

Science, Movement and Health, Vol. XIII, ISSUE 2, 2013  
June 2013, 13 (2), 96-102

Original Article

## AQUATIC INTERVENTION PLAN FOR PEOPLE WITH NEUROMUSCULAR DISORDERS

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### Abstract

*Objective.* The people with multiple sclerosis could benefit from competent aquatic therapy to improving range of motion and strength of the arms and legs and reducing spasticity, besides socializing.

*Methods.* Use of aquatic therapy for people with multiple sclerosis through Watsu sessions, Bad Ragaz Method, Halliwick Concept, Task-Type Training Approach and by patient education.

*Results.*

Although multiple sclerosis is a degenerative and progressive disease, the role of therapeutic aquatic program is reached by maintaining a level of continuous independent life, with patient more confident in hers abilities.

Returning to prior level of function and independence.

Aquatic program can support full range of motion, offers buoyancy supported environment.

Through this study we observed a significant improvement in the level of fatigue with a potential positive effect on functional abilities.

*Conclusions.*

Aquatic rehabilitation effectively improves impairment and disability oriented problems for people with limitations from neuromuscular occurrence.

Aquatic exercise programs for people with neuromuscular disorders should be designed and supervised by therapists with expertise in recognizing the lack of control of functional movement commonly encountered by patients with those clinical conditions and identifying strategies to overcome them.

*Key words:* aquatic rehabilitation, multiple sclerosis.

### Introduction

The inactivity and obesity at patients with neuromuscular disease presents a high risk for developing or worsening comorbid conditions such as high blood pressure, high blood cholesterol, diabetes, heart disease, strokes and other conditions. „Impaired aerobic capacity, also resulting from inactivity, negatively affects a person's ability to carry out functional activities” (Brody L. T., Geigle P. R., 2009, p. 239). „In recent years, rehabilitation professionals have grown to appreciate their role in secondary prevention, designing and providing wellness opportunities that include community-based exercise programs for people with neuromuscular dysfunction” (Rimmer J. H., cited in Brody L. T., Geigle P. R., 2009 p. 239). Many people with neuromuscular dysfunction are interested in exercise, but multiple obstacles causes their capability to achieve the advised level of exercise, besides the absence of places where to practice. Land-based exercise is difficult for patients with neuromuscular dysfunction because of the effort needed to move against gravity and the higher risk of falls and other injuries. The aquatic environment offers for all people, even those with mobility limitations, with a safe and effective alternative for exercise. Because of the buoyant support of the water is reduced the risk of falls and allows persons with mobility impairments to exercise at higher intensity. The

turbulence and drag properties of the water are ideal for strengthening exercises. The patients can easily achieve aerobic fitness levels in water.

„Treating a neurological patient in water offers a wide variety of options in a highly dynamic environment” (Campion M. R., 2001)

Aquatic wellness programs is very important for the healthy people but is the most importance for people with impairments.

The limitation in performing of any activities is any difficulty that it may have in executing activities. Typical activity limitations resulting from neuromuscular dysfunction include walking and performing transfers. A participation restriction is a problem that a person may experience in involvement in life situations. Typical participation restrictions following neuromuscular dysfunction relate to physical barriers, attitudinal barriers, lowered expectations and fears. The application of aquatic rehabilitation approaches can influence people with neuromuscular disorders at any or all of these levels.

The central nervous system plays a vital role in control of functional movement. Injury or disease affecting this system can result in a variety of primary movement problems involving motor, sensory, perceptual, cognitive, and behavioral systems. Additionally, primary body structure impairments (e.g., paralysis, spasticity, rigidity, tremor, dysmetria,

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Received 05.01.2013 / Accepted 22.05.2012

hyperkinetic) can lead to secondary movement problems that do not result directly from the nervous system lesion. These are rather developed in time, for example, paralysis resulting directly from spinal cord injury can lead to joint tightness and limited range of motion over time, or hypokinesia can lead to illusion of motion or athetosis can have as dysfunction inability to perform a movement or sequence of movements despite intact sensation.

Aquatic rehabilitation programs, from skilled therapy to wellness services, offers a unique, versatile approach to interventions for these body structure impairments and the activity limitations that they create. Improved technology and medical management allow more people with the need of neuromuscular rehabilitation to survive head injuries, brain tumors, strokes, birth injuries. Longer and healthier life hopes may account for an increased predominance of specific neuromuscular disorders. The unique properties of water, particularly buoyancy, turbulence and drag, enable the design of effective and versatile treatment programs. Specific benefits of the aquatic environment include weight release and easiness in movements. These characteristics allow safe movement exploration, strengthening, and functional activity training, often before patients can perform the same activities on land. In addition, the supportive properties of water allow easier handling of patients by therapists.

**Objective.** The people with multiple sclerosis could benefit from competent aquatic therapy to improving range of motion and strength of the arms and legs and reducing spasticity.

The important aims for the first stage of the aquatic treatment, in which we participated were primary: accommodation with water, improved breath control, appreciation of longitudinal roll and stability, normalization of tone and we tried some intermediate.

### Methodology

#### *Motor Control Models*

Three motor control models are studied:

- the reflex model,
- the hierarchical model,
- the systems model.

The reflex model assumes that human movement occurs in response to sensory input to the central nervous system but a reflex model does not fully explain the production of skilled movement.

„The hierarchical model views the central nervous system as a top-down control pattern in which the higher centers of the cerebral cortex control the lower centers of the brain stem and spinal cord. The lower centers are in charge of more primitive, reflexive movement; the higher centers control the more complex, voluntary movement. Reflexive movements may appropriately override voluntary movements for functional purposes in normal humans” (Brody L. T., Geige P. R., 2009).

The systems model does not regard the central nervous system as being only liable for motor control, movement results from interaction among many different kinds of systems, including environmental, musculoskeletal, sensorimotor, and cognitive.

Resulting movements occur secondary to interactions between the systems.

The intervention approaches used by rehabilitation therapists are many and varied. In the beginning of neurorehabilitation, the prevalent rehabilitation model was a muscle reeducation model wherein therapists strengthened weak musculature and provided orthopedic support or bracing for body segments to which strength would not return. Patients with neuromuscular disorders were treated in a similar manner. In recent years „research of contemporary movement science indicates that functionally oriented neurotreatment, in which patients are more active problem solvers, may be more effective than treatments based on earlier models” (Gordon J., 2000). This rehabilitation approach to neurorehabilitation would mean specific functional tasks: patients must develop effective compensatory strategies to carry out their skills, to learn adaptability to performing the tasks under a variety of musculoskeletal and environmental constraints (e.g., on different surfaces, with different obstacles to avoid). At patients with neurological impairments displays limited ability to participate as active problem solvers because of major physical or mental impairments.

### Methods

The people would benefit from skilled aquatic therapy directed at improving the range of motion at the arms and legs and strengthening the musculature and gait and balance retraining.

The buoyant support during gait and balance activities, reducing fear of falling. Some people with multiple sclerosis are heat intolerant; a warmer therapeutic pool may further induce fatigue. This response to heat is variable from one person to another.

*Watsu*, are suitable at the beginning of the recovery sessions, that emphasizes the basic moves and a far or near leg-over sequence can be used. The main purpose for those activities would be to reduce spasticity and allow increased freedom of movement during gait and balance activities.

*Bad Ragaz Method*, is suitable for those persons who, besides multiple sclerosis have other medical diagnosis and has to prevent excessive fatigue. For the application of these method the appropriate pattern are:

- shoulder flexion and abduction, external rotation, wrist and finger extension moving to shoulder extension and adduction, internal rotation, and wrist and finger extension moving to shoulder extension and adduction, internal rotation, and wrist and finger flexion,

- leg patterns to increase strength and coordinated, reciprocal movements of the legs, unilateral and bilateral movements.

**Halliwick Concept**, in which are used activities to facilitate patterns of movement with attentive account of the level of difficulty of the activity and the quantity of manual guidance, like:

- changing the basic body position: sit to stand exercises, rolling,
- maintaining the body position: stand, sit, floating up, gliding supine gliding prone,
- moving around.

**Task-Type Training Approach**, can be useful for increasing isotonic strength of the moving leg while simultaneously challenging the ability to stabilize with the stance leg and trunk. Emphasis is put on disability by working in functional positions like water walking

(will also improve gait and balance skills) and can be progressed with more advance skills like quick turns or stopping and starting on demand.

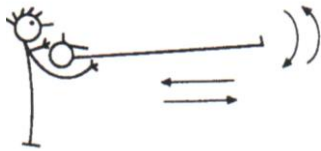
**Patient education**, presume that patients to return to aquatic exercise program because is important for a lifelong physical physical fitness activity and work to improve social wellness.

The subjects was a older woman of 75 years old, who participated in aquatic activities at the swimming pool into the Faculty of Medicine and Pharmacy Carol Davila from Bucharest. This project.

The study held place on the october - november 2012 (on a period of 7 weeks, once a week, with 30 minutes per session).

I prepared programs for learning her own limitations and accepting that she needs to rest, to enjoy it and feel that is beneficial. A program adapted to cope with abnormal increases and decreases in muscle tone.

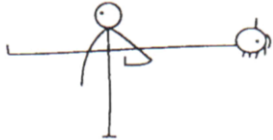
**Practical techniques**



1. The body is moving forward or backward with or without floats, feet up, with minimal support of the head



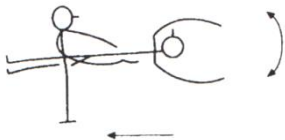
2. Movement of rotation, side-to-side, with or without flotation devices.



3. For roll, find balance point, the therapist use edge of palm to correct



4. The therapist alter balance from the feet at roll



5. Stretches with prolonged circles, moving forward and backward to mobilize shoulders



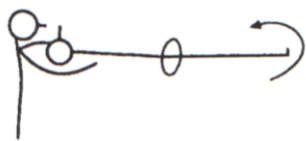
6. Trunk rotation, in flexion



7. Therapist holds the knees of the patient



8. Small stretches



9. Stretching by swinging the body from the head



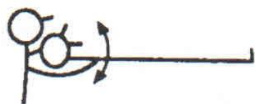
10. Prolonged stretches of the muscles of the foot



11. Prolonged stretches aiding selective flexion or extension



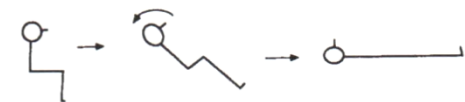
12. Prolonged stretch of the body with extension and rotation



13. Movements of rotation



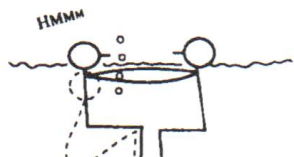
14. Longitudinal rotation in both directions, initially controlled by therapist



15. Vertical rotation, patient must learn to blow the air.



16. Combination of rotations



17. Exercise of breath control with selective flexion and extension



18. Buoyancy with trunk rotation



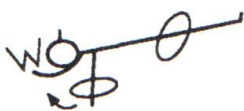
19. Buoyancy with lateral flexion



20. Buoyancy with hip extension



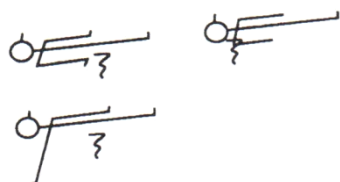
21. Buoyancy with extension



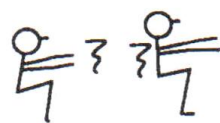
22. Buoyancy with thoracic rotation



23. Flotation, lifting raising individual limbs



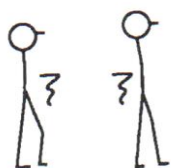
24. Flotation aided by isometric holding, using turbulence



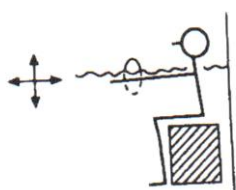
25. Flotation, using turbulence, with extension of the shoulders



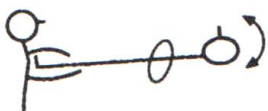
26. Flotation with elbow extension



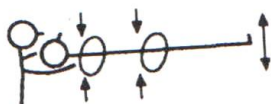
27. Flotation with assistance and resistance from turbulence. Movements of extension at hips



28. Flotation of movements of superior members



29. Rhythmic stabilization with rotation exercises, with flexion and extension



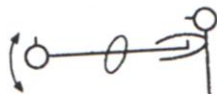
30. Rhythmic stabilization with patient maintaining position while therapist applies pressure around the trunk



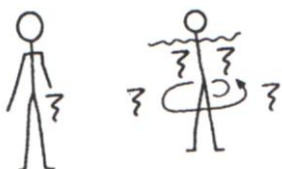
31. Movements for awareness executing longitudinal rocking



32. Maintaining balance



33. Patient tries to resist at rotation



34. Turbulence is used for perturb balance



35. Maintaining balance changing the depth of water and increasing turbulence

(Figures are from Campion. M.R., 2001)

In the therapeutic sessions (table below) we used the techniques above.

Days	Practical techniques	Aims
1.	1 – 4 17 18 – 22	Floating reducing head support, with selective release using a short lever and appreciation of roll Breath control exercise Buoyancy exercises
2.	1 – 4 17 18 – 22	Floating reducing head support, with selective release using a short lever and appreciation of roll Breath control exercise Buoyancy exercises
3.	5 – 9	Stretching exercises

	18 – 22	Buoyancy exercises
4.	17 3 – 4 5 – 9	Breath control exercise Appreciation of roll Stretching exercises
5	10 – 12 13 – 14 29 – 30	Prolonged stretches Rotations Rhythmic stabilizations
6.	13 – 16 18 – 22 31 – 35	Rotation and longitudinal rotations Buoyancy exercises Balance and saving reactions
7.	23 – 28 29 – 30 31 – 35	Facilitation of movement using turbulence and buoyancy Rhythmic stabilizations Balance and saving reactions

### Conclusions

Rehabilitation through hydrotherapy after neurological and physical injury requires competent and different approaches, to recreate and strengthen the patient.

The treatment lessons must be done slowly and wait for reactions before changing to a new activity.

The skill in treatment is to challenge the patient to her limits, not beyond central nervous system. In water is very easy to overchallenge the damaged central nervous system beyond its capacity to execute natural.

Water can be used as facilitator, is a dynamic environment that can recreate for the person the feeling of freedom of movement, it allows a subtle and intuitive approach to treatment.

Aquatic intervention has a important role in the rehabilitation of the neurologically damaged person.

Although multiple sclerosis is a degenerative and progressive disease, the role of therapeutic aquatic program is reached by maintaining a level of continuous independent life, with patient more confident in hers abilities.

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Aquatic program can support full range of motion, offers buoyancy supported environment.

Through this study we observed a significant improvement in the level of fatigue with a potential positive effect on functional abilities.

### Discussion

Geigle and Brody (2009) found that „Challenges to the delivery of care to patients with neuromuscular disorders encourage rehabilitation professionals to explore many approaches to neurorehabilitation”.

Campion (2001) revealed that through practical techniques applied in water therapy in the later stages „not too much harm can be done and the patient enjoys doing something a bit different”.

„The effect of immersion on the sympathetic nervous system due to the depression of noradrenaline production (O'Hare, 1985) may partially account for the feeling of well-being that patient often report after hydrotherapy treatment” (Campion M. R., 2001).