

HYDROTHERAPY AQUATIC PHYSIOTHERAPY AND THE APPLICATION OF BAD RAGAZ RING METHOD

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ABSTRACT

This paper reviews the use of water-based therapy to rehabilitate patients with deficits of functional movement or muscle control. The properties of water are described and their relevance to the application of treatment techniques to patients in a therapy pool. The physiological effects of being immersed in water are described with reference to treatment application. It is important to ensure that the contraindications and precautions are considered before a patient can enter a therapy pool. A specific approach to rehabilitation of patients in a therapy pool utilising the Bad Ragaz Ring Method is outlined, with examples being given of how this approach may be used in the rehabilitation of patients.

INTRODUCTION

The Roman Empire saw the advent of 'Sanus per Aquam' or Spa baths, with them being used in a therapeutic manner to recuperate wounded legionnaires. Galen (130-200 A.D) one of the forefathers of medicine undertook studies of the properties and effects of water and with others developed this into a science (Hajar, 2012).

With the demise of the Roman Empire there was little further development until the Renaissance in the 15th and 16th Centuries (Hajar, 2012).

By this point of view, Vincent Priessnitz, 1799-1851 may be considered as the father of the modern hydrotherapy (immersion of the body in thermal water for therapeutic purposes) and one of the originators of naturopathic medicine and balneotherapy (medicinal use of thermal water) (Metcalf, 2012).

Spas became popular throughout America and Europe becoming centres for the new social elites emerging along with the industrial revolution (Gianfaldoni et al., 2017).

The twenty first century has seen water therapy establish its role in modern healthcare provision with water-based therapy providing physical, psychological benefits as well as being a relaxing experience (Gianfaldoni et al., 2017).

In the United Kingdom in the 1930s The Chartered Society of Physiotherapy in conjunction with Rheumatologists began to train physiotherapists to treat patients with Rheumatological diseases. Roman Spas such as Bath, became acknowledged centres of thermal aquatic therapy (Ainslie, 2012).

During the same period German doctor H. Knupfner began using a method of treatment where a therapist worked in water with patients to produce changes in muscle tone (Knupfner, 1956). Polio epidemics in America in the 1940s and 1950s led to the proprioceptive neuromuscular facilitation (PNF) techniques developed by Knott and Voss in Vallejo California

that became integral part of rehabilitation in the 1960s (Voss et al., 1985).

In Bad Ragaz Switzerland during the 1960s the physicians and therapists WM Zinn, Nele Ipsen and Bridget Davies and Beatrice Egger published articles outlining the Bad Ragaz ring method (BRRM) drawing upon the work of Knupfer, Knott and Voss. These techniques utilise the water properties of turbulence and streamlining, using buoyancy for support. Techniques are applied utilising physiological movement of joints and muscles in functional patterns (Ainslie, 2012).

Contemporary Aquatic Physiotherapy should form a part of a patient pathway where rehabilitation is necessary. It may be delivered as a sole treatment or as part of a treatment package complimenting other interventions.

Cardiorespiratory endurance, muscle strength, flexibility, balance, functional capacity and psychological considerations may benefit from treatments provided in a therapy pool (Templeton et al., 1996; Hinman et al., 2007; Wang et al., 2007).

A good knowledge of the physical properties of water and the skills to utilise these properties to create effective treatments are prerequisites for therapists using water as a therapeutic medium.

There is a danger of water-based therapies becoming marginalised in the modern health systems due to economic pressures. Teaching time devoted to the theory and practical application of hydrotherapy has been eroded on physical therapy programmes. Hospitals and centres look at hydrotherapy as being an expensive resource that often becomes subject to cutbacks when financial savings have to be made. It is essential that therapists are aware of the benefits of water based therapy and that further evidence is generated to justify the use of hydrotherapy/aquatic physiotherapy as a necessary part of the rehabilitation options available to treat patients (Cole & Becker, 2010).

■ THE PROPERTIES OF WATER

Hydrostatic Pressure

The pressure of water exerted on a body immersed up to the level of C7 will lead to decreased diastolic blood pressure, increased systolic volume, increased venous return to the right side of the heart and increased renal function. Factors that need to be considered when a patient is being assessed for suitability for aquatic therapy. Expiratory reserve volume decreases, vital capacity decreases and lung compliance is reduced meaning precautions should be taken for patients with compromised lung function (Hellsten et al., 2012).

Relative Density of Water

The average human body with air in the lungs will float with 2.5% of its volume out of the water. As muscle bulk increases so the body becomes denser and less buoyant. Males tend to have greater muscle mass than women and therefore float less easily. With old age bone and muscle mass decreases and therefore the body will be more buoyant. In application the legs tend to sink into the water while the trunk floats (Brody & Geigle, 2009).

Buoyancy

Archimedes principle states that a body totally or partially immersed in a fluid is subject to an upward force equal in magnitude to the weight of fluid it displaces. A person standing immersed to the xiphisternum experiences 70% weight relief and to C7 90% weight relief (Harrison & Bulstrode, 2009)

A person with a slight build will have their centre of buoyancy close to the centre of gravity so will be stable, whereas a person who is obese, with a large abdomen will tend to fall backwards and have legs that will float to the surface more easily. A muscular person will tend to have legs that sink to the bottom of the water.

Turbulence

Turbulence can be utilised as a resistance to movement. As a body moves through water it leaves an area of low pressure behind the body that creates a drag (resistance) to the movement of the body through the water. The amount of turbulence may be influenced by the surface area presented by the body, thus the more streamlined the body the less drag will be created behind it. The velocity of movement will also influence the amount of turbulence and therefore the amount of resistance to movement.

Refraction

The light passing from air into the water will be distorted by the denser water. This means it is difficult to evaluate movement of a limb and its correct position in the water.

■ CONTRAINDICATIONS AND PRECAUTIONS FOR HYDROTHERAPY/AQUATIC PHYSIOTHERAPY

All patients should have a comprehensive assessment, part of which will assess the suitability of the patient for this intervention and will include screening for contraindications and precautions. These are divided into absolute contraindications (Table 1), relative contraindications and precautions and acted upon accordingly.

Relative contraindications: Patients with the following conditions require further consideration considering the risk/benefit analysis, but if hydrotherapy/aquatic therapy is considered this should be done so cautiously (Table 2)

Precautions Patients with the following may receive hydrotherapy/aquatic therapy but additional precautions may be required (Table 3)

Considerations The following additional factors should be taken into consideration during treatment planning and participation (Table 4).

■ BAD RAGAZ RING METHOD (BRRM)

These techniques are applied with one therapist working with a single patient in the water.

All patients are assessed for suitability for aquatic therapy ensuring all contraindications and precautions are accounted for and in addition the planned treatment should avoid fatigue, which is easily reached in patients who are in poor general physical condition.

The therapist should be aware of the patient getting dizzy due to the vestibular stimulus generated through the patient's body movements. Care should be taken when treating patients with neurological conditions where active or resisted exercise may increase spasticity.

As with PNF techniques BRRM uses functional patterns of movement, these patterns may be applied bilaterally or as unilateral techniques. Short concise verbal commands are given by the therapist. Maximal resistance is used, and weak muscles are recruited by overflow from stronger muscles (Adler et al., 2008).

PNF is different to BRRM, in that PNF requires the therapist to move with the working part of the body, whereas with BRRM the body moves through the water as a result of the manual force applied by the therapist, where the therapist is the fixed point.

Patients tend to be positioned in supine or side lying and may be provided with floatation aids such as a neck collar or a waist float to maintain the body at the water's surface, with floats being attached to wrists or ankles as necessary. The floats assist the therapist in maintaining the patient's position to enable the desired movements to be applied to their body.

The therapist maintains a stable stance in the water with their feet at least a shoulders width apart, the water level should be up to the therapist's axillae, with the therapist maintaining contact with the patient at all times, this is especially important where the patient may be anxious about being immersed in water.

■ PRINCIPLES OF APPLICATION OF BRRM

BRRM method advocates using isometric patterns to manage pain with movement being in pain free range. Treatment will aim to increase joint range of movement, improve muscle power and endurance, relieve pain, restore normal patterns of movement, and improve the patient's confidence (Taunton et al., 1996; Omar et al., 2019).

Generally, treatment for trunk weakness or pain is begun using limb patterns. In the case of patients demonstrating anxiety about being immersed in water the therapist will begin with hold that are proximal to the body, near the patient's head.

As treatment is progressed the levers can be length-

Tab.1 - Absolute contraindications to hydrotherapy / aquatic therapy	
Acute systemic pathology	Emesis e dysentery
Clinical instability due to acute episodes	Allergy to chlorine and bromine
Angina at rest	Breathlessness at rest
Uncontrolled cardiac insufficiency / paroxysmal nocturnal dyspnea	Infected wounds
HIV or hepatitis C positive people (should not enter in water during menstrual cycle)	

Tab. 2 - Relative contraindications to hydrotherapy / aquatic therapy	
Patients undergoing radiation therapy	Aneurysm
Open wounds	Uncontrolled epilepsy
Unstable diabetes	Thyroid deficit
Neutropenia	Artificial oxygenation necessity
Bodyweight exceeding the maximum load of safety facilities	

Tab. 3 - Precautions to hydrotherapy / aquatic therapy	
Urinary or fecal incontinence	Severe obesity
Epilepsy	Haemophilia
Staphylococcus infection	Ipotension
Renal insufficiency	Cutaneous pathologies or surgical / open wounds
Pregnancy (if water temperature is higher than 35°C)	Invasive pathologies
Aspiration risk	Reduced caloric provision
Syncope	Sickle cell anemia
Inefficient thermoregulation	Tracheostomy
Fungal infection	Episodes of disreflexia
Fear of water	Aggressive or unpredictable behavior
Congiuntivitis or contact lenses	Acoustic pathology
Vision alteration	

Tab. 4 - Conditions to take into account while planning a session of hydrotherapy / aquatic therapy	
Shortness of breath during under exertion	Dizziness / Nausea / Syncope
Multiple sclerosis (in particular for patients with high sensitivity to high temperatures)	Language problems
Psoriasis / Sensitivity to cutaneous disinfectant	Warts / Tinea pedis

ened by the therapist changing their position to hold the upper or lower limbs more distally. Duration of the treatment will begin initially with between 5-10 minutes of BRRM techniques, with patient fatigue being monitored. It is surprisingly tiring receiving BRRM treatments and the duration of the treatment session can be gradually increased according to the response of the patient up to 20 minutes of a 30-minute session of immersion in a therapy pool.

Conditions indicated for BBRM

Most orthopaedic or rheumatological conditions, for example: rheumatoid arthritis, osteoarthritis, pre and post-surgery, post fracture, neurological conditions such as post CVA or post spinal cord injury.

Progression of BRRM exercises

Increase speed of movement of the patient through the water.

Make the patient less streamlined, by adding floats or changing the shape of their body exposed to the water. The therapist can increase the lever arm by grasping the patient more distally. Sudden change of direction of movement, so patient has to work against the water resistance and turbulence created by the sudden change of direction.

Example of bilateral pattern BRRM technique (Hip abduction)

Patient supported by neck and waist floats, lying supine with the therapist placing their hands on the lateral aspect of both ankles. At the start of the pattern the patient’s feet will be just in front of the therapist. The patient is instructed to abduct both hips, while the therapist provides a resistance, guiding both legs into internal rotation and extension at both hips. The patient will finish with their hips abducted, internally rotated, and extended and their knees being at

the therapists' sides. The therapist steps back to bring the patient's legs into the starting position with the patient's feet in front of them once more.

■ CONCLUSION

Aquatic physiotherapy is a means of treating patients with a variety of conditions that cause them to have pain, weakness, joint hypo-mobility, and loss of functional movement patterns. The properties of the water are utilised to provide graded rehabilitation for patients in a way that is difficult to replicate through land-based interventions. This paper has specifically explored the use of Bad Ragaz Ring Method as a

treatment approach incorporating the properties of water that can be applied effectively to improve functional mobility and muscle function with patients in a heated therapy pool.

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Competing Interest

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