

REHABILITATION, DISABILITY AND PARTICIPATION

Activity-Based Restorative Therapy and Aquatics

Rebecca Martin, OTD, OTR/L and
Kimberly Obst, MS, OTR/L, CPAM, ATRIC



AOTA Student Conclave November 2009; Baltimore, Maryland

martire@kennedykrieger.org obstk@kennedykrieger.org spinalcordrecovery.org

Objectives

- To understand mechanisms for repair of the damaged nervous system.
- To understand novel therapeutic approaches, aquatic and land-based, to optimize the nervous system for recovery.
- To understand the progression of therapy for the neurologically involved patient.

Following Neurological Insult

- **Input and output of the nervous system is disrupted.**
- Reduction in activity inhibits healing.
- Need to provide near normal levels of input to facilitate neuron turnover and optimize neurological system for healing.

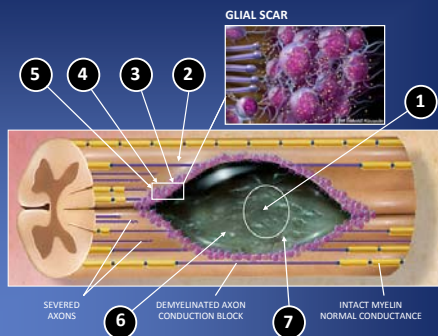
Following Neurological Insult

- Input and output of the nervous system is disrupted.
- Reduction in activity inhibits healing.
- Need to provide near normal levels of input to facilitate neuron turnover and optimize neurological system for healing.

Following Neurological Insult

- Input and output of the nervous system is disrupted.
- Reduction in activity inhibits healing.
- Need to provide near normal levels of input to facilitate neuron turnover and optimize neurological system for healing.

Targets for Therapy



Recovery Is Activity Dependent

Activity-Based Restorative Therapy

- Repeated, near normal stimulus to affected part of the body intended to
 - Optimize neurological system for recovery
 - Provide afferent information to normalize inputs and outputs
 - Remediate impairments
- Neural activation can be enhanced by patterned sensory feedback and facilitated activity.

Activity-Based Restorative Therapy

- Uses novel and traditional modalities at a higher frequency and intensity than in conventional therapy
- Focus on restoring lost functions rather than compensation

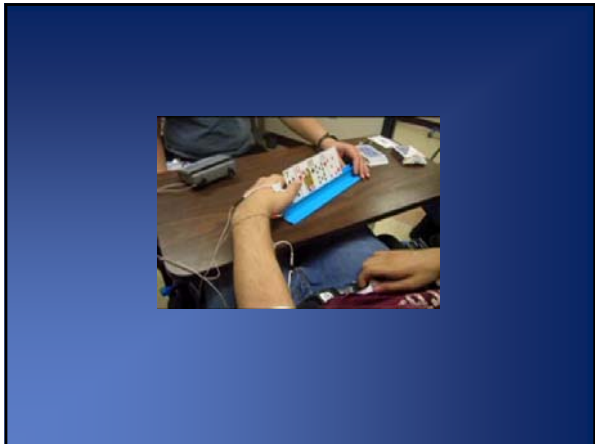
Facilitated Movement

- Sensory driven responses (reflex)
- Traditional facilitation approaches (PNF, NDT)
- Unweight the extremity (aquatics)
- Functional Electrical Stimulation

Functional Electrical Stimulation

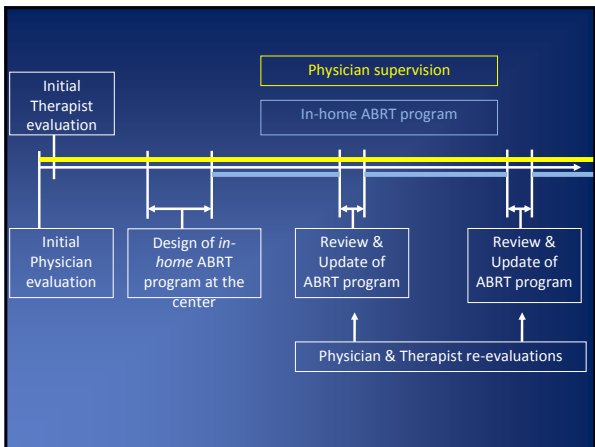
- Stimulation of intact peripheral nerve, generates action potential to drive motor response. Provides afferent input.
- Patient is responsible for assisting movement.
 - Ensures maximal recruitment.
 - Provides descending input.
- Pair with functional activity.
- High repetition, high frequency to create motor pattern.





Transition to Home-Based

- Rehabilitation is lifelong.
- Impairments and disability changes over time.
- Need for skilled intervention will vary.
- Need to consider an individual's strength, weaknesses, resources, and goals.



Outcomes:
Body Functions and Structures

- Enhanced neural regeneration
- Decreased spasticity
- Increased muscle mass & strength
- Improved coordination
- Maintenance of bone density
- Enhanced blood flow & cardiovascular fitness
- Decreased complications: pathologic bone fractures, skin breakdown, blood clots

Outcomes: Activity and Participation

- Improved mobility—bed, wheelchair, ambulation
- Increased independence in self care and home management tasks
- Enhanced engagement in work and leisure activities



Aquatic Rehab History

- Late 20th century term
- Describes a scientific and medical rationale
- Set of clinical procedures using water immersion for:
 - Restoration of physical mobility and physiologic activity
 - Effecting psychological transformation

History

- Longstanding history with different cultures for healing of sick, wellness, religious purposes, social renewals, and spiritual reasons.
- Ancient civilizations used many various water baths such as the Greek, Egyptians, Romans, Hebrews, Swiss, etc.

Why Aquatic Therapy?

- Buoyancy
- Hydrostatic Pressure
- Viscosity
- Water Temperature
- Refraction

Buoyancy

- Upward thrust acting in the opposite direction of gravity.
- Can assist, resist , or support movement of a person or extremity in water.

Hydrostatic Pressure

- PASCAL'S Law
 - Pascal's law states that , at any given depth, the pressure from a liquid is exerted equally on all surfaces of the immersed object.
- Impact on Therapy:
- assist with decreasing peripheral edema
 - Increase cardiovascular response
 - Improve balance, sensory awareness (proprioception)
 - Create a safe, supportive environment.

Viscosity

- Magnitude of internal friction among individual molecules in a liquid.
- The faster the object moves through water the greater the viscosity and therefore the greater the resistance to movement.

Water Temperature

- 91-95 degrees: Ideal for Therapeutic Water
- 82-86 degrees: Ideal for Vigorous Exercise
- Can impact fatigue, tone, temperature of patient.



Refraction

- The bending of the ray of light as it moves from one medium to another.
- Impact:
 - Posture
 - Visual perception
 - Joint angles
 - Feedback

Overall Benefits

- Increased respiratory rate
- General muscle relaxation
- Increased heart rate
- Increased movement of blood to the heart
- Reduced sensitivity of sensory nerve endings
- Increased muscle blood supply and metabolism.
- Assists with pain management
- Improved relaxation and self-esteem

Indications

- Sensory disorders
- Limited Range of Motion
- Overall Weakness
- Coordination issues
- Pain management
- Increased tone/spasticity
- Balance deficits
- Perceptual/spacial issues
- And the list goes on and on

Some things to think about before jumping in!

- Bowel/bladder incontinence
- Fear
- Blood pressure issues
- Ostomy
- Epilepsy
- Central line catheters
- IV site
- Decreased endurance
- Respiratory issues.
- Open wounds
- Water-borne infections
- Flu
- Sore throats
- Gastrointestinal issues.
- Immune deficiencies (ie. HIV)



Interventions



Additional Techniques

- Pilates in water
- Yoga in water
- Ai Chi
- Unpredictable Command Technique
- Jahara Experiential Thermal Aquatic Bodywork

Bad Ragaz

- Originated in Germany in 1957 and was introduced to therapeutic thermal pools in Switzerland.
- Method of muscle re-education utilizing specific patterns of resistance, endurance, elongation, relaxation, range of motion, and tonal reduction.
- Incorporates Proprioceptive Neuromuscular Facilitation (PNF)

Watsu

- Developed in 1980 by Harold Dull in Harbin Host Springs in Northern, CA.
- Cradling 1-to-1 program
- Form of physical and emotional therapy.
- Indicated for: Pain and stressful conditions, increase in ROM, decrease in muscle stiffness, head injury, and neuro populations.
- Foundation of every session is unconditional acceptance.

The Burdenko Method

- 1984: Developed by Igor Burdenko
- A water and land based technique
- Principles:
 - Pain free, never hit the limit
 - Simple → complex
 - Slowly increase number of repetitions
 - Deep pool → Shallow → Land
- Starts in water: 6 Qualities
 - Posture/Balance → Flexibility → Coordination → Endurance → Speed → and Strength

Treatment techniques for the Sensory System

- Tactile: sit on deck and kick water (slow and fast)
- Oral Motor: Blowing bubbles in the water/whistles
- Tactile/Perceptual: Watercolor painting/ Drag a theraband or towel through the water
- Proprioception/Motor Planning: PNF patterns, side stepping, hopping.
- Vestibular: swimming underwater/Slow rocking/rolling exercises/Adding turbulence.

Carry-over to Land

- Self-dressing
- Reaching tasks for cooking, cleaning, dressing.
- Trunk control for sitting for self-cathing, toileting, self-feeding.
- Stress management
- Increase endurance tolerance for ADLs and IADLs
- Promote leisure activities
- Increase self-esteem
- Cognitive training-i.e. direction following, problem solving
- Play skills and social skill training
- Sensory integration
- Improve respiratory function
- Oral Motor/Tactile

Aquatic Therapy Research

- Evidence was found that suggests that aquatic therapy can positively impact adults with brain injury.
- Increase the interest in individuals to engage in health-promoting self-care behaviors.
- Correlation with physical activity increasing self-esteem and the overall impact on individuals health promoting self-care behaviors by increasing a person's locus of control.

Driver, Rees, O'Conner, and Lox (2005)

Functional Mobility of Infants/Toddlers

- Beneficial results were found when PT's and OT's working in Early Intervention collaborated with community pool staff.
- This was a small and single-site study and therefore a larger study is needed.
- Based on this promising study, gains include:
 - Positive gains in mobility
 - Recreational inclusion with peers that are normally developing.
 - Promotes therapy in a community setting.

McManus and Kotelchuck (2007)

Research

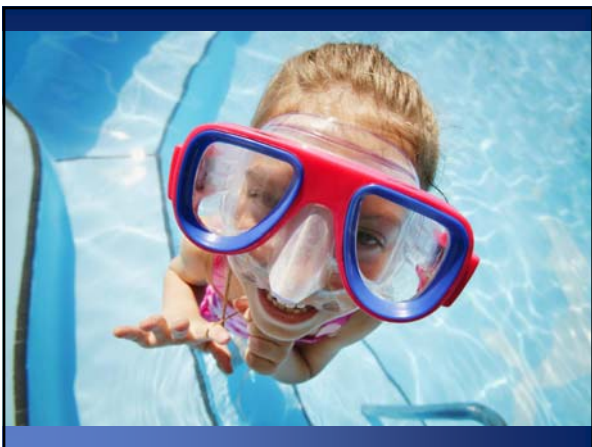
- Systemic review of literature
- Possible link to improving respiratory function in children with cerebral palsy.

Getz, Hutzler, and Vermeer (2005)

Effects on physical functioning in older adults

- Regular participation in a water exercise program improves balance and flexibility.
- Secondary to low impact and lower risk, water exercise is an appropriate modality for the older adult limited by arthritis and mobility limitations.
- Adherence and participation was moderate.

Lord et al. (2006)



Lacking Evidence

- Further research on aspects of function with good design
- Outcomes need to be related to the benefits specifically to aquatic therapy.
- Been difficult to conduct large group randomized control trials.
- Lack of consistent valid and reliable outcome measures.

Documentation and Billing

- Goals must be functional goals.
- Clarify the skilled level of aquatic therapy necessity and note specific interventions.
- Establish the benefits of water for achieving established goals.
- Establish that any improvements made can carry over to land.
- CPT code: 97113- Aquatic Therapy
- 97150- Group Procedures
- Must perform a land based evaluation first.
- Be aware of when re-evaluations are due.

Documentation/Assessment

- Land based evaluation
- Self-report tools such as Quality of Life Index.
- Pain scales
- COPM

Marketing OT and Aquatics

- Collaborate with local community pools.
- In the hospital setting: attend management meetings and departmental meetings and share the benefits of OT in the aquatic therapy setting.
- Educate the MDs on the benefit of Aquatics
- Educate rehabilitation team



References

- Aquatic Therap & Rehab Institute. www.aqr.org/.
- Cole, A.J. & Becker, B. (2004) *Comprehensive Aquatic Therapy* (2nd ed.). Pennsylvania: Buttersworth –Heinemann.
- Driver, S., O'Connor, J., & Lox, C. (2006) Aquatics, health promoting self-care behaviours and adults with brain injuries. *Brain Injury Journal*, 20(2), 133-141.
- Getz, M., Hutzler, Y., & Vermeer, A. (2006). Effects of aquatic interventions in children with neuromotor impairments: A systematic review of the literature. *Clinical Rehabilitation*, 20(11), 927-936.
- Lord, S.R., Matters, B., St George, R., Thomas, M, Bindon, J., Chan, D., et al. (2006). The effects of water exercise on physical functioning in older people. *Australasian Journal of Ageing*, 25(1), 36-41.
- McManus, B.M. & Kotelchuck, M. (2007). The effect of aquatic therapy on functional mobility of infants and toddlers in early intervention. *Pediatric Physical Therapy*, 19(4), 275-282.
- Sova, R. (Ed.) (2008). Introduction to Aquatic Therapy and Rehab.
