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Original article

Aquatic therapy: some theoretical considerations about Bad Ragaz Ring Method

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Abstract

Aim. The aim of this study is to emphasizes the importance of aquatic therapy for recovery in general and in sport in particular. Increasing interest in aquatic therapy can be attributed in part to its evolution. There are many different techniques attributed for aquatic therapy and the theoretical reviwes has determined many aquatic rehabilitation concepts: Watsu, Ai Chi, Halliwick, The Feldenkrais, AquaStrech™ and Bad Ragaz Ring Method. The last one, Bad Ragaz Ring Method is most useful concept of aquatic therapy with a positive effect on rehabilitation.

Methods. This systematic review is performed in the electronic databases PubMed, PEDro studies that tested the effectiveness of aquatic therapy using the Bad Ragaz Ring method.

Conclusions. The Bad Ragaz Ring Method concept is most useful aquatic physical therapy concept. The Method focuses upon using the patient's muscular force, which should be less than the therapist's force. So Bad Ragaz Ring Method has to combine with other aquatic rehabilitation concepts whose focus to increase activities and participation like the water specific therapy like Halliwick concept.

Key words: Aquatic therapy, Bad RagazRing Method, Rehabilitation.

Introduction

Over the course of that history a great number of terms have been generated to describe this type of therapy such as hydrotherapy, balneotherapy, hydrology, hydro-gymnastics, water therapy, spa therapy, water therapeutics and water exercise. Today, it is most commonly referred to as aquatic rehabilitation or aquatic therapy (Howard 2016).

Egyptian, Greek and Roman civilizations recognized the use of the therapeutic water, so Hipocrates prescribed bathing in spring water for sickness, Egyptian royalty bathed with essential oils and flowers, while Romans had communal public baths for their citizens (https:/en.wikipedia.org/wiki/Hydrotherapy#History).

According with Becker, & Cole (1997), aquatic rehabilitation is a late-twentieth century term that describes a scientific therapy, medical rationale, and a set of clinical procedures using water immersion for the restoration of physical mobility and physiologic activity, and, at times, for effecting psychological transformation (Andrew et al. 1997).

In the 18th and 19th century, hydrotherapy became more prominent following the growth and development of modern medical practices. Hydrotherapy, has often been associated with the use of cold water. Priessntiz, (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 (Metcalfe 2012). He combined cold water with a vigorous exercise program to strengthen patients who were ill, in the same times the specialists recognize the benefit of hot water for recovery. So, the benefit of cold water are the decreases of pain, reduces inflammation, lessens soreness in muscles, lowers body temperature, boosts the immune system. The warm water benefit include: decrease pain, promotes blood flow, relaxes muscle, flushes out toxins, relieves constipation (Goedsche et al. 2007).

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 (Ainslie 2020).

Today, aquatic therapy is used to help individuals improve balance, coordination, weight bearing, muscular endurance, muscular strength, cardiovascular and pulmonary endurance, pain management, motor skills, motor control, range of motion, and circulatory function (Sova 2012).

Types of hydrotherapy: Whether it's using a cold compress on a sprained ankle or taking part in a group water aerobics class, there are many different forms of

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hydrotherapy. Here are a few of the most common (Sullivan et al. 2020):

- aquatic exercise: water aerobics, lap swimming and group exercise classes all fall under aquatic exercise;
- aquatic physical therapy: performed by a licenced physical therapist, this type of therapy includes a specialized program for each person;
-warm water bath: taking a warm water bath can increase blood flow and it can also reduce pain and inflammation (Gianfaldoni et al. 2017);
- Kneipp hydrotherapy the form of alternate cold and warm thigh affusions, having an active effect on the vessels by causing initial local vasoconstriction followed by reflexive vasodilatation, which activates the cutaneous circulation (Franke 1961).

The benefits of aquatic therapy include the ability to offer prescriptive exercise that is functional without being painful. Balance exercises can be completed safely in an aquatic environment well before they can be attempted on land. Elevated metabolism resulting from the resistance provided by water helps to speed weight loss while increasing muscle strength (Chiquoineurie et. al. 2018). Underwater treadmill work adds the benefits of gradually increased weight bearing while giving the therapist the option to quickly change tread speed as needed. The inherent properties of water, including buoyancy, hydrostatic pressure, viscosity, fluid dynamics, and resistance make aquatic training efficient for achieving rehabilitation and maintaining total fitness (Herold et al. 2016).

Also, the psychosocial benefits. Aquatic therapy can reduce stress and anxiety, increase one's ability to concentrate, enhance a feeling of well-being and confidence, and allow a person in pain to find their center of calm. The pool atmosphere often seems less clinical than a gym, and most people equate the swimming pool with fun (Norton et al. 2000).

Aquatic therapy is primarily focused on exercise in water but also includes hands-on techniques. It can include some of the methods, it can also include joint mobilizing or stretching techniques or other passive relaxation techniques, it can also include gait or postural re-education. All techniques can be combined depending on the individual's goals. In order to achieve specific physical or functional goals, aquatic physical therapists can choose a number of concepts (methods or techniques) (https://www.brainline.org/article/why-aquatic-therapy).

WATSU (Water Shiatsu) promotes deep relaxation, quieting the sympathetic and enhancing the parasympathetic nervous systems. It has profound beneficial effects for trauma, both physical and psycho-emotional, with therapeutic application for neuromuscular injuries, stress, chronic pain, discomfort during pregnancy, and special needs (https://www.watsu.com).

Ai Chi is a water-based total body strengthening and relaxation progression, and integrates mental, physical, and spiritual energy. It combines Tai-Chi concepts with Shiatsu and Watsu techniques, and is performed standing in shoulder-depth water using a combination of deep breathing and slow, broad movements of the arms, legs, and torso. The Ai Chi progression moves from simple breathing, to the incorporation of upper-extremity, trunk, lower-extremity, and finally total body involvement (https://www.nchpad.org/373/2078/Ai~Chi).

Halliwick is an aquatic motor relearning programme. Therefore it is founded on principles of motor learning (like the dynamic systems model) and has two parts: the Ten-Point-Programme and Water Specific Therapy. This second part is especially suitable to stabilize the trunk and has resemblances with Pilates. In water, the trunk must be used in the "game of balancing" (Gresswell 2015). That's why Halliwick also is a (minimized) Constraint Induced Movement Therapy. Increased trunk stability can be used in exercises for falls prevention like an obstacle course or Clinical Ai Chi (https://www.ewacmedical.com/methods-in-aquatic-therapy/).

The Haillwick concept is based on the following: introduction to water, motor learning, holistic learning, awareness of abilities and achievements in water instead of disability on land, improving the quality of life, integrating children and people with and those without disabilities (https://www.halliwick.net/en/course-contents).

The Feldenkrais Method is a movement based, exploratory learning system that enhances your ability to move and remain active in life. Through hands on facilitation (Functional Integration) and verbally guided group lessons (Awareness Through Movement), individuals gain an insight into the quality of their movements, the connection between different body parts and how the whole body can move with greater ease and efficiency (https://feldenkrais-method.org/archive/feldenkrais-method/). This method promotes teaching individuals about the quality of their movements and how to move effortlessly with ease and efficiency (http://www.neuroaquatics.com.au/feldenkrais).

AquaStrech™ is a one-on-one, assisted, stretching and myofascial release technique performed in shallow water using weighted resistance. The more that the client shares with the therapist about how they

are feeling, about good pain/bad pain, the more they are going to get out of treatment (https://www.physicaltherapy.com/articles/aquastretch-principles-foundations-and-preliminary-2267).

AquaStrech™ also differs from myofascial release in that it utilizes the aquatic environment's properties. Upon immersion, particularly in warm water, blood flow increases to the muscles by 50% or more and physical stress and load on the body, or the weight-bearing on the joints, is going to be extremely reduced. It is basically a zero gravity event that the client experiences (Sherlock et al. 2013). The buoyancy, increase in blood flow, increase in flexibility, and the reduction in joint compression will allow the participant to have increased movement with reduced restriction. They will be able to get into positions that they would not necessarily be able to get into when on land. That is exciting and a key factor in the effectiveness of this particular modality (Sherlock et al. 2013).

AquaStrech™ is a technique that combines manual therapy and active assisted exercise in a gravity-reduced aquatic environment. This intervention has been reproduced in clinical settings and has shown improvement in range of motion after a single treatment session in non-injured individuals (https://aquapilates.net/wp-content/uploads/2017/03/TalejoASPoster2016-4.).

The Bad Ragaz Ring Method is a strengthening and mobilizing resistive exercise model based on the principles of proprioceptive neuromuscular facilitation techniques (Gianfaldoni et al. 2017). This specific treatment concept was developed by physiotherapists in Bad Ragaz, Switzerland and published by Davies (1967). The Bad Ragaz Ring Method isn't just a strengthening and mobilizing technique, but a complete physiotherapeutic treatment concept, which can be focused on modulation of pain and muscular relaxation (Urs et al. 2017).

Stan (2016), afirmed that the exercises in Bad Ragaz Ring Method can be divided into separate models of working legs, trunk and arms. Models can also be classified as unilateral or bilateral models. The models have options bilateral symmetrical and asymmetrical. All models are applied in moving back floating position. Bad Ragaz Ring Method is a concept of active aquatic physical therapy done on an individual basis, the therapist and the patient (Stan 2016). The therapist specializing in learning the art handling pacients, aims to support patients in a horizontal position in water. In her study the author specified the benefits of waters and method:

- in treating locomotor deficiencies;
- was introduced technique of floating material, neck, pelvis and ankles, by which to get water moving through the patient by the therapist;
-oriented approach is used for stabilization and consolidation exercises, which can address various conditions imposed by the resistance manually with passive movements, active with active assistance and resistive;
-proprioceptive neuromuscular facilitation technique, used by therapists in Europe included a three-dimensional movements, each model can be modified and adapted to a wide variety of orthopedic or neurological diagnoses (Ainslie 2020);
- „during the implementation of original concepts, models most commonly used Bad Ragaz Ring Method allow better control and plug the therapist's hands, emphasizing the ability to facilitate or inhibit a response" (Atkinson et al. 1981);
-there is a range of models based on direct approach between therapist and patient, grouped into three categories: lower extremity, trunk and upper extremity;
-applied techniques constitute the passive models that require no active participation of the patient and imposed, requiring the patient to have intact cognitive skills in order to perform adequately patterns indicated (Ainslie 2020).

The functional therapeutic abilities and limitations are analyzed precisely by the therapist and the most suitable patterns chosen by the knowledgeable aquatic practitioner. Patients who need to improve strength, mobility, stability or function can benefit from Bad Ragaz Ring Method (Urs et al. 2017).

The technique is useful with (Chiquoineurie et. al. 2018):

• peripheral joint problems like osteoarthritis,
• inflammatory diseases like rheumatoid arthritis or ankylosing spondylitis,
• chronic spine problems,
• general weakness or motor control deficit Range of motion, neurological diseases like stroke, peripheral nerve lesions, polyneuropathies,
• impairments postsurgery, like trauma, and joint replacement.

Treatment time in the Bad Ragaz Ring Method depends on the treatment goals. The minimum time should not be shorter than 15 minutes, especially with those patients having significant weakness. Somewhat longer periods of treatment are needed to train aerobic capacity or local muscular endurance. In this case, a treatment should last at most 30 minutes (Urs et al. 2017).

Accurate knowledge of techniques in Bad Ragaz Ring Method is very important for a specific treatment (Knott et al. 1968).

To understand the principles of how the Bad Ragaz Ring Method function, it is necessary to analyze how chains of movements in the body function as well as how they influence equilibrium.

Aquatic therapy has a positive effect on rehabilitation, so further research is needed to confirm the clinical utility of this therapy.

Methods

This systematic review is performed in the electronic databases PubMed, PEDro studies that tested the effectiveness of aquatic therapy using the Bad Ragaz Ring method. For research criteria were used terms: "aquatic therapy", "hydrotherapy", "Bad Ragaz Ring Method", "water-based therapy" and "aquatic rehabilitation".

A systematic literature search was conducted to identify all articles published, to collect the available evidence of aquatic therapy and to investigate the effect of Bad Ragaz Ring Method in various pathologies. Following research, suitable studies have been identified, some using the Bad Ragaz Ring Method in combination with other aquatic methods, such as Halliwick, Ai Chi, Watsu.

Discussion

There are a lot of researches about aquatic therapy, specialy for stroke. Veldema and Jansen (2020), in a review and meta-analyses on overall 28 appropriate studies (N = 961) they find in a comparison with no intervention that aquatic therapy is effective in supporting walking, balance, emotional status and health-related quality of life, spasticity, and physiological indicators. In comparison with land-based interventions, aquatic therapy shows superior effectiveness on balance, walking, muscular strength, proprioception, health-related quality of life, physiological indicators, and cardiorespiratory fitness. Established concepts of water-based therapy (such as the Halliwick, Ai Chi, Watsu, or Bad Ragaz Ring methods) are the most effective.

Another reaserch of Iliescu, et al. (2002), analyzed the type of aquatic therapy program in stroke rehabilitation which varied between studies. They finde of the 19 studies examined, four studies (Cha et al. 2017), (Han et al. 2013), (Matsumoto et al. 2016), (Park et al. 2011), administered general aquatic therapy with exercises aimed at improving strength, endurance, mobility, and/or flexibility; five studies provided Halliwick aquatic therapy in combination with Ai Chi, (Furnari et al. 2014), (Kim et al. 2010), Watsu, (Park et al. 2016), or walking; (Zhang et al. 2016), (Zhu et al. 2016), four studies (Kum et al. 2017), (Lee et al. 2018), (Park et al. 2012), (Tripp et al. 2014), implemented underwater treadmill training; three studies (DaSilva et al. 2020), (Kim et al. 2015), (Kim et al. 2016), implemented programs based on proprioceptive neuromuscular facilitation; and two studies (Kim et al. 2015), (Saleh et al. 2019), implemented dual-task training.

The research conducted by Hyun Gyu Cha et al. (2017), evaluates the effects of the Bad Ragaz Ring Method on functional recovery in chronic stroke patients. The experimental performed on a twentytwo chronic stroke patients were randomly assigned to two groups: a Bad Ragaz Ring Method group (the experimental group) and a control group. The results of the experimental group showed significant improvements in activations of tibialis anterior and gastrocnemius muscles, balance index, and Timed Up and Go test results. This study confirmed that the Bad Ragaz Ring Method significantly improved lower limb muscle activities and dynamic and static balance in patients with chronic stroke (Hyun GyuCha et al. 2017).

Others reaserchers have studied the effect of aqua therapy on geriatric rehabilitation.

DaSilva et al. (2020), evaluates the effects of aquatic therapy versus conventional physicaltherapy on the risk of fall in the elderly. The sample was composed of 35 senior individuals of both sexes, with average age of 65. Nineteen people composed the control Group/Conventional Physiotherapy, while the rest composed the experimental Group/Aquatic therapy. Exercises using water specific therapy, such as Halliwick rotation control and Bad Ragaz Ring Method, were used in the experimental group. The results showed to be greatly efficient, however aquatic physiotherapy showed certain advantages compared to conventional physicaltherapy, promoting more beneficial effects in the gait speed, balance, motor abilities and, mainly, in the reduction of the risk of fall.

Another study (Morris 2010), about aquatic therapy to improve balance dysfunction in older adults, found that balance dysfunction can result from the negative effects of the aging process on musculoskeletal factors, sensory capabilities, postural strategies, and/or anticipatory control skills. These problems can be compounded by medical conditions commonly experienced by aging adults (eg, stroke, Parkinson disease, osteoporosis). The physical principles of water allow the application of a wide range of therapeutic strategies to positively influence balance control. Mounting evidence suggests that aquatic therapy is beneficial, when applied as part of rehabilitation and/or community fitness programs, for improving balance control (Morris 2010).

Zhongju et. al. (2018) in a review and meta-analyses on overall 47 potential articles, which included 331 patients with low back pain. The eight studies summarized in efficacy of aquatic exercise, and the analysis revealed that aquatic exercise could statistically significantly reduce pain and increase physical function in patients with low back pain. There was no significant effectiveness with regard to general mental health in aquatic group.

Aquatic exercises are frequently used as a treatment for the rehabilitation of patients with musculoskeletal disorders (Verhagen et al. 2012). In a previous systematic review, therapeutic aquatic exercise has shown to be safe and effective in the patients experiencing chronic low back pain (Waller et al. 2009).

Another research, investigate the efficacy of a 4-week community aquatic physiotherapy program with Ai Chi and the Bad Ragaz Ring Method on pain and disability in adults with chronic low back pain.

Billy et al. (2019), performed an experiment on 44 adults, were assigned to either an Ai Chi (n= 23) or Bad Ragaz Ring Method (n= 21) program. The results of the experiment, prouved that a 4-week aquatic physiotherapy program with Ai Chi or Bad Ragaz Ring Method, are significant pre- to post-treatment improvements in disability and global core muscle endurance. Ai Chi appeared to have an additional benefit of improving single-leg standing balance and Bad Ragaz Ring Method an additional benefit of reducing pain (Billy et al. 2019).

There are some researches about aquatic therapy, in the rehabilitation of athletic injuries. The systematic review, Eunkuk Kim and Hokyung Choi (2014), evaluate the evidence for the effectiveness of aquatic physical therapy in the treatment of athletes and/or individuals with sports injuries. They suggest that athletes and/or individuals who underwent aquatic physical therapy for rehabilitation of sports injuries showed improvement in pain, range of motion, muscle strength, balance ability, and performance. However, the evidence for the benefits of aquatic physical therapy in comparison to land-based physical therapy was found to be inconclusive. The 8 articles included subjects with a variety of sports injuries such as ankle instability, low back pain, and knee ligament injury and those with no health problems (Asimenia et al. 2013), (Chan et al. 2017), (Eunkuk et al. 2014), (Kelly et al. 2000), (Kim et al. 2010), (Martel et al. 2005), (Roth et al. 2006), (Tripp et al. 2014). They underwent different types of aquatic exercise programs including the plyometric, balance training, and functional rehabilitation programs, and they were evaluated using various method. Therefore, we were unable to determine the ideal aquatic physical therapy program from this review, which is needed during rehabilitation of a specific sports injury to derive clinically significant benefits.

A high recurrence rate of ankle sprain has been reported in athletes who have residual symptoms such as pain, swelling, weakness, and instability, and this occurrence of multiple episodes of ankle sprain and instability is referred to as chronic ankle instability (Nualon et al. 2013). One of the articles in this review showed that the functional ability of the ankle had improved after hydrotherapy until 3-month follow-up, and only 4 (17%) of 24 athletes who performed hydrotherapy reinjured their ankle, whereas 8 (35%) of 23 athletes who participated in land-based therapy reinjured their ankle (Nualon et al. 2013). Follow-up studies on the recurrence rate of sports injuries based on the environment in which the physical therapy is provided are needed for determining the effectiveness of aquatic physical therapy.

Conclusions

Aquatic therapy is that activity performed in water to assist in rehabilitation and recovery patients with a variety of pathologies. According to the literature, there is evidence to suggest that aquatic physical therapy improves range of motion and balance, reduces pain and spasticity, increases athlete's performance.

This article specifically represents the techniques and methods used in aquatic therapy. The Bad Ragaz Ring Method concept is most useful for aquatic rehabilitation, and can be applied to all patients with orthopedic, neurological, rheumatology problems, in an early stage of rehabilitation. In combination with other aquatic methods, such as Halliwick, Ai Chi, or others, can improve better and shortly the recovery.

We found only a few researches on the Bad Ragaz Ring Method, which states that this method is a much more efficient and faster way to recover.

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