60 - THE EFFECTS OF RESISTANCE TRAINING (RT) IN PATIENTS WITH SPINAL CORD INJURY (SCI) - LITERATURE REVIEW.

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INTRODUCTION

According to the American Spinal Injury Association (ASIA), spinal cord injury is the loss or impairment of motor and / or sensory and / or anatomical levels below the lesion, affecting their functionality and independence (Maynard; Bracken, 1997 cited by Trento and collaborators, 2009).

The type of spinal cord injury (SCI) and its location determine the type and extent of injury, can cause various dysfunctions that interfere negatively func ¬ tional activities and quality of life of individuals with SCI (Cicero, 2009).

Approximately 20% of cases of spinal cord injury does not occur, but by degenerative or pathological processes such as tumors and malformations (Santos, 2010).

Gonçalves and colleagues (2007) reported that adequate levels of muscular strength and flexibility are extremely crucial for the effective implementation of the movements involved in performing the activities of daily living (ADLs) . The decrease in the functionality of these components , with advancing age, so may compromise the partial or complete performance of ADLs , resulting in greater dependency and reduced quality of life .

Salvador and Tarnhovi (2012) describes that inactivity after TRM causes a decrease in muscle mass and aerobic capacity , a condition osteoporotic and renal dysfunction , also puts the individual at risk of heart disease and consequently reduces your life expectancy . Emphasizing the benefits of physical activity in these individuals , there is an improvement in muscle strength , reduction of negative psychological reactions such as depression , mental inactivity and social isolation , improved independence in activities of daily living , facilitating social integration and reduction of complications as urinary tract infections , bedsores and hospitalizations .

Resistance training (RT) or against resistance is also known as weight training or strength training. It is a training that aims to increase physical strength and improvement in functional capacity, bringing numerous health benefits, having a great influence on the body composition of its practitioners (Birth and Collaborators, 2011).

The TR stimulates positive changes in relation to risk factors associated with osteoporosis, cardiovascular disease, cancer, diabetes, and produces increased strength of 20 to 60%, without differences in relation to sex or age (Cortes and Collaborators, 2002).

There is then the need to conduct a study on the benefits of resistance training in patients with spinal cord injury, as they are affected functional independence, and resistance training can provide a benefit to this patient contributing elusive quality of life of these individuals.

LITERATURE REVIEW

As Cortez (2002) The spinal cord injury is damage to the spinal cord , which causes neurological disorders and is characterized by a functional disturbance of the autonomic body segments located below the lesion by changes in motor skills, superficial and deep sensitivity . It may be complete or incomplete. In a complete injury there is total absence of sensory and motor function . In incomplete injury , there is partial preservation of sensory or motor function below the neurological level (Umphred , 2009) .

The incidence of TRM in the United States is approximately 11:00 cases per year. In Brazil , although no epidemiological data , the incidence of spinal cord injury are increasing, especially in large urban centers (Faro , 2003) .

Umphred (2009) mentions that the majority of spinal cord injuries occur as a result of trauma , biomechanical as having a lesion by pure bending or flexion -rotation hyperextension injuries and damage by compression. The injury caused by the mechanism is a major non-traumatic spinal circulatory compromise resulting in ischemia causes neurological damage below the level of injury.

Ax (2000) tells us that after traumatic spinal cord injury , spinal shock occurs , ie, loss of function below the lesion. But gradually the body will react making it possible to identify the actual frame and spinal cord involvement , and the clinical events of a patient with SCT will vary according to the extent and location of spinal cord injury .

The aftermath of the TRM are varied , such as atrophy of the musculoskeletal system , spasticity , metabolic changes , hormonal and neuromuscular , reduced breathing capacity , blood flow and dimensions of cardiac structures , which associated with a sedentary lifestyle can lead to cardiovascular and respiratory diseases altering physiological responses to motor activity , and fatigue occurs rapidly decreasing life expectancy of these individuals (Trent et al , 2009; Nascimento et al , 2007; Woellner and collaborators , 2012) .

Table 1 - Demographics of TRM.	
Average age at the time of injury	31.7
Most common age	19,0
SEX	
Male	81,2%
Female	18,8%
CAUSESTHE LESION	
Vehicle acidentes	40,9%
Violent acts	21,6%
Falls	22,4%
Injury in sports	7,5%
Others	7,6%
LOCAL COMMON INJURY	
C5	15,7%
C4	12,7%
C6	12,6%
T12	7,6%
C7	6,3%
L1	4,8%
Source: *Umphred* apud *Spinal Cord Injury: facts and figures at a glance*. 2009.	

Resistance training or against resistance is also known as weight training or strength training. It is a training that aims to increase physical strength and improvement in functional capacity, brings numerous health benefits to its practitioners (Nascimento et al, 2011).

Strength is the ability of a muscle or muscle group producing strain based on the demands placed on this muscle (Kisner, 2009).

This type of training when well planned, organized and carried with suitable fillers and respecting the individuality of each, can be performed by all including special groups such as the elderly, obese, hypertensive heart disease among others (Simon and Fleck, 2008).

METHODOLOGY

This research is characterized as a literature review , a descriptive and qualitative . To develop the study , a survey was conducted in references and databases Lilacs , Medline , SciELO and International Spinal Cord Injury Society with keywords : " Spinal Cord Injuries " , " Spinal cord injury " , " spinal cord injury " , " strength training " , " Resistance training " , " Weight Lifting " , " Resistance exercise ", " strength exercise ", " Weight training " , " resistance training " , " strength training " .

31 articles were found , these , but went through an analysis of inclusion and exclusion criteria for the study . We included articles from 2000 to the present day , articles that addressed both resistance training and spinal cord injury and articles that highlight the gains from resistance training . And were exclusion criteria , articles of the period following 2000 . Totaling 18 articles for the study and 4 references.

DISCUSSION

The American College of Sports Medicine (ACSM) recommends that individuals perform resistance training beginners with a load of 60 or 70 % of 1 RM , with 2 or 3 sets of 8 to 12 repetitions , having a rest 1-2 minutes. It is emphasized that sort of recommendation for not having a specific protocol training for the population shown (Mutti et al , 2010; Jorge et al , 2009) .

Birth and Mutti (2007, 2010 cited by Jacobs et al 2002) found a study that aimed to examine the metabolic responses and heart rate (HR) in a session of strength training in a circuit , was carried out with 6 men between age 23-43 years, with a complete injury at T5 -T12 , three times a week for 3 months and found a mean VO2 was 11.6 ± 2.4 ml / kg / min and HR 136 ± 17bpm , which corresponds to 49.0 % of VO2 max and 76.8 % of maximum HR. Reporting that is a good method of cardiorespiratory training to be used with paraplegic patients and promotes glycolytic metabolism .

Mutti and coworkers (2010) in their literature review , found studies through resistance exercises , patients with paraplegia gets an increase in strength , that assist in their activities of daily living (ADLs) , as well as a significant improvement in psychological well-being and social needs of individuals , but emphasized that there are no recommendations on what type of training is more advisable for this population .

Hicks and colleagues (2003) conducted a randomized controlled trial with 34 men and women aged 19-65 years with a lesion from C4 . He separated the two groups (21 subjects were randomized and controlled were 13 individuals) , with the aim of examining the effects of physical training twice a week at arm ergometry , strength and psychological quality of life for 9 months of study . Their findings were that the randomized group had significant improvements in arm ergometry (81 %) , and significant increases in upper body muscle strength (19-34 %) , in addition to the randomized group have reported a decrease in the indices of psychological pain and improved wellbeing . Yang and colleagues (2011) conducted a study with 19 individuals with chronic incomplete lesion (> 7 months of injury) of C1 - L1 with the aim of analyzing voluntary strength and walking speed by treadmill exercise using body weight , and he found that four muscle groups are more important to the work of better walking. (knee extensors , knee flexors , ankle plantar flexors and hip abductors) .

Edelle and colleagues (2011) also conducted a longitudinal study using walking with body weight along with functional electrical stimulation (FES) with 19 subjects aged 31 to 40 years with ASIA C level (paraplegia and quadriplegia) , held for 3 months , 3 times per week lasting 1 hour and 30 minutes. And his finding was that increased walking speed (12 ± 0.8 m / s to 21 ± 15 m / s) , and an increase of 3 in the lower limb motor score (in members with and without FES FES) . However it is reported that there are few studies regarding the combination of FES and training base of body weight , which makes it impossible to confirm its benefits (Edelle and collaborators , 2011; Harvey and colleagues , 2010) .

Gregory and colleagues (2007) conducted a longitudinal study with cases of variant 3 individuals age 18-70 years, with incomplete injury (C5 - T10) , using for each resistance training and plyometric training , between 2 / 3 times per week lasting 12 weeks , measuring using magnetic resonance imaging and dynamometry . And his finding was that hears a higher peak torque, and the increase of maximum strength . These improvements in muscle function can be attributed to both an increase in cross-sectional area of muscle and increased ability to voluntarily activate the affected skeletal muscles In addition , there was improvement in running speed ae been explained by increased thrust of the lower limbs , suggesting improved muscle function of specific tasks .

Hicks and colleagues (2011) conducted a systematic literature review , a total of 166 studies, but only 82 were analyzed and showed that although their research has been limited , there are significant effects on physical fitness, such as muscle strength , body composition and functional performance . Reporting in their studies that there is a higher oxygen consumption , power , torque capacity . There was strong evidence that exercise performed 2/3 times per week in moderate to intense physical capacity and increases muscle strength in these individuals .

CONCLUSION

The articles demonstrated an increase in physical and functional capabilities of individuals with spinal cord injury ¬ home, for example, increased cardiovascular capacity increases for ¬ CA, psychosocial factor thus acquired indepen ¬ dence. However, these studies do not provide guidelines regarding the intensity and volume of resistance training for individuals affected with TRM.

The studies emphasize the trains ¬ ment resisted as rehabilitation for functional gain, preventing potential injuries, improving the health and quality of life.

More studies should be done with the aim of deepening the varieties of the benefits that the TR can provide patients with spinal cord injury.

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THE EFFECTS OF RESISTANCE TRAINING (RT) IN PATIENTS WITH SPINAL CORD INJURY (SCI) - LITERATURE REVIEW.

ABSTRACT

The spinal cord injury (SCI) is a disability that causes morbidity and mortality, which brings consequences serious, sometimes irreversible, in the lives of affected individuals. Resistance training is a resource that can contribute to the recovery of patients assisting them in their activities of daily living (ADLs). To review the effects that the RT back for patients affected with SCI. Was held a search for references and databases Lilacs, Medline, SciELO and International Spinal Cord Injury Society. Studies have shown that RT is able to promote benefits psychological, social and physical, until even necessary to maintain functional capacity. However, these studies do not provide guidelines regarding the intensity and volume of resistance training for individuals affected with SCI.

KEY-WORDS: Traumatic spinal cord, resistance training.

LES EFFETS DE LA FORMATION DE LA RÉSISTANCE (RT) CHEZ LESPATIENTSATTEINTS DE LÉSIONS DE LAMOELLEÉPINIÈRE (SCI) - REVUE DE LITTÉRATURE.

RÉSUMÉ

La blessure de la moelleépinière (SCI) est un handicap quientraîne une morbidité et la mortalité, quiapporteconsé ¬ quences graves, parfoisirréversibles, dans laviedes personnes touchées. L'entraînementen résistance est une ressource quipeut contribuer à laguérisondes patients en lesaidantdansleursactivités de laviequotidienne (AVQ). Nousavons effect uéunexamendes effets que leretour de TR pourlespatientsatteints de TRM. uneenquête a étémenéedanslesréférences et bases de données Medline, lilas, SciELO et laSociété de Spinal Cord Injuryinternational, desétudesontmontré que TR est en mesure de promouvoir les avantages psychologiques, sociaux et physiques, jusqu'àmême nécessaire pour maintenir la capacité fonctionnelle. Toutefois, cesétudesnefournissentpas de directivesconcernantl'intensité et le volume de laformation de résistancepourlespersonnesatteintes de TRM.

MOTSCLÉS: lamoelleépinièretraumatique, la formation de résistance.

LOS EFECTOSDELENTRENAMIENTO DE RESISTENCIA (TR) EN PACIENTES CONLESIÓN DE LAMÉDULA ESPINAL (SCI) - LITERATURA.

RESUMEN:

La lesión de lamédula espinal (SCI) es una incapacidad que causa morbilidad y mortalidad, lo que traeconse ¬ cuencias graves, a vecesirreversibles, enlas vidas de las personas afectadas. El entrenamiento de resistenciaesun recurso que puede contribuir a larecuperación de los pacientes que lesayudenen sus actividades de la vida diaria (AVD). Se realizó una revisión de losefectos que la posterior TR para los pacientes afectadoscon TRM. serealizó una encuestaenlas referencias y bases de datosLilacs, Medline, SciELO y Spinal Cord InjurySociedad Internacional, losestudioshan demostrado que la TR es capaz de promover losbeneficios psicológicos, sociales y físicos, hasta que incluso seanecesario para mantenerlacapacidad funcional. Sin embargo, estosestudios no proporcionandirectrices sobre laintensidad y volumen de entrenamiento de resistencia para las personas afectadas por el TRM.

PALABRAS CLAVE: Traumaticmédula espinal, elentrenamiento de resistencia.

OS EFEITOS DO TREINAMENTO RESISTIDO (TR) EM PACIENTES COM LESÃO RAQUIMEDULAR (TRM) – REVISÃO DE LITERATURA.

RESUMO

O traumatismo raquimedular (TRM) é uma incapacidade funcional que causa morbidade e mortalidade e, que traz consequências graves, às vezes irreversíveis, na vida dos indivíduos acometidos. O treinamento resistido é um recurso que pode contribuir para a recuperação de pacientes auxiliando-lhes em suas atividades de vida diária (AVDs). Foi realizado uma revisão sobre os efeitos que o TR trás para os pacientes acometidos com TRM. foi realizada uma pesquisa em referências bibliográficas e base de dados Lilacs, Medline, SciELO e International Spinal Cord Injury Society, Os estudos demonstraram que o TR é capazes de promover benefícios psicológicos, sociais e físicos, ate mesmo necessários para manter a capacidade funcional. Porém, esses estudos não fornecem diretrizes em relação à intensidade e volume de treinamento resistido para indivíduos acometidos com TRM.

PALAVRAS-CHAVES: Traumatismo raquimedular, treinamento resistido.