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ARTIGO DE REVISÃO

Discussing about the use of water as facilitation, resistence or support in hydrotherapy

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ABSTRACT

The hydrotherapy is a physiotherapeutic resource based in the hydrodynamic that includes the flotation and the viscosity analysis. It provides that the motors activities in warm pool can be facilitated resisted or offer support to the body or its segment. In this revision it is discussed motor activities in these three situations focusing the correct posture to be used for a certain therapeutic objective besides as the aquatic equipment that can offer progression to motor activities.

KEY-WORDS

physical therapy, physical exercise and hydrotherapy

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Introduction

Hydrotherapy is a physical therapy modality that utilizes the physical, physiological and kinesiological effects caused by the immersion of the body into a heated pool, as an auxiliary rehabilitation resource or in the prevention of functional alterations[1].

Among the physical principles of the water on which hydrotherapy is based are fluctuation and viscosity[2,3]. Fluctuation is the force experienced as an upward thrust that acts against gravity; viscosity is the result of the friction among the molecules of a liquid due to the adhesion and cohesion forces[4]. Fluctuation and viscosity, either alone or combined, make it possible to use the water as a facilitator, resistance or support factor for body movements or one of its segments[5], depending on the patient's posture, i.e., it is directly related to the body position inside the water (decubitus).

The literature concerning this topic is quite scarce, being restricted to book chapters that deal with the subject by focusing on the basics of hydrokinesiotherapy, but not discussing, in a simplistic and superficial manner, its applicability in clinical practice.

Based on the above mentioned facts, this study was conceived specifically to discuss the different possibilities of physical exercises offered by water to facilitate, resist or provide support to the segment or the whole body.

The exercises assisted or facilitated by fluctuation are those in which a certain part of the body is moving upwards, towards the water surface. These exercises promote early passive joint ranges of motion with no pain. They can be used when there is muscular weakness, to the point when it is not possible to maintain the limb on the water surface for assisted active exercises[6].

The use of a fluctuator in this type of movement increases the force of traction on the soft tissues. It is important to remember that the use of fluctuators to increase the effects of fluctuation towards the water surface also increases the resistance to the downward movements, towards the pool floor. The amount of facilitation provided can be altered by modifying the size of the fluctuator (directly proportional to the size), the amount of air in the fluctuation material or by the lever arm that is exercised on the limb[7].

The water offers resistance[8,9] whichever is the movement direction, when the velocity of the exercise is higher than the water critical velocity, which is the effect caused by viscosity. The grading of the water resistance to motor activities is obtained by the movement velocity, water depth, lever arm, frontal area of the object, change of movement direction and density (use of fluctuators)10. The fluctuators demand that the patient exercises a motor force and control to thrust and/or restrain the limb through the water.

The water will offer support to a body segment when there is no muscular contraction of the limb being used at the moment when the fluctuation force is equivalent to the gravity force, making the limb or the body to stay on the water surface. It is a downward thrust that acts in an opposite direction to that of gravity. The patient's support will be better with the use of fluctuators, proportional to the size, type and position of the used fluctutator[10]. This criterion is very important, as the physical therapist must know about his or her patient's deficiency to correctly indicate the fluctuators (for instance, a tall patient or a patient with a higher density in the lower limbs than the water, needs more and larger fluctuators).

The use of water fluctuation equipment in the water can potentialize the use of water in these three situations: facilitator, resistance and support, and can also alter the natural position of fluctuation[11]. This is important to alter the postures of motor activities in these three physical therapy objectives. The type of injury and the degree of deficiency determine the type of exercises and the water equipment to be used[12].

The water equipment of hydrokinesiotherapy can be used in the upper and lower limbs and the trunk. They are made of materials that are less dense than the water, as they have a large volume of air and little weight. The lighter the object is in relation to its volume, the more it will fluctuate. The raw materials of water equipment of hydrokinesiotherapy are: rubber, plastic and ethylene vinyl acetate (EVA) foam[5].

The indication of the amount and type of water equipment to be used in hydrokinesiotherapy must be appropriate for the purposes or objectives of the exercise, and thus, it is very important to consider the principles of hydrodynamics when an exercise is to be modified for a determined objective.

In this review, the authors considers it necessary to draw the reader's attention to the importance of determining the decubitus in which the patient will be positioned and the water equipment to be used, so that the physical therapist can use the correct technique according to the aim to be achieved.

In order to make the concept of positioning the patient in the water clearer, the authors decided to use posture examples inducing motor activities that are not significantly different.

The hydrokinesiotherapy, as it is performed in an environment that allows the use of many ludic water equipments and permits three-dimensional exercises, presents a large variety of exercise options with the same therapeutic objective. In this review article, the authors give examples of the exercises to allow a critical discussion, bearing in mind that other types of water equipment or decubitus can and should be used to attain the same physical therapy objective.

Examples of motor activities in the water, with different therapeutic objectives:

Below is an example of motor activity for the upper limb, lower limb and the trunk, which discusses the patient's position, the use of water as a facilitator, resistance or support factor, as well as the grading of the movement and examples of water equipment that can be used in each situation.

1. Lower limbs

Position: patient standing upright, with one hand on the border of the swimming-pool, performs the movement with the contralateral lower limb.

Facilitation: without muscular contraction, the fluctuation will assist the movement directed towards the water surface. It allows ROM gain of hip abductors and extensors (Figure 1).

Figure 1
Use of ankle devices to assist the abduction of the lower limb.

Resistance: to move the lower limb above its critical velocity in different directions. It allows the strengthening of the external and internal rotators, abductors and adductors, flexors and extensors of the hip, directly, and of the hamstring muscles, indirectly. (Figure 2).

Figure 2
Use of ankle devices to offer higher resistance when enveloping the lower limb.

Support: to keep the lower limb relaxed in hip flexion. The fluctuation will maintain the segment fluctuating and will allow the movement of the limb in abduction and adduction (Figure 3).

Progression: without fluctuator, with fluctuator, increase of fluctuator size; position of the fluctuator from proximal to distal.

Types of water equipments that can be used: ankle devices, floaters and water tube.

2. Upper limbs: with one hand on the border of the swimming-pool and performs the movement with the contralateral limb extended.

Facilitation: without muscular contraction, the fluctuation will assist the movements towards the water surface. This activity allows a ROM gain of the shoulder abductors, extensors and flexors (Figure 4).

Figure 3
Use of ankle device to help the support offered by the water during hip flexion.

Figure 4
Use of weights to assist shoulder abduction (90º).

Resistance: to move the upper limb above its critical velocity in different directions. It allows the strengthening of the shoulder external and internal abductors and adductors, flexors and extensors (Figure 5).

Support: with the limb relaxed, the fluctuation will maintain the segment in shoulder abduction or flexion. It allows muscular relaxation and segment support (Figure 6).

Progression: without fluctuator, with fluctuator, increase of the fluctuator size and position of the fluctuator from proximal to distal.

Types of water equipments that can be used: weights, hand paddles, floaters and water tube.

3. Trunk

Position: the patient changes from bipedestation posture to dorsal decubitus.

Figure 5
Use of weights to offer higher resistance to shoulder abduction and adduction with shoulder flexion (90º).

Figure 6
Use of weights to help assist the support provided by the water to shoulder abduction.

Facilitation: patient slowly bends the body backwards (the fluctuation will assist the lower limbs towards the water surface) (Figure 7).

Figure 7
Use of ankle devices to facilitate changing from bipedestation posture to dorsal decubitus.

Resistance: any movement performed with the body straight, immersed in the water at a depth that can vary from the xiphoid process to the shoulders (Figure 8).

Figure 8
Use of ankle devices and board to offer higher resistance to gait.

Support: with the body relaxed in dorsal or ventral decubitus, fluctuation will support the whole body (Figure 9).

Figure 9
Use of cervical collar, water tube and ankle devices to help support the trunk.

Progression: without fluctuator, with fluctuator, increase of fluctuator size and position of the fluctuator from proximal to distal.

Types of water equipment that can be used: ankle devices (lower limbs); weights and hand paddles (upper limbs) and board, cervical

collar, pelvic collar and water tube (trunk).

Conclusion

The comprehension of the movement inside the water and the difference when it is compared to movement on the ground is essential for the planning of the hydrotherapy.

The water can be used to facilitate, resist or support a movement. The change of decubitus to perform a certain exercise can compromise the therapeutic objective. The water assists movements directed at the surface (used to increase joint range of motion), resists any movement performed above its critical velocity (used for muscular strengthening) and supports the limb as long as it is free of muscular contraction on the water surface.

We conclude that the physical therapist must understand and utilize the interaction of these forces in the water and it is necessary to be careful when choosing the decubitus and the equipment to be used, in consideration of the therapeutic objective to be achieved.

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