17 - PHYSICAL FITNESS OF PARATHLETES WITH SPINAL CORD INJURY OF TEAMS IN WHEELCHAIR BASKETBALL SANTA CATARINA.

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INTRODUCTION

Spinal Cord Injury (SCI) is an injury that occurs when the spinal cord is damage, and these types of injuries are usually the result of catastrophic events, and the most frequent causes are motor vehicle accidents, injury by firearms, declines in recreational activities or sports (GREVE et al., 2001 SCHMITZ, 1993). It is a disabling condition in the patient's life, because of this traumatic effects related to the loss of bodily functions and it requires tremendous change in the lifestyle of the patient (GREVE et al., 2001 SCHMITZ, 1993).

Different studies have demonstrated physiological benefits in the quality of life through sports activities adapted along with physical therapy for physically disabled, such as: increased agility, flexibility, balance, muscle strength, motor coordination, muscle resistance, improvement of organic systems (circulatory, respiratory, digestive, reproductive and excretory system), prevention of secondary disabilities and increased of functional capacity (WINNICK, 2003; STEINBERG, 1994)

So, the aim of this study was to evaluate the benefits of physical therapy monitoring and sports adapted practicing on physical fitness in spinal cord injury patients.

MATERIALS AND METHODS

Population and sample

The sample consisted of 10 parathletes with spinal cord injury (SCI) that participated in the competitions of wheelchair basketball in the town of Caçador - SC in 2009 and 5 sedentary patients with SCI which was used as control group. The study included only those parathletes that underwent follow-up physical therapy and adapted sports basketball daily and for comparison was used a sedentary control group that did not perform any physical activity intervention. After being informed about the suggestions of the research and procedures that they were submitted, agreed to participate of the research and all subjects signed the term of free and illustrious consent.

Physical Fitness Evaluation

To evaluate the muscle strength and resistance from groups the following tests were performed according to Winnick (2001):

- Prone rising trunk: patients with SCI lay in the prone in mat and raised the upper end of the trunk with arms, for achieve elbow full extension maintaining the movement for 20 seconds.The aim of this test was to raise the upper end of the body.
- Sitting-rising: patients with SCI placed their hands on the handles of the blocks to raising the support cubits for the wheelchair and raised the body so that the glutes be lifted from the supporting surface for a elbow total extension maintaining this position for 20 seconds.

For the evaluation of range of motion in the flexion and extension shoulders using Carci scientific goniometer, following tests were performed according to Marques (2003):

- Shoulder flexion movement: it was requested to SCI patients that carried flexion the arm, with the palm facing medially parallel to the sagittal plane. The examiner sat, the fixed arm of the goniometer was placed along the trunk midaxillary line, pointing to the femur greater trochanter, the goniometer mobile arm was placed on the humerus body lateral surface toward the medial epicondyle. The normal degree of flexion is 180 degrees.
- Shoulder extension movement: it was requested to SCI patients that carried extension the arm, with the palm facing medially parallel to the sagittal plane. The examiner sat, the fixed arm of the goniometer was placed along the trunk midaxillary line, pointing to the femur greater trochanter, the goniometer mobile arm was placed on the humerus body lateral surface toward the medial epicondyle. The normal degree of extension is 45 degrees.

Skinfolds Evaluation

The skinfolds from triceps, biceps, pectoral and abdomen were measured with Cescorf scientific adipomethry, with constant pressure of 10g/mm² on the contact surface and exactness of 0,1 mm. Three measures were taken in each point, in row, of the right side of the body, being registered the average value.

Blood Pressure Measured

Blood pressure was measured with an aneroid sphygmomanometer according to the guidelines of the Joint National Committee (2003). It was considered the 1˚ Korotkoff sound as systolic blood pressure (SBP) and 5˚ as diastolic blood pressure (DBP).

Statistical analysis

Data were analyzed using the statistical package Graph Pad Prism (Version 5.0) and expressed as mean ± standard deviation (SD). The non-parametric statistics were used to analyze data and to test differences between groups applied the test of Mann-Whitney U in quantitative variables and the Chi-square in qualitative variables. A value for $P<0,05$ was taken to indicate statistical significance.

RESULTS

Table 1 presents the sample characteristics. Both groups came to spinal cord injury in the young adult age and the control showed longer duration of injury (7,8 ± 9,68 age) compared to parathletes group (7,5 ± 6,38 age).

Table 1. Age and time of spinal cord injury from control and parathletes groups (mean ± SD).

	Control (n=5)	Parathletes (n=10)
Age (years)	39,00 ± 11,90	27,00 ± 7,52
Time of injury (years)	7,8 ± 9,68	7,5 ± 6,38

Table 2 presents the results of the muscle strength and resistance from groups in the sitting-rising. The parathletes that follow-up physical therapy and adapted sports showed higher proportion in good (n=4) and excellent ratings (n=4) in the strength and muscle resistance, while the control group, all were classified as insufficient.

Table 2. Evalution of muscle strength and resistance in sitting-rising from control and parathletes groups (mean ± SD)

	Insufficient	Regulate	Good	Excellent
Control	5	0	0	0
Parathletes*	1	1	4	4

*P<0,05 compared to control group

Table 3 presents the results of the evaluation of muscle strength in trunk rising prone. Parathletes that performed follow-up physical therapy and adapted sports demonstrated a higher proportion in the ratings yes (n=9) and no (n=1), while in the control group 1 was able to do and 4 did not.

Table 3. Evalution of muscle strength in trunk rising prone from control and parathletes groups (mean ± SD).

	Yes	No
Control	1	4
Parathletes*	9	1

*P<0,05 compared to control group

Table 4 presents the results of range of motion (degrees) in flexion and extension shoulders. Parathletes that performed follow-up physical therapy and adapted sports demonstrated greater range of motion in flexion 182,5 ± 4,24 degrees and in extension 52,0 ± 5,37 degrees compared to flexion 155,0 ± 15,00 degrees and extension 34,0 ± 4,18 degrees from control group (P=0,002).

Table 4. Range of motion in flexion and extension shoulders from control and parathletes groups (mean ± SD).

	Flexion (degrees)	Extension (degrees)
Control	155.0 ± 15.00	34.0 ± 4.18
Parathletes	182,5 ± 4,24*	52,0 ± 5,37*

*P<0,05 compared to control group

Table 5 presents the results (mm) triceps, biceps, pectoral and abdomen skinfolds from groups. Parathletes that performed follow-up physical therapy and adapted sports the biceps 5,20 ± 1,69mm, triceps 6,20 ± 1,87mm, pectoral 4,20 ± 0,91mm and abdomen 9,30 ± 2,40mm skinfolds were smaller than control group that presented biceps 17,60 ± 1,61mm, triceps 18,00 ± 6,96mm, pectoral 16,60 ± 5,27mm and abdomen 28,80 ± 8,31mm skinfolds (P<0,05).

Table 5. Skinfolds of biceps, triceps, pectoral and abdomen from control and parathletes groups (mean ± SD).

	Biceps (mm)	Triceps (mm)	Pectoral (mm)	Abdomen (mm)
Control	17.60 ± 1.61	18.00 ± 6.96	16.60 ± 5.27	28.80 ± 8.31
Parathletes	5.20 ± 1.69*	6.20 ± 1.87*	4.20 ± 0.91*	9.30 ± 2.40*

*P<0,05 compared to control group

Table 6 presents the results blood pressure (mmHg) from groups. In systolic blood pressure parathletes that follow-up physical therapy and adapted sports showed lower values (SBP= 117,0 ± 2,13mmHg) compared to control group (SBP= 144,0 ± 7,48mmHg) (P=0,007). There was no difference in diastolic blood pressure between groups (P>0,05).

Table 6. Systolic (SBP) and diastolic (DBP) blood pressure from control and parathletes groups (mean ± SD).

	SBP (mmHg)	DBP (mmHg)
Control	144.0 ± 7.48	82.0 ± 2.0
Parathletes	117,0 ± 2,13*	80,0 ± 0,0

*P<0,05 compared to control group

DISCUSSION

The injuries of the spine cause several sequels and physical dysfunctions, dramatically altering the course of life, leading to social and economic consequences for the patient, family and society (MAROTTA, 2002). The spinal cord injury (SCI) occurs primarily in young adults and the highest incidence in the age group of 20-39 years (45%), 40-59 years (24%), 0-19 years (20%) and 11% for people over 60 years (DELISA, 2002; STOKES, 2000). The sample this research (table 1) demonstrated that the SCI occurred in young adults, corroborating studies.

Maintaining physical fitness with physical exercise and physiotherapy after spinal cord injury promote an improvement of muscle strength and resistance, motor coordination, reduction of negative psychological reactions, as depression and social isolation, increased functional capacity, reduction in complications such as urinary tract infection, hospitalizations and improve mood (SILVA et al., 2005; SALVADOR et al., 2004). The parathletes presented proportions of muscle strength and resistance, range of motion higher than the control group which had no physical intervention (table 2, 3 and 4). These results show that after SCI the adapted sports and monitoring physiotherapy have the ability to maintain and improve functional capacity of patients with SCI reducing the risk of musculoskeletal injuries.

People with SCI tend to have more subcutaneous fat due to loss of muscle mass with physical inactivity, resulting in loss of aerobic capacity, establishing an osteoporotic condition and reducing life expectancy (SALVADOR et al., 2004). According to our study subcutaneous fat from triceps, biceps, pectoral and abdomen were higher in control sedentary compared to parathletes group that performed physical therapy and adapted sports. The loss of muscle mass with physical inactivity and reduced basal metabolic rate contributes to the increased of body fat and increase diseases related to excess fat.

People with SCI beyond physical and sensory dysfunction, also show a reduction in cardiovascular capacity and changes sympathetic nerve, together with a sedentary lifestyle can lead to cardiovascular and respiratory diseases (PAOLILLO et al., 2005). Our research showed that systolic blood pressure control was higher compared to parathletes group (table 6), these results demonstrate that physiotherapy and physical activity keeps the cardiovascular capacity reducing the risk of developing diseases related to sedentary lifestyle.

CONCLUSION

Rehabilitation exercises conducted by physiotherapist together with sports activities in individuals with spinal cord injury are essential for those who suffer this injury able to maintain independence and perform daily activities as best as possible. The role of physiotherapist is essential to prevent contractures, deformities and reduction in physical fitness, that over time problems associated with physical inactivity and sedentary lifestyle lead individuals with SCI developing chronic diseases.

We thus conclude that individuals with SCI performing physical therapy with adapted sports have higher physical fitness and lower probability of developing cardiovascular and musculoskeletal disease compared to spinal cord injury sedentary.

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ABSTRACT

The rehabilitation of patients with spinal cord injury (SCI) is important for the development of functional independence and return to activities of daily living. The goal this research was to compare the physical fitness level from parathletes and sedentary groups with SCI that had and had not follow-up physiotherapy. The sample included 10 parathletes and 5 sedentary with SCI. The following measurements were performed: muscle strength and resistance in the prone rising trunk, sitting and rising, goniometry in flexion and extension of trunk, skinfolds of triceps, biceps, pectoral and abdomen, but also, blood pressure. The results showed that parathletes had the muscle strength and resistance, range of motion higher than sedentary control group ($P<0,05$). The skinfods and systolic blood pressure of parathletes were smaller than spinal cord injury sedentary control group ($P<0,05$), however, diastolic blood pressure did not modify between groups ($P>0,05$). We conclude that spinal cord injury parathletes have higher physical fitness and lower risk of developing cardiovascular and osteomuscular disease than spinal cord injury sedentary.

KEY WORDS: Spinal cord injury, physical fitness, physiotherapy.

RESUMÉ

La réhabilitation des patients atteints de lésions de la moelle épinière (LME) est importante pour le développement de l'autonomie fonctionnelle et le retour aux activités de la vie quotidienne. L'objectif de cette recherche était de comparer le niveau de condition physique des athlètes handicapés avec la LME qui avait la thérapie physique et des patients avec LME sédentaires qui n'a pas suivi la thérapie physique. L'échantillon était composé de 10 athlètes handicapés et des 5 contrôles sédentaires avec LME. Les évaluations suivantes ont été réalisées: la force de levage et de l'endurance du tronc en position couchée et assise, goniométrie en flexion et en extension du tronc, plis cutanés du triceps, biceps, poitrine et abdomen, et aussi, la pression artérielle. Les résultats ont montré que les athlètes handicapés ont la force, l'endurance musculaire et l'amplitude de mouvement plus grande que les individus sédentaires avec LME et sans accompagnement physiothérapie (P<0,05). Les plis cutanés et la pression artérielle systolique des athlètes handicapés étaient plus petits que des contrôles sédentaires avec LME (P<0,05). Cependant, pour la pression diastolique, il ni a pas de différence entre les groupes (P>0,05). Nous concluons que les athlètes handicapés qui ont effectué le suivi thérapeutique physiques et sportives adaptées ont plus de remise en forme et un moindre risque de développer des problèmes cardiovasculaires et muscle-squelettiques que les sédentaires avec LME.

MOTS CLÉS: Lésion de la moelle épinière, condition physique, physiothérapie.

RESUMEN

La rehabilitación de los pacientes con lesión en la médula espiñal (LME) es importante para el desarrollo de la independencia funcional y retorno a las actividades de la vida diaria. El objetivo de esta investigación fue comparar el nivel de aptitud física de los deportistas discapacitados con LEM que habían terapia física y monitorización de los pacientes con lesiones medulares sedentario que no realizó el seguimiento de terapia física. La muestra consistió de 10 atletas con discapacidad y 5 controles sedentarios con LME. Las evaluaciones se realizaron las siguientes: la fuerza de elevación y resistencia del tronco en la encuesta de boca abajo, sentado, goniometría de flexión y extensión del tronco, pliegues cutáneos de tríceps, bíceps, pecho y abdomen, pero también la presión arterial. Los resultados mostraron que los atletas con discapacidad tienen la fuerza, resistencia muscular y la amplitud de movimiento mayor que las personas sedentarias con y sin acompañamiento de terapia física LME (P <0,05). Los pliegues cutáneos y la presión arterial sistólica de los atletas discapacitados más pequeño que los controles sedentarios con LME (P <0.05), sin embargo, la presión diastólica no fue diferente entre grupos (P> 0,05). Llegamos a la conclusión de que los atletas con discapacidad que realiza la terapia de seguimiento físico y deporte adaptado tienen una mayor aptitud y menor riesgo de desarrollar problemas cardiovasculares y músculo-esqueléticos que los sedentarios con lesione de la medula espinal.

PALABRAS CLAVE: Lesione de la medula espinal, la aptitud física, la fisioterapia.

APTIDÃO FÍSICA DE PARATLETAS COM TRAUMA RAQUIMEDULAR DAS EQUIPES DE BASQUETE EM CADEIRA DE RODAS DE SANTA CATARINA

RESUMO

A reabilitação de pacientes com Trauma Raquimedular (TRM) é importante para o desenvolvimento da independência funcional e retorno as atividades da vida diária. O objetivo desta pesquisa foi comparar o nível de aptidão física de paratletas com TRM que possuíam acompanhamento fisioterapêutico e portadores com TRM sedentários que não realizavam o acompanhamento fisioterapêutico. A amostra foi composta de 10 paratletas e 5 controles sedentários com TRM. As seguintes avaliações foram realizadas: força e resistência no levantamento de tronco em decúbito ventral, levantamento sentado, goniometria no movimento de flexão e extensão de tronco, dobras cutâneas do tríceps, bíceps, peitoral e abdômen, como também, a pressão arterial. Os resultados demonstraram que os paratletas tinham a força, resistência muscular e amplitude de movimento maior do que os sedentários com TRM e sem acompanhamento fisioterapêutico (P<0,05). As dobras cutâneas e a pressão sistólica dos paratletas eram menores do que os controles sedentários com TRM (P<0,05), entretanto, a pressão diastólica não houve diferença entre os grupos (P>0,05). Concluímos que os paratletas que realizavam acompanhamento fisioterapêutico e esporte adaptado apresentam aptidão física mais elevada e menor risco de desenvolver problemas cardiovasculares e osteomusculares do que sedentários com TRM.

PALAVRAS-CHAVES: Trauma raquimedular, aptidão física, fisioterapia.