Density (how well objects float) = density/volume.
4. Position/Size of an object influences how well it floats.

Properties of Water: Buoyancy (Continued)

5. Buoyancy can be used to assist, support or resist movement.
 - a. Depends on patients' position – standing, supine, sitting, etc.
 - When immersed to pubic symphysis = 60% weight bearing (WB)
 - To umbilicus = 50% WB
 - To xiphoid = 40% WB
 - To shoulders = 20-30% WB
 - b. Depends on patient characteristics – spasticity/tone – increased tends to sink, decreased tends to float; innervation; body composition; fear of water; height.

Properties of Water: Turbulence

1. Important to understand turbulence to allow you to use the property to facilitate or hinder movement.
2. If move in the direction of the turbulence, you will decrease the amount of work needed to move; therefore facilitating movement; if move against turbulence will provide resistance.

TURBULENCE (continued)

3. Resistance to movement in water
 - a. Bernoulli's principle:
Increased speed of flow;
decreased pressure; object
moves into an area of decreased
pressure.
 - b. Resistance altered by: Speed,
Shape, Length

Properties of Water: Hydrostatic Pressure

1. Pressure is exerted equally around an object at any given depth – if pressure is exerted unequally, the object will move in that direction.
2. When you enter a pool, there is a slight increase in pressure exerted to the skin covering the body and therefore blood pressure increases slightly by momentary constriction of cutaneous blood vessels. However, body regulates quickly and blood pressure actually becomes slightly lower than when on land. Important to keep in mind for cardiac and pediatric populations who are more sensitive to changes in blood pressure.

Hydrostatic Pressure (continued)

3. Pressure in a liquid increases with increasing depth. This is relevant to the practice of aquatic therapy because this increases blood flow from feet to thorax if standing in a pool. This helps to decrease edema in the lower extremities.
4. Renal output is also increased during aquatic therapy which attributes to the shift in body fluids from the extremities to the thorax.

AQUATIC THERAPY

- **INTRODUCTION TO HALLIWICK METHOD**
 - Developed by James McMillan in 1950
 - 10-Point Program began at Halliwick School for Crippled Girls in London.
 - Children learned to swim independently with increase in head control, trunk stability, breath control, endurance, and self esteem.
 - Concept one of most widely utilized methods of aquatic therapy.

Philosophy of Halliwick

Goal: Achieve maximum independence in the water and on land through self-reliance.

Uses a systems theory to implement a psycho-sensory motor approach in water.

Focus is that swimming is a means to independence.

Encourages active participation without flotation devices.

Halliwick: The Motor Learning Process

- Goal of independence achieved through controlled movement.
- Shape, density, and asymmetry of body will influence equilibrium and stability of a body in water.
- Body uses automatic responses to balance and stabilize posture.
- Postural tone is influenced by proprioceptive input stimulated by gravitational forces.
- When immersed, postural tone is reduced, tactile information is enhanced and motor behavior establishes control.

Ten Point Program

- Motor learning sequence that focuses on postural control to teach swimming.
- Three phases make up the ten-point-program:
- Step 1: Mental Adaptation
 - Mental adjustment and disengagement in primarily the sagittal plane.
 - Process begins with breath control.

Step 1: Mental Adaptation

- Breath control includes holding breath in water and control in expiration to prevent inhaling or swallowing water.
- Facilitates forward head movement and head control.
- Support is given at shoulder girdle, never at head.
- Gradually support is decreased.
- Final stages of mental adaptation include, jumping, walking, and turning.

Step 2: Balance Control (2-8)

- Balance control is ability to independently maintain or change a position in the water.
- Involves balance in stillness and turbulent gliding to challenge balance control.
- Sagittal rotation occurs in an upright position by bending to right or left.
- Transverse rotation involves moving from standing to supine to standing.
- Longitudinal rotation produces a roll in supine to prone to supine 360 degrees.

Balance control (Continued)

- Balance in stillness involves the client assuming a position and maintaining their balance while the instructor introduces turbulence in the water.
- Phase 2 challenges swimmers to develop postural control, spinal range of motion, spinal stabilization, strength, greater control in reaching for objects, righting and supportive reactions, trunk dissociation, scapular depression, maintaining neutral pelvic alignment, head righting reactions, control over lateral rotation, and moving in three dimensional patterns.

Movement (Steps 9-10)

- Movement phase involves a simple progression towards creating an effective swimming movement.
- Movement begins with sculling and progresses to a double sided rowing activity with both arms symmetrically in supine.

Utilizing Halliwick

- Halliwick method focuses on basic techniques of land based interventions that are utilized in clinic.
- Similar to NDT techniques.
- Water motivates and stimulates clients to practice stability activities.
- Teaches all levels of disabilities to enjoy water without dependence on flotation devices.
- Clinical applications limited only by our creativity and how much fun we want to have in water.

References

- Johan Lambeck, PT "Clinical Applications of Halliwick-A Certification Course" December 7-9, 2001 Greenville, NC.
- Johan Lambeck, PT and Fran Colley Stanat, PhD. J of Aquatic Therapy, 8,(2), 2000, 6-11.

Neurodevelopmental Treatment Approach to Aquatics

Objective of this section:

To provide a basic understanding of how NDT can be implemented in water.

To understand how water can enhance handling techniques.

Introduction to NDT

- Neurodevelopmental treatment is defined as a hands on problem solving approach to improve a patients motor function (L. Beeler 2000).
- Old philosophy: Spasticity can be facilitated or inhibited.
- Current philosophy: Spasticity is not permanently changed through handling; however, changes in muscle length, flexibility, and strength can be changed.

Goal of NDT

- Human nature is to seek the path of least resistance.
- Goal of therapist is to teach the patient correct movement patterns that will allow more efficient function.
- NDT incorporates use of hands to assist in initiating, sustaining, and helping child to achieve movements in controlled ranges and in functional patterns.
- Child must be motivated and invested in the treatment and in selecting a functional goal for therapy. Without this motivation, the child will probably not achieve the goals set for them.

Considerations in NDT

- NDT requires precise facilitation of certain parts of body.
- This fluctuates from a light, gentle input to firmer, deeper input.
- Water removes much of the force required to facilitate due to the buoyancy property which makes the patient lighter (weigh less in the water).
- Balance is the key in water as if give too heavy of manual input can push the patient and therapist off balance.
- Use properties of water to your advantage

NDT in the Water

- SIDELYING

Children with decreased tone may require floating devices to assist with maintaining heads above water and assisting with alignment in positions. In this picture the therapist is using a boogie board to assist in the sidelying position. The goal of this position is to promote bilateral reaching towards midline. The therapist's right hand is facilitating scapular movement initially then assists with scapular stabilization. The therapist's left hand facilitates a functional reach pattern. The therapist utilizes her trunk and one knee to balance the board.



NDT in Water: Prone

- Prone position will help facilitate dynamic weight bearing through the child's upper extremities in the water due to the constant movement of water. Also, prone facilitates and strengthens neck and spinal extensors while elongating obliques.



NDT in Water: Supine

This position helps to relax the child. In this position, opening up of the rib cage, adduction of the scapulas, and elongation of the pecs can be facilitated.



NDT in Water: Supine

- A float is used to support the head and neck. The child's legs are positioned around the therapist's trunk to assist with balance. Rib cage mobility is provided to the posterior, lateral and anterior sections.



NDT in Water: Tall Kneeling in Warm Water

The warmth of the water helps to relax the muscles to provide more flexibility. The therapist positions her hands in the lumbar spine and bottom of anterior rib cage with fingertips touching the abdominals.



NDT in Water: Tall Kneeling

The input is given into the lumbar spine and downward for the base of support with the therapist's right hand, while simultaneously facilitating extension of the upper trunk with the left hand. Promoting postural alignment is key in all positions.



NDT in Water: Standing

- The difficulty with this position is maintaining the child's feet on the pool floor. The therapist must use her body to support the child's body and facilitate alignment while providing adequate downward force toward the base of support so child does not float up off of feet. The therapist's hands work across the trunk to open the rib cage elongating the intercostal muscles.



NDT in Water: Standing

- The therapist then provides a combination of horizontal (towards the child's spine) and downward input to the base of support (towards the child's feet) using her hands, while using her hip and trunk to cue the child into neutral spinal alignment.



NDT in Water: Standing

- Once this position is achieved, the therapist can work on elongating the child's upper extremities for improved reach and function.



NDT in Water: Prone in Water- 1/2 out

This position allows the therapist to focus on elongating the abdominals as well as the hip flexors. Care is taken not to hyperextend the child's back. The therapist's hand provides support at the child's abdomen while the opposite hand will provide the force that will help to elongate the hip flexors.



NDT in Water: Prone: 1/2 in water

- Position is achieved!



NDT in Water: Rotation

The position to facilitate trunk rotation, upper extremity weight bearing for strengthening, hip flexor and extensor elongation, neck and trunk extension, abdominal strengthening, etc. This is a difficult position to attain and many times requires a second person to assist.



NDT in Water: Rotation

- The therapist uses her trunk and hip to help widen the child's lower extremity scissor position to elongate the hip flexors, while using her hand to elongate the opposite lower extremity hip extensors. Another way to increase the difficulty and dynamic movement of this position is to have the child reach for a toy with one upper extremity.



NDT Wrap Up

- This is just a small handful of ways to use NDT in the water. I hope that this has given you some “out of the box” ideas for treating children with tonal imbalances.