31 - EFFECTS OF RESISTANCE TRAINING IN RISK FACTORS OF METABOLIC SYNDROME IN INDIVIDUALS WITH SPINAL CORD INJURY

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INTRODUCTION

The growing number of individuals who are victims of spinal cord injury is a worrying statistic for its implications on the social, psychological and physical, also associated with increased risk of morbidity and mortality from chronic diseases.

There's in Brazil, aproximatelly 150.000 carriers and each year it keeps growing due to automobile accidents and mainly the violence. Regional factors, failure of vehicle safety, impunity against traffic laws and the violence in major urban centers, appears as major drivers (SARAH NETWORK, 2008).

Sir Ludwing Guttman, father of the modern treatment for injured spinal, allied to the sports therapeutic techniques, employing values of practicing sports as motivational factor to combat the boredom of the new condition. Today we know that his initiative was critical to the success of the treatment sometimes dispensed (STEVENS, 2008).

Epidemiological studies have shown a direct relation between physical inactivity and the presence of several risk factors for cardiovascular disease, such as those that comprise the metabolic syndrome. (Gustat, 2002; Lakka, 2003; RENNIE, 2003).

The metabolic syndrome is a set of risk factors that could reach this population, and are related to abdominal obesity, glucose intolerance, type 2 diabetes, insulin resistance, dyslipidemia and hypertension (Lakka, 2003; Jurca, 2004; LUNA, 2006).

The benefits of strength training have been verified by reducing the risk of premature death from cardiovascular disease onset, are clearly described in the literature.

However, few studies have focused on the problem of injured individuals, particularly with use of strength training and more specifically the involvement of metabolic syndrome.

Thus, the aim of this study was to evaluate how the biochemical and anthropometric parameters influence the health of this population, as well as strength training can be used in a physical fitness program that aims at the maintenance of health or reversal risk factors of the metabolic syndrome in evidence.

METHODOLOGY

Participated in the study 20 male inviduals, from Belém-Pará, holders of SCI below T7 (low paraplegia), practicing basketball in a wheelchair and no experience with resistance training: (G1) experimental group with eight (8) participants who were submitted to a resistance training program and (G2) control group of twelve (12) members. Were performed anthropometric evaluation, biochemical analysis of blood, hemodynamic, and evaluation of the components of muscular strength through repetition maximum test. The training program lasted twelve (12) weeks, divided into three phases (accumulation, development and implementation) according to the adaptation of the participant. The training frequency was 2-3 times a week, with sessions of 40 min - 60min in the last phase (realization). 2-3 sets with 8-15 repetitions. The training intensity was 65% to 85% of CF.

The survey was submitted to the Ethics Committee of Physical Education Course at the University of the State of Pará, in accordance with Resolution 196/96, the National Health Council, which deals with the Code of Ethics of Human Research approved and under o n° 0081.0.412.000-09 (CAAE). Participants signed a consent form.

All data were analyzed by software processing and statistical analysis "Statistical Package for the Social Sciences" (SPSS Science, Chicago, USA) version 17.0. The minimum level $P \leq 0.05$ of was significance accepted.

RESULTS AND DISCUSSIONS

G1 showed statistically significant differences in all variables from the first to the second assessment, while G2 showed no differences in the variables studied. Componentes of G1 had body weight reduction (75,58±5,11Kg vs 73,40±4,98Kg, respectivamente), while G2 presented low varation (77,28±8,66Kg vs 77,15±8,13kg, respectivamente). There was a reduction in body mass index of G1 and stability for G2, but both remain classified as overweight according to World Health Organization, 2004. The values found for %MG fit the sample in moderate obesity, according to NIDDK, 1993; However G1 presented decreased values (20,40±6,99Kg vs 18,62±6,17kg), while G2 showed slight elevation. Increased muscle mass was observed with statistically significant values for G1 (28,48±433Kg vs 29,55±4,36kg), and muscle weight reduction for G2. There was a decrease in waist circumference in both groups, but only G1 (105,45±9,09Kg vs 102,16±8,70kg), is in accordance to the I Brazilian Guideline for the Diagnosis and Treatment of Metabolic Syndrome, (2005). There is still a trend of reduction of adipose tissue in the abdominal region. The reduced size of the samples may reduce the expression of the results.

Tabela 1– Anthropometric parameters of the sample

VARIABLES	1ªev. Average ± SD	2ªev. Average ± SD	1ªev. Average ± SD	2ªev. Average± SD
BMI (kg/m2)	26,47±1,55	25,81±1,69	27,38±2,59	27,43±2,53
%Fat Mass	20,40±6,99	18,62±6,17	23,45±2,83	23,22±2,82
Muscle Weigh(Kg)	28,48±4,33	29,55±4,36	28,23±2,76	27,64±2,07
Abm. Circ. (cm)	105,45±9,09	1102,16±8,70	106,66±11,09	106,37±10,64

In accordance with the data shown in the table below, it appears that there were statistically significant changes between the two moments of the evaluation in G1 for all variables of the lipid profile and glycemic analysis, however the values found for the parameter fit both CT groups on the threshold of high risk for heart disease.

Whereas for the fraction of HDL cholesterol, there was no change in the framing of both groups because G1 remained in the average level and G2 at the low level. As for the LDL fraction, G1 remained in borderline and G2, has to be classified as high

level, according to the classification of Koeppen, 2009

It is also observed that the concentrations of triglycerides found in G1 and G2 groups refer to a framework of hypertriglyceridemia. On the other hand, the dosage glycemic showed normal levels for G1 and signs of diabetes for G2, according to the parameters of the Brazilian Diabetes Society, 2010.

The hemodynamic for PAS showed statistically significant differences among groups, although G1 remains in the pressure boundary condition and G2 in stage 1 hypertension. With no significant changes in DBP between the two time points of the evaluation in the two groups, according to the amounts shown in the table below.

Tabela 2– Parameters of Glycemic and Lipid Profile of the sample

LIPID GLICMIC PROFILE	1ªev. Average±SD	2ªev. Average±SD	1ªev. Average±SD	2ªev. Average±SD
CT (mg/dl)	228,63±27,84	208,13± 3,02	231,08±17,90	234,83±19,18
TG (mg/dl)	201,5±5,40	172,13±12,55	186,25±18,32	185,75±18,45
HDL(mg/dl)	42,75±6,82	172,13±12,55	38,00± 6,35	38,08 ±5,73
LDL(mg/dl)	156,76 ± 3,63	1 44,45±19,78	153,45±18,28	174,97±17,91

The hemodynamic for PAS showed statistically significant differences among groups, although G1 remains in the pressure boundary condition and G2 in stage 1 hypertension. With no significant changes in DBP between the two time points of the evaluation in the two groups, according to the amounts shown in the table below.

Table 3 – Sample values as the Hemodynamic Profile

VARIABLES	1ªev. Average± SD	2ªev. Average ± SD	1ªev. Average ± SD	2ªev. Average± SD
PAS (mmHg)	138,02±10,24	136,88±8,46	140±10,75	140±10,81
PAD (mmHg)	89,75±9,19	88,38±6,74	89±7,93	89,32±5,55

The evaluations of the components of muscle strength showed statistically significant differences between the 1st and the 2nd time of the evaluation in all parameters studied.

Table 4– Parameters of Muscle Strength components (RM)

PEQUIPMENT/ EWORKOUT (kg)	1ªev. Average ± SD	2ªev. Average ± SD	DM±SD
Flat Bench	19,75±3,24	28,28±5,70	8,53±2,85
Bench Press Machine	49,93±5,60	54,12±6,94	4,18±2,64
Rowing Machine	46,87±6,64	50,58±7,12	3,71±2,37
Traction Machine	58,50±6,74	63,75±8,96	5,25±2,76
Shoulder Abdu	6,75±1,28	8,00±2,07	1,25±1,03
Curl – Bíceps	9,12±1,04	10,87±1,25	1,75±0,70
Curl – Tríceps	8,50±1,30	9,87±1,55	1,37±1,40

CONCLUSION

The results of this research indicate that training with additional loads is an important ally in the prevention and control of risk factors of metabolic syndrome already installed, as well as being the most suitable for the population studied because it is a form of training perfectly suited the individual physical condition, respecting the limitations imposed by the trauma.

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EFFECTS OF RESISTANCE TRAINING IN RISK FACTORS OF METABOLIC SYNDROME IN INDIVIDUALS WITH SPINAL CORD INJURY

ABSTRACT

The spinal cord injury reduces the autonomy, predisposing the individual to sedentary lifestyle and consequently the development of the metabolic syndrome. The perivisceral obesity, glucose intolerance, insulin resistance, low HDL-C, high TG levels and hypertension are risk factors for the disease. The aim of the study was to evaluate the influence of strength training on the risk factors of metabolic syndrome in patients with spinal cord injury. There were 20 males , patients with SCI below T7 (low paraplegia), divided into two groups: (G1) group with 8 participants (body mass, 75.58 ± 5.11 kg; % MG, 20.40 ± 6.99) and (G2) control group with 12 members (Body mass, 77.28 ± 8.66 kg; % MG , 23.45 ± 2.83). After the twelve weeks intervention (3x/week, 2-3series, 8-15 repetitions). G1 showed a decrease in abdominal circumference (AC, 105.45 ± 9.09 cm vs 102.16 ± 8.70 cm). Body Mass (75.58 kg ± 5.11 vs 73.40 ± 4.98 kg) and % BF (20.40 ± 6.99 vs 18.62 ± 6.17 kg kg) at p <0.05 while there were no alterations in G2. The fat-free mass increased in G1 (28.48 ± 29.55 vs 433 kg ± 4.36 kg, p=0. 000). Decreased systolic blood pressure (138.02 ± 10.24 mmHg vs 136.88 ± 8.46 mmHg). There was improvement of cholesterol serum total (228.63 ± 27.84 mg / dl vs. 208.13 ± 3.02 mg/dl, for p = 0.037), triglycerides (201.5 ± 5.40 mg/dl vs. 172.13 ± 12.55 mg/dl, for p = 0.000), HDL (42.75 ± 6.82 mg/dl vs 49.00 ± 5.45 mg/dl, for p=0.000), LDL (156.76 ± 3,63mg/dl vs 144.45 ± 19.78 mg/dl. G2 no changes. Findings of this study align the evidence described in the Literature about the importance of higher strength levels for the prevention and control of factors syndrome risk. Results also suggest that strength training seems to be an important ally in fighting the disease, especially for injured individuals because it is a form of training perfectly suited to individual physical condition, respecting the limitations imposed by trauma.

KEYWORDS: spinal cord injured, metabolic syndrome, strength training.

EFFETS DE LA FORMATION DE LA RÉSISTANCE DANS LES FACTEURS RISQUE DE SYNDROME MÉTABOLIQUE CHEZ LES PERSONNES ATTEINTES TRAUMATISME MEDULLAIRE

RESUME

La lésion de lamoelle épinière réduitl' autonomie, prédisposant l'individu à Le mode de vie sédentaire et par consequence à Le développement de la syndrome métabolique. L'obésité périviscéral, l'intolérance au glucose, faible taux de HDLC, desnive aux élevés de TG et l'hypertension artériel, constituent des facteurs de risque de maladie. L'objectif de l'étude était d'evaluer l'influence de l'entraînement de force surles facteurs du syndrome métabolique avecles patients atteints de lésions de lamoelleépinière risque. Ont été évalués 20 patientes Du sexe masculine, quisouffrentdes lesions de la moelle épinière traumatique au-dessous de la T7 (faible paraplégie), divisé en deux groupes: (G1) groupe experimental avec 8 participants (masse corporelle, MC, 75,58 ± 5,11kg; %MG, 20,40 ± 6,99) et le (G2) groupe controle avec douze membres (MC, 77,28 ± 8,66kg; %MG, 23,45±2,83). Après l'intervention de douze semaines (3 fois par semaine; 2-3 séries; 8 à 15 répétitions), le G1 a montré la diminution du tour de taille (CA, 105,45 ± 9,09cm vs 102,16 ± 8,70 cm), de la MC (75,58±5,11 kg vs 73,40±4,98 kg) e de la %MG (20,40+-6,99kg vs 18,62+-6,17kg) jusqu'au p<0,05, par contre, dans le G2, il n'avait pas des changements. La masse maigre a augmenté dans le G1 (28,48 ± 433kg vs 29,55 ± 4,36 kg, p=0,000). Il avaitla diminuition de la pression artérielle systolique (138,02 ± 10,24mm hg vs 136,88 mmHg), la amélioration desconcentrations de cholestérol sérique total (228,53± 27,84mg/dl vs 208,13±3,02mg/dl `a p=0,037), triglycérides (201,5±5,40mg/dl vs 172,13±12,55mg/dl à p=0,000), HDL (42,75+-6,82 mg/dl vs 49,00 ± 5,45mg/dl, à p=0,000), LDL (156,76±3,63mg/dl vs 144,45±19,78mg/dl. Dans le G2 il n'y avait des alterations. Les résultats de cette étude aligne les éléments de preuve décrits dans lalittérature sur l'importance du augmente des niveaux de force pour la prévention et le contrôle des facteurs du syndrome de risque. Les résultats sugere encore, qui le entraînement de force semble être un alié important contre la maladie, en particulier pour les blessés médullaires, parce que c'est une forme d'entraînement parfaitement adapté à lacondition physique individuelle, en respectant les limites imposées par le traumatisme.

MOTS CLÉS: lésion de la moelle épinière, le syndrome métabolique el, el entrenamiento de fuerza

EFECTOS DE ENTRENAMIENTO RESISTENCIA EN FACTORES RIESGO DE SÍNDROME METABÓLICO EN LAS PERSONAS CON LESIÓN MEDULAR

RESUMEN

Una lesión en la médula espinal reduce la autonomía, lo que predispone al individuo a estilo de vida sedentario y por lo tanto El desarrollo del síndrome metabólico. A obesidad abdominal, intolerancia a la glucosa , resistencia a la insulina, bajo nivel de HDL-C, altos niveles de triglicéridos y la hipertensión, constituem os fatores de risco da enfermidade. El objetivo del estúdio fue evaluar la influencia de entrenamiento de la fuerza em los factores de riesgo del síndrome metabólico en pacientes com lesión de la médula espinal. Se evaluaron 20 pacientes varones, com SCI abajo T7 (bajo paraplejia), distribuídos en dos grupos: (G1) grupo experimental com 8 participantes (MC, 75,58±5,11kg; %MG, 20,40±6,99) y (G2) rupo control con 12 miembros (MC, 77,28 ± 8,66 kg;.% MG, 23,45 ± 2,83). Después de la intervención de doce semanas (3 veces por semana, 2-3 series; 8-15 repeticiones), G1 mostró una disminución em la circunferencia abdominal (CA, 105,45 ± 9,09 cm vs 102,16 ± 8,70 cm), MC (75,58 ± 5,11 kg en comparación con 73,40 ± 4,98 kg) y %MG (20,40 ± 6 kg , 99 vs 18,62 ± 6,17 kg) p <0,05, mientras que en G2 no hubo cambios. La masa libre de grasa aumento en G1 (28,48 ± 29,55 vs 433 kg ± 4,36 kg, p =, 000). Disminución de la presión arterial sistólica (138,02 ± 10,24 mmHg frente a 136,88 ± 8,46 mmHg). Hubo una mejora del colesterol total em suero (228,63 ± 27,84 mg / dl frente a 208,13 ± 3,02 mg / dl, para p = 0,037), triglicéridos (201,5 ± 5,40 mg / dl vs 172.13 ± 12,55 mg/dl, para p = 0,000), HDL (42,75 ± 6,82 mg / dl frente a 49,00 ± 5,45 mg / dl, para p = 0,000), LDL (156,76 ± 3, 63mg/dl vs 144,45 ± 19,78 mg/dl). En G2 no hubo cambios. Los resultados de este estudio se suman lãs pruebas descritas em la literatura sobre la importancia de los niveles de fuerza mayor para la prevención y el control de los factores de riesgo del síndrome.Os resultados sugerem ainda, que o treinamento de força parece ser um importante aliado no enfrentamento da enfermidade, em especial para o lesado medular porque es una forma de entrenamiento perfectamente adaptado a la condición física individual, respetando lãs limitaciones impuestas por el trauma.

PALABRAS CLAVE: lesionados medulares, el síndrome metabólico, el entrenamiento de fuerza

EFEITOS DO TREINAMENTO RESISTIDO NOS FATORES DE RISCO DA SÍNDROME METABÓLICA EM INDIVÍDUOS COM LESÃO MEDULAR

RESUMO

A lesão na medula espinhal reduz a autonomia, predispondo o indivíduo ao sedentarismo e consequentemente ao desenvolvimento da síndrome metabólica. A obesidade perivisceral, intolerância a glicose, resistência à insulina, baixo nível de HDL-C, níveis elevados de TG e hipertensão arterial, constituem os fatores de risco da enfermidade. O objetivo do estudo foi avaliar a influência do treino de força sobre os fatores de risco da síndrome metabólica em portadores de lesão medular. Foram avaliados 20 indivíduos do sexo masculino, portadores de lesão medular traumática abaixo de T7 (paraplegia baixa), divididos em dois grupos: (G1) grupo experimental com 8 participantes (massa corporal, MC, 75,58±5,11kg; %MG, 20,40±6,99;) e o (G2) grupo controle com 12 integrantes (MC, 77,28 ±8,66kg; %MG, 23,45±2,83). Após a intervenção de doze semanas (3x/semana; 2–3series; 8 a 15 repetições) o G1 apresentou uma diminuição da circunferência abdominal (CA, 105,45±9,09cm vs 102,16 ±8,70cm), da MC (75,58±5,11Kg vs 73,40±4,98Kg) e da %MG (20,40±6,99Kg vs 18,62±6,17kg) para p<0,05, enquanto no G2 não se verificaram alterações. A massa isenta de gordura aumentou no G1 (28,48±433 kg vs 29,55±4,36kg, p=,000). Houve diminuição da pressão arterial sistólica (138,02±10,24mmHg vs 136,88±8,46 mmHg). Houve melhoria das concentrações séricas de colesterol total (228,63±27,84mg/dl vs 208,13±3,02mg/dl, para p=0,037), trigliceridos (201,5±5,40mg/dl vs 172,13±12,55mg/dl, para p=0,000), HDL(42,75±6,82 mg/dl vs 49,00±5,45mg/dl, para p=0,000), LDL (156,76±3,63mg/dl vs 144,45±19,78mg/dl. No G2 não se verificaram alterações. Os achados do presente estudo se alinham as evidências descritas na literatura acerca da importância do aumento dos níveis de força para a prevenção e controle dos fatores de risco da síndrome. Os resultados sugerem ainda, que o treinamento de força parece ser um importante aliado no enfrentamento da enfermidade, em especial para o lesado medular por se tratar de uma modalidade de treinamento perfeitamente adaptada a condição física individual, respeitando as limitações imposta pelo trauma.

PALAVRAS-CHAVE: lesado medular, síndrome metabólica, treino de força.