Importancia del ejercicio físico en la capacidad pulmonar de personas con lesión medular, una propuesta pedagógica a través del medio acuático

Importance of physical exercise on lung capacity of people with spinal cord injury, a pedagogical proposal through the aquatic environment

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RESUMEN

La práctica regular y sistemática de ejercicio físico ha sido recomendada para las personas con lesión medular debido a las complicaciones derivadas de esta enfermedad, dentro de las cuales están los problemas del sistema respiratorio. El objetivo de esta revisión es mostrar la manera como el ejercicio físico puede coadyuvar a la mejora de su capacidad respiratoria, por lo que se hace una propuesta pedagógica para la prescripción del ejercicio en el medio acuático.

Palabras clave: lesión medular, capacidad pulmonar, ejercicio.

Abstract

The regular and systematic practice of physical exercise has been recommended for people with spinal cord injury due to complications arising from the disease, among which are the respiratory system problems. The objective of this review is to show the way as physical exercise can help improve your breathing capacity, what becomes a pedagogical proposal for the prescription of exercise in the aquatic environment.

Key Words: spinal cord injury, lung capacity, exercise.

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Introduction

People with spinal cord injury suffer from multiple health complications related to the respiratory system. The injury usually does not directly affect the trachea and lungs, however, the respiratory problems can occur when signals sent by the brain to control the respiratory muscles and do not flow through the spinal cord. The degree of loss of control of the muscles after suffering a spinal cord injury, will also depend on the severity of the injury (Mueller et al 2008). People with lesions below the level of the thoracic vertebra 12 do not tend to lose control of the four groups of respiratory muscles: diaphragm, external intercostals, intercostal means and inspiratory muscle accessories, necessary for a proper mechanical ventilation, which means that the respiratory system does not usually see affected by injuries in the lumbar or sacral regions of the spinal cord (Stolzmann et to the.) 2010). Individuals with full or cervical thoracic injury experience a loss of control of the respiratory muscles, resulting in the permanent loss of respiratory muscle function below the level of the lesion; However, where the injury is incomplete, is difficult to predict whether the individual can recover part or all of their respiratory function below the level of the lesion (Bach et al., 2006). Respiratory complications are common in people with spinal cord injury, a term that encompasses a variety of diseases, including respiratory infections, problems of pulmonary ventilation, pulmonary embolism, pneumonia and sleep apnea (García et al., 2007;) Postma et al., 2009; Biering-Sorensen et al., 2009); at the same time, studies related respiratory complications with 24% of factors of morbidity in this type of population, pneumonia being the pathology that most often causes death in any post injury period, ranging from 18% in the first year to the 12.7% after the year post injury (Garshick et al., 2005; Furlan et al., 2009).

People with spinal cord injury show a progressive decline in lung capacity, especially of the residual capacity, favoring the accumulation of bronchial secretions, atelectacias and hypoventilation, which may result in being prone to infections of the respiratory tract, weakness in the muscles responsible for mechanical ventilation (Garcia et al., 2007, Mueller et al., 2008).

Medularmente injured person usually has a restrictive pulmonary pattern with a decrease of all abilities and lung volumes (Ovechkin et al, 2010;. Schilero et al., 2009); studies show reductions in forced vital capacity (FVC) and forced expiratory volume

(FEV1), decreasing on average -17.2 ml and -21.0 ml per year respectively have submitted SCI (Mueller et al., 2008) . Similar research shows that the degree of lung function decline of these is 7.5 years after presenting spinal cord injury, depending on the age, the extent of the injury and if there is smoking and obesity (Stolzmann et al., 2008) and breaking function inspiratory and expiratory muscles, producing an ineffective cough and reduced distention of lung and chest wall (Brown et al., 2006).

Other neuromuscular disorders arising from late complications from spinal cord injury are musculo-skeletal problems, which indirectly affect the strength of the respiratory muscles, as in the case of scoliosis which may be present in the injured spinal cord (Schwartz et al., 2007; Inal-Ince et al, 2009;. Wang et al, 2010)..

Have documented the many benefits that exercise brings the lung capacity of people with spinal cord injury, however, it is important to take into account their degree of SCI to find the most appropriate exercise program. . Devillard et al, 2007;;. Valent et al., 2007; Sheel et al, 2008;. Spooren et al generally activities that involve physical strength, endurance, flexibility and breathing exercises (Jacobs et al, 2004 recommended ., 2009).

Le Foll-Moro et al., (2005) reported on how respiratory function at rest and during exercise acted after an interval training wheelchair program, which affected both breathing patterns as in lung capacity, particularly of people with spinal cord injury above the T12 vertebra. After following this fitness program, patients showed a significant decrease in oxygen increased ventilation and respiratory reserve (12.9%). These results are explained by the direct benefits in the inspiratory accessory muscles, particularly the sternocleidomastoid, pectoralis major, pectoralis minor and serratus.

In other adjustments arising from the exercise of force in the form of weightlifting increasing expiratory muscle strength, vital capacity and residual volume (Van Houtte et al., 2006) was observed. On the other hand, another study where people with SCI trained through exercises with incentive spirometry was performed; They did 10 repetitions, twice a day for five days in a period of six weeks, significantly improved their forced vital capacity and forced expiratory volume (Colman et al, 2010;. Roth et al., 2010). Therefore given the complications in the respiratory systems of people with spinal cord injury, there is a greater demand for health services. It is important to plan and prescribe appropriate exercise to strengthen the respiratory muscles, which is why in this paper the pedagogical approach of performing aquatic physical exercise.

The water activity is the epitome of everything that takes place on the water with a fundamentally driving content, which can be applied in different areas. The water

activities are a source of health, as well as a complementary form of intervention programs focused on physical health, therapeutic and rehabilitative element in the care of various population groups, as in the case of older adults (Lopez & Nuria, 2003). Hydrogymnastics can be defined as a form of physical exercise through-rhythmic gymnastic activities carried out in the water in order to counteract the effect of gravity and enhance physical abilities, especially suitable in promoting health of those with limitations for exercise on land (de Souza & Simões, 2007).

Water can transfer heat by conduction and convection, therefore it is used as a reheating agent or surface cooler having the ability to quickly and efficiently transferred according to Archimedes' principle, "in a fluid at rest, experiences an upthrust equal the weight of the volume of liquid it displaces. " The amount of liquid which moves depends on liquid density, if the density of the immersed body is less than the density of liquid, then move a volume of lower and float liquid, so that the buoyancy is a force that is experienced as an push up on the body in the opposite direction to gravity (López & Nuria, 2003).

By using the water bath as two mechanical effects acting on the body, the compression effect which depends on the hydrostatic pressure and the effect of floating or are thrust; if there is water in motion applications whether the patient objects or the water itself, we get a new hydrokinetic effect (Leon JC, 2005). Water viscosity resists the movement of a body immersed in it and their displacement; Water resistance is 900 times greater than that which opposes the air, although this varies depending on the viscosity, the density of water, the moving body surface and the angle at which the user. Hydrostatic pressure is the pressure of a liquid on a body immersed in it, according to Pascal's law of fluid pressure is exerted equally over the entire surface of a body at rest immersed to a given depth (Leon et al., 2005).

The physiological benefits of the aquatic environment are an essential part of the rehabilitation treatment of numerous conditions and offer the ability to maintain physiological functions at an acceptable level (Mas GR, 1997); in turn, provide conducive conditions that favor physical health at various levels. The most prominent therapeutic effects in hydrokinesitherapy are those relating to the musculoskeletal system, due to the physiological effects (Leon et al ,. 2005). When people enter the water at first, cutaneous vessels constrict takes place momentarily and increased peripheral resistance and blood pressure, however, dilate arterioles, reducing peripheral

resistance and blood pressure, improving cardiac output and increasing circulation and venous return (Pazos JA, 2002).

The hydrostatic pressure increases with the depth of the dive; physiological and clinical benefits of this property of water vary with the patient's position (MH Cameron, 2009). The major effects are produced with the upright, in which the feet are those deeper. Researchers like Simon HY, 1987 M Esnault, 1991, indicate that the hydrostatic pressure vessels dilate large producing a derivation of venous blood from the periphery to the central circulation; immersion in water increases the work of breathing and lung expansion; hydrostatic pressure on the chest wall expands resistance, and when the body is submerged to the neck expiratory reserve volume by about 50% and vital capacity in 6-12% is reduced. These effects, when combined, increase the total work of breathing by about 60%. Wilmore & Costill, 2007, refer increased oxygen demand and carbon dioxide production, rising thus the expiratory reserve volume due to increased diaphragm travel. Cameron MH, 2009, indicates that it is a viable option for improving the efficiency and strength of respiratory muscles herramieta.

López & Nuria, 2003, point out that the aquatic environment exteroceptive sensitivity increases as it reinforces the perception of touch receptors, favoring at all times body image improved by establishing an improved proprioceptive vestibular receptors, tendon and muscles in relation to maintaining the balance in that half. Immersion of most of the body reduces stress and compression load bearing joints, muscles and connective tissue, increasing mobility and allowing locomotor weak muscles work against gravity, as well as enhancement muscle. Helps the therapist to support the weight of the patient's body for therapeutic activities, so exercising in water is a very effective way to condition and strengthen seniors (Leon et al., 2005; Cameron MH, 2009) .

The activity within the aquatic environment, taking recumbent positions during the performance of aquatic physical activity, coupled with the massage caused by contact with water layers produces a great benefit to the cardiovascular system and increases venous return and therefore, there is an increase in stroke volume, contractility and the ability of heart chamber (Wilmore & Costill, 2007). The exercise in the water causes a decrease of antidiuretic hormone (ADH) and aldosterone which is accompanied by an increased release of sodium and potassium, thus favoring a decrease of blood pressure and improve the removal of waste products metabolic (Pazos JM, 2002). The aquatic environment contributes to the overall activity of the body not only in the physical

realm, but also in the psychological; brings an invigorating or relaxing effect depending on the water temperature and allows the patient to observe yourself to make gestures and movements whose breadth and strength progressively improve (Leon et al., 2005).

DEVELOPMENT ON THE THEME OF CONTENTS SELECTED

To strengthen the muscles of breathing the Halliwick method, which is based on scientific principles of fluid mechanics and the reaction of the human body in the aquatic environment is proposed, which leads to neurobiological body's response to a sensorimotor learning sequence. 10 exercises are done in 4 stages of development; mental adjustment, money, inhibition and facilitation of the movement, which is evaluated before the second month of treatment and after this. Then these phases occur (Pereira D, 2004).

• Mental Adaptation: In the mental or psychological adaptation, the subject should be introduced into the aquatic environment without disturbances, it is a medium with which you are unfamiliar. Regarding the ease or decoupling, the subject should not have problems to adapt to the environment when their breathing vary as needed.

• Drafts: For vertical rotation, the subject can take from a vertical position to a longitudinal position and vice versa; regarding lateral rotation, the subject can rotate on its axis, on both sides, while the combined turnover in the subject can rotate on its axis multilaterally and return to the upright position.

• Inhibition of movement: In flotation, the subject should be held floating in the middle without the use of any attachment; in the balance, the subject should be kept floating in the floating position without rotation or movement.

• When the subject to weather turbulence, despite the different movements in the water there, to overcome, trying to locate where these are not annoying.

• Facilitation of movement: In the basic movements that take place, the subject must incorporate movements and rotations in addition to floats, see movements where mixed up his upper and lower limbs.

• In the basic movements, the subject must increase their movements with more difficulty, where different muscle groups from being mixed up.

Relationship Exercise Method Halliwick:

CONCLUSIONS

Overall, this study aimed to gather information to serve as reference for planning, implementing and evaluating interventions designed to prevent, minimize and / or eliminate the problem of susceptibility to respiratory diseases in people with spinal cord injury. It also seeks researchers and professionals in general who work around this population have better elements to provide better care. It is recommended that future research with transverse and quasi-experimental designs, consider the following variables: lifestyle, fitness and lung volumes, avoiding a possible alteration of the results due to the exercise prescription in the aquatic environment.

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