08 - MUSCLE FORCE TRAINING AND REDUCTION OF CARDIOVASCULAR RISK FACTORS IN ADULT WOMEN WITH METABOLIC SYNDROME

WASHINGTON RODRIGUES,1
CASSIANO MERUSSI NEIVA, 2
Centro Universitário Católico Salesiano Auxilium – UniSALESIANO Araçatuba/SP - Brasil
1Physical Education Professional. Doctor of Health Promotion (UNIFRAN); Master in Human Performance (UNIMEP);
Specialist in Exercise Physiology and Physical Activities at the Academy (UNIFMU).
Teacher of the Bachelor's Degree in Physical Education UniSALESIANO Araçatuba/SP.
2Physical Education Professional. Adjunct Professor "Free Teacher" (MS 5) UNESP Bauru/SP.
Coordinator of the Laboratory of Metabolism and Physiology of Effort (MEFE).
rwxis@hotmail.com

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INTRODUCTION

The forms of behavior and lifestyle of the world population, from the second half of the twentieth century, demonstrated severe changes in nutritional habits and the prevalence of sedentary lifestyle. These factors contributed to the growing epidemic of chronic diseases (obesity, diabetes mellitus and hypertension), conditions that occur with lipid changes, hypercoagulability and increased risk of cardiovascular disease (CD) (POZZAN et al, 2004).

Individuals with CD have associated risk factors, called Metabolic Syndrome (MS), described as a set of simultaneous pathophysiological changes capable of increasing mortality by about 2.5 times in cases of Infarction, Stroke and Cancer (POZZAN et al., 2004; VOLP et al., 2008).

In 2001 at the “Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults” (NCEP-ATPIII), three clinical laboratory criteria were established for the diagnosis of MS among the following 5: Abdominal circumference (>8 cm for women, >102 cm for men); (≥150mg / dL), HDL cholesterol (<40mg / dL for men <50mg / dL for women), fasting glucose (≥ 110mg / dL) and blood pressure (≥ 130 / 85mmHg)).

Nakazone et al. (2007) mentions that CD is the leading cause of death in developed countries, with large growth in underdeveloped countries, being considered the main cause of death in Brazil. Sedentary lifestyle increases the risk of premature mortality, in the same way as smoking, dyslipidemia and systemic arterial hypertension (SAH). Epidemiological studies (LAKKA et al., 2003; RENNIE et al., 2003), showed a strong relationship between physical inactivity and the presence of cardiovascular risk factors, due to the MS.

The regular practice of physical training has been recommended as non-drug intervention for the prevention and treatment of chronic and cardiovascular diseases (VASQUES & LOPES, 2009; ACSM, 2001). Among the variations of physical training, muscle strength training (MTF) is essential to the development of physiological functions; increases muscle mass, the volume of fast fibers, elevates the basal and rest metabolic rate, in addition to producing an additional expenditure of energy during its execution, expressed by the Metabolic Rate of Effort (BRUM et al., 2004; NEIVA et al., 2012).

Consideration should be given to a significant increase in oxygen consumption, which consequently contributes to the acceleration of metabolism after the end of the effort, a factor known internationally by the acronym EPOC (Excess Post-exercise Oxigen Consuption) (WIJNDAELE, et al., 2007). As a result, there is a consequent impact related to the process of weight loss and the control of certain biochemical changes, which are positive factors in the fight against MS (ACSM, 2001; NEIVA et al., 2012).

The Ministry of Health (2010) presented the proposals of the National Politic for Health Promotion, and the creation of the Family Health Support Centers (FHSC), enabling the Physical Education professional to base their actions in this segment, making use of physical exercise prescription as an instrument of prophylaxis, intervening in social behavior, to optimize healthy practices that contribute to positive change in the MS, resulting in a reduction in drug costs and hospitalizations.

The objective of this study was to identify the effects of MTF on the body composition and lipid profile in adult women, as a way to mitigate the condition of vulnerability to MS, of the beneficiaries of the physical activity programs developed by the FHSC in the city of Araçatuba / SP.

METHODS

Study Characterization and Population

The sample consisted of 39 women (51 ± 6.4 years), with a positive profile for MS. The selection was based on the following inclusion criteria:

- to attend the FHSC Araçatuba physical activity programs;
- to have a medical diagnosis for MS according to NCEP ATP III (2001);
- do not use medicines;
- had no orthopedic limitations;
- had no experience with MTF;
- presented a medical certificate releasing the practice of physical exercises.

The volunteers had the support of the multidisciplinary team of FHSC Araçatuba (ordinance 256/13), composed by professionals of Physical Education, Psychologist, Physiotherapist and an Endocrinologist, responsible for the request of the laboratory exams.

After extensive and detailed explanation of the purposes and methods of this study, the volunteers signed a Free and Informed Consent Form. This study followed the guidelines of Resolution of the National Health Council 466/12, and was approved by the Research Ethics Committee under the number 634.874 / 14.

Groups Composition

Group 1 - "G1" (15 volunteers) - Practiced 4 training sessions per week, 2 sessions developed with gymnastics and dance routines, with FHSC team; and 2 other weekly sessions of MTF worked in a supervised manner. The activities ranged from 24 to 48 hours apart.

Group 2 - "G2" (14 volunteers) - Performed only 2 training sessions per week, developed with gymnastics and dance routines, with the FHSC team. Sessions ranged from 48 to 72 hours.

Group 3 - GC "Control" (10 volunteers): They did not undergo any routine of physical training in this period.

Training Protocols

The sessions were held on Mondays and Wednesdays, with an hour of duration, in the period of 12 weeks. The study was developed and supervised by the authors of this study. Two sets of 12 exercises were performed, with repetitions at moderate speed (40 seconds), 30 seconds pause and 5 minutes passive interval between sets.

At the beginning of the study G1 underwent a period of adaptation, the first two sessions were developed on an experimental basis, with the purpose of learning the motor tasks and familiarization with technical aspects such as:

- speed of execution of movements; counting of repetitions;
- control over recovery intervals.

The circuit training used variable loads for each exercise, adjusted fortnightly, according to the additional strength gains, so that the initial intensity could be preserved. The exercises worked were: abdominal, pushchair, open front pulley, extensor chair, vertical machine bench press, 45º leg press, peck deck, seated paddling, shoulder press, bicep threading, triceps thread on the pulley, squatting with pitch.

Analyzes

Anthropometric, biochemical and metabolic analyzes occurred in two stages, the first one (phase 1) before the training sessions were systematized, and the second (phase 2) at the end of the 12 weeks of the experiment. The following analyzes were carried out:

Body composition – body mass (kg) and height (m) were obtained by means of an anthropometric scale (Filizola®) with stadiometer, with precision of 0.1 kg and 0.5 cm respectively, according to the procedures described by Gordon et al., (1988). For estimates of body composition, the technique of thickness of the subcutaneous tissue. Three measurements were taken at each point, in a rotational sequence, on the right side of the body, and the median value was recorded. The equations used for the prediction of body fat and lean mass followed the Jackson Pollock & Ward protocol (1980), which uses the sum of triceps, supra iliac and thigh folds.

Lipid profile and plasma glucose – blood samples (~ 10 ml) were obtained from the anticubital vein in the morning after 12 hours of fasting. Serum total cholesterol (TC), high-density lipoproteins (HDL) and glucose were measured using an automated analyzer (Technicon, RA 1000, USA) and commercially available kits (Laborlab, Brazil). Low-density lipoprotein (LDL) was calculated by the enzymatic method (Wiener lab.). The analyzes were performed on the BioTek microplate spectrophotometer (SANTOS, 2001).

Statistical treatment

The data obtained in this study were presented through the mean and standard deviation of the quantitative variables, compared by means of the one-way ANOVA Variance Analysis using the Tukey post-test. For all analyzes, significance level $p \leq 0.05$ was adopted using the GraphPad Prism 6.0 software.

RESULTS AND DISCUSSION

In the development of the study there was no withdrawal of the volunteers, which is considered a big step, when it comes to experiments with humans. The results were presented in the tables below.

Table 1 shows that the 12 weeks of MTF promoted positive adaptations in body composition, with a reduction in the fat percentage of G1 volunteers, highlighting the significant loss of almost 5 kg in body mass, the decrease in absolute body fat, expressing an important lean mass gain (p≤0,05). On the other hand, no major changes were presented in the other groups.

TABLE 1. Body Composition representation (mean and standard deviation ±) of the variables: body mass,% fat, lean mass and absolute body fat, of the volunteers. Pre- and post-intervention data (12 weeks).

	Body mass (kg)	%Fat	Lean mass (kg)	Body Fat (kg)
		Phases 1 and 2		
G1	78,59 ± 12	35 ± 5,95	50,1 ± 8,15	27,5 ± 3,85
	73,67 ± 8*	29 ± 4,35*	52,32 ± 6,3*	21,37 ± 1,7*
G2	66,80 ± 9,93	34,04 ± 5,35	43,95 ± 6,85	23,6 ± 6,90
	67,11 ± 9,59	34,48 ± 4,60	43,85 ± 7,0	23,44 ± 6,50
GC	89,70 ± 9,84	39 ± 2,25	54,57 ± 5,95	35,11 ± 3,85
	90,64 ± 9,86	39,3 ± 2,35	54,61 ± 4,75	36 ± 3,75

*** Significant effect on phases 1 and 2 (p≤0,05)**

The magnitude of changes in body composition depends on factors, directly or indirectly related to physical training. The differences in the comparison between the studies available in the literature that investigate the practice of MTF may be linked to a series of variables such as: the duration of the study; the training protocols employed; intensity and volume applied; to sample groups (gender and age group); to the existence or not of nutritional control, among others.

A systematic review study (Paes Arruda et al., 2010) confirmed that the MTF promoted an increase in muscle mass and reduction of body fat, contributing to the prevention and treatment of obesity, in addition to other diseases linked to MS. According to the review, the TFM has an important role in the search for weight loss, since it promotes the maintenance and/or increase of lean mass, increasing the energy expenditure at rest, and this effect can be enhanced if associated with a nutritional diet.

Another study of a systematic review that could support the data presented in the G1 body composition was developed by Capra, Tartaro, Magalhães & Martelli (2016), who makes an approach on the benefits of MTF aiming at reducing the percentage of fat of the practitioners, by increasing caloric expenditure and healthy weight loss. The authors confirmed the important influence of this training modality on weight loss, becoming an ally in the recovery of the basic components of the body structure, improving the health of the practitioners.

Fasting glycemia showed a significant improvement in G1, with a reduction of 117 ml / dl at the start of the study, to 94 ml / dl in G1 (p≤0.05). This same result did not occur in the other groups.

TABLE 2. Representation (mean and standard deviation ±) of the variables: Fasting glycemia, and cholesterol (HDL, LDL and Total Cholesterol in ml/dl) of the volunteers. Pre and post intervention data (12 weeks).

	Glycemia (ml/dl)	HDL(ml/dl)	LDL (ml/dl)	Total Cholesterol (ml/dl)
		Phases 1 and 2		
G1	117 ± 22	42 ± 8	157 ± 21,5	200 ± 13,5
	94 ± 9*	56 ± 13*	123 ± 10,50*	179 ± 7,5*
G2	113 ± 21	41 ± 6,5	168 ± 33,5	209 ± 31,5
	114 ± 25	40 ± 7	151 ± 26	200 ± 25
GC	118 ± 21	45 ± 9	176 ± 22,5	221 ± 28
	114 ± 20	45 ± 8	167 ± 24,5	211 ± 22

*** Significant effect on phases 1 and 2 (p≤0,05)**

We identified a case study that analyzed the influence of MTF on a circuit with a series of 30 repetitions, combined with aerobic training (60 to 80% heart rate), in order to control the glycemia of a male subject (27 years), type 1 diabetic, for 90 days. There was a 41.52% decrease in glycemic indexes, from 209.3 mg / dl to 122.4 mg / dl, at the end of the study (LIMA et al., 2013).

On the other hand, Danilo, Mattos & Higino (2006) verified the influence of MTF on fasting glycemia and other physiological parameters of 8 women (59.87 ± 8.62 years old) with DM2. The volunteers were submitted to circuit sessions 3 times a week for 8 weeks. Fasting glycemia did not present a significant difference, despite a significant reduction in body mass.

For the levels of cholesterolemia, significant differences in G1 were identified in the present study. TC had a significant reduction of 21 ml / dl (± 7.5), HDL showed a significant progression from 42 (± 8) to 56 ml/dl (± 13), and finally, LDL presented a reduction of 157 ml/dl (± 21.5), to 123 ml / dl (± 10.5).

These results indicate that the study was successful in modulating levels of cholesterolemia, and that MTF can be used as an alternative to control the lipid profile of individuals presenting MS.

In a study comparing MTF induced physiological adaptations for 14 weeks in 24 women (± 50 years), divided into 2 equal groups, the CG and the MTF group, evaluated the lipid profile and body composition of the volunteers. The results showed that the MTF group achieved significant reductions in body mass,% Fat, basal metabolic rate, TC, triglycerides and VLDL cholesterol when compared before and after the intervention period between the groups (NEVES et al., 2013).

CONCLUSION

Consistent with the established goals, it can be concluded that 12 weeks of MFT for women over 50 years old could provide positive changes in body composition, and some metabolic components responsible for cardiovascular diseases, such as glycemia and cholesterolemia, contributing to a reduction in the vulnerability to MS.

It is suggested that, due to the low financial cost and the ease of use of the evaluation and physical training methods presented in this study, these procedures can be used and / or recommended to Physical Education professionals, acting in a multidisciplinary capacity, with the intention promote health promotion public policy in the different populations. However, it is necessary to develop new investigations, with similar designs, supplying the limitations of the present study.

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Prof. Dr. WASHINGTON RODRIGUES – rwxis@hotmail.com
Rua Cândido Portinari, 1106 – Jardim Nova Yorque
Araçatuba/SP Cep. 16018-220 Fone: (18) 98804-9888 / 3624-7199

MUSCLE FORCE TRAINING AND REDUCTION OF CARDIOVASCULAR RISK FACTORS IN ADULT WOMEN WITH METABOLIC SYNDROME

Abstract: This study evaluated the effects of 12 weeks of muscle strength training (MST) in 39 women (51 ± 6,4 years) with Metabolic Syndrome, investigating changes in body composition, cholesterolemia and fasting glycemia. The data were presented through the mean and the standard deviation of the quantitative variables, compared by one-way ANOVA Variance Analysis using the Tukey post-test, with significance level p ≤ 0,05. It was concluded that MST brought significant changes in body composition, blood glucose and cholesterolemia.

Keywords: Cardiovascular Diseases. Metabolic syndrome. Physical training

FORMATION DE LA FORCE MUSCULAIRE ET RÉDUCTION DES FACTEURS DE RISQUE CARDIO-VASCULAIRE CHEZ LES FEMMES ADULTES PRÉSENTANT UN SYNDROME MÉTABOLIQUE

Résumé: Cette étude a évalué les effets de 12 semaines de la musculation chez 39 femmes (51 ± 6,4 ans) atteintes de syndrome métabolique, explorant les changements dans la composition corporelle, la cholestérolémie et la glycémie à jeun. Les données ont été présentées par la moyenne et l'écart-type des variables quantitatives, comparées par l'analyse de la variance ANOVA à un facteur utilisant le test post-test de Tukey, avec un niveau de signification p ≤ 0,05. Il a été conclu que la musculation a apporté des changements significatifs dans la composition corporelle, la glycémie et la cholestérolémie.

Mots-clés: Maladies cardiovasculaires. Syndrome métabolique. Éducation physique

ENTRENAMIENTO DE LA FUERZA MUSCULAR Y REDUCCIÓN DE FACTORES DE RIESGO CARDIOVASCULAR EN MUJERES ADULTAS CON SÍNDROME METABÓLICO

Resumen: Este estudio evaluó los efectos de 12 semanas de entrenamiento de fuerza muscular (EFM) en 39 mujeres (51 ± 6,4 años) con Síndrome Metabólico, investigando los cambios en la composición corporal, la colesterolemia y la glucemia en ayunas. Los datos se presentaron a través de la media y la desviación estándar de las variables cuantitativas, en comparación con el análisis de varianza ANOVA unidireccional utilizando la prueba posterior de Tukey, con un nivel de significación p ≤ 0,05. Se concluyó que EFM trajo cambios significativos en la composición corporal, la glucosa en sangre y la colesterolemia.

Palabras clave: Enfermedades cardiovasculares. Síndrome metabólico. Entrenamiento físico

TREINAMENTO DE FORÇA MUSCULAR E REDUÇÃO DOS FATORES DE RISCO CARDIOVASCULAR EM MULHERES ADULTAS COM SÍNDROME METABÓLICA

Resumo: Este estudo avaliou os efeitos de 12 semanas de treinamento de força muscular (TFM) em 39 mulheres (51 ± 6,4 anos) com Síndrome Metabólica, investigando alterações sobre a composição corporal, colesterolemia e glicemia em jejum. Os dados foram apresentados através da média e o desvio padrão das variáveis quantitativas, comparados por meio da Análise de Variância one-way ANOVA utilizando-se o pós-teste de Tukey, com nível de significância p ≤ 0,05 através do software GraphPad Prism 6.0. Concluiu-se que o (TFM) trouxe alterações significativas na composição corporal, glicemia e colesterolemia.

Palavras Chave: Doenças Cardiovasculares. Síndrome Metabólica. Treinamento Físico.