35 - EFFECTS OF RESISTANCE TRAINING ON INDICATORS OF NORMAL RESPIRATORY MUSCLE STRENGTH IN ELDERLY

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INTRODUCTION

Nowadays the Brazilian media emphasizes the practice of regular physical activity for maintenance of health indicators, including the elderly. In this context, the resistance exercise1 often is agreed, particularly when correlations are established with the development of predictive strength in health indicators and quality of life.

The remarkable demographic transition that is occurring around the world shows that the pace of growth in the number of elderly is much higher than other age groups and in Brazil, the age structure exhibits the same conduct (PAPALÉO NETTO, 2007).

The Brazilian Institute of Geography and Statistics, medical advances and the living conditions of the population increased the average life of Brazilians. According to the same projections, this growth will continue, reaching in 2050 the level of 81.3 years, basically the same current level of Island (81.8), Hong Kong (82.2) and Japan (82.6) (IBGE, 2010).

Life expectative increased by the decrease in cardiorespiratory fitness in the elderly to perform activities of daily living, among other factors, the reduction in the ability to generate muscle force, entails risk factor to health (SANTARÉM, 2010).

Regular exercise can help slow this process and resistance exercises are considered effective interventions on the proper performance of the skeletal striated muscles (SANTARÉM, 2010). However, it's necessary to intensify studies to better identify the effect of resistance training on respiratory muscle strength, particularly in the elderly population.

The respiratory muscles, the functional point of view, are considered skeletal muscles whose primary function is to move rhythmically to the chest wall to allow ventilation and keep arterial blood gases within normal limits (MACHADO, 2008).

The measurements of MIP and MEP may be considered as predictive indicators to quantify the strength of respiratory muscles in healthy subjects, with general disturbances, as well as to evaluate the response to respiratory muscle training (PARREIRA et al, 2007).

Neder et al. 1999, developed predictive equations for sex and age dependent MIP and MEP (Table 1) (PARREIRA et al, 2007).

Table 1: Equations MIP and MEP:

	MASCULINO	FEMININO
MIP	- 0,80 (idade) + 155,3	- 0,49 (idade) + 110,4
MEP	- 0,81 (idade) + 165,3	- 0,61 (idade) + 115,6

Font: Neder et al, 1999 apud Parreira et al, 2007.

The security promoted by resistance exercises increases, interest in this exercise, especially those people who are part of groups considered "special", including the elderly, by itself constitute potential means to maintain the ideal conditions of muscle tropism. (SANTARÉM, 2000).

When looking for publications in specialist circles, realizes limited scientific literature that establishes connection with the effects of physical exercise, particularly resistance exercise on the development of respiratory muscle strength in the general population and the elderly in particular, as a variable best player in the development of respiratory conditions.

In this context and considering the prevention and rehabilitation programs are important role in maintaining or restoring the physical ability of the elderly to develop studies to assess the capabilities of muscle respiratory muscles of elderly people and their relationships with practices of resistance exercise and sedentary lifestyle, may contribute to a better characterization of these exercises as a therapeutic and prophylactic alternative.

The objective was to compare the effect of resistance exercise and sedentary lifestyle indicator of normal respiratory muscle strength in the elderly of both genders.

METHODOLOGY

Developed field research, observational and cross-sectional quantitative.

Performed at the Laboratory of Resistance Exercise and Health of UEPA.

Population consists of two groups: a) Group trained (GT) with resistance exercise, consisting of elderly of the extension project Resistive Exercise and Quality of Life UEPA b) sedentary group (SG) consisting of community elders, selected spontaneous.

Used as inclusion and exclusion criteria: a) GT: both genders, have 60 years or more, be practicing resistance exercise for at least 12 months, have obtained scores on the Mini-Mental State Examination incompatible with indications of dementia; not practice any other form of physical activity for the purpose of systematic improvement in physical conditioning; lack cardiorespiratory diseases, neurological and musculoskeletal and other changes that promote acute or chronic respiratory capabilities, not being a smoker and sign the Term of Consent; b) GS: same group of trained, except not practicing physical activity in order to systematically improved physical condition in the last 12 months.

Sample consisted of 19 trained and 20 sedentary elderly of both genders. The GT had 13 women and 6 men and GS 13 women and 7 men.

Original design approved on 21/10/2011 by the University of Amazonia Protocol 466990/11.

PROCEDURES: Data collection took place from 7:30-10am, from 5 to 16.12.2011;

Instruments, protocols and evaluative intervention: applied the mini-mental, before the evaluation form. Signature Term of Consent and completion of the evaluation form. Used analog manometer Wika brand, model MV 300, stepped in cmH_2O ranging from -300 cmH_2O to +300 cmH_2O;

Resistance exercise program: 02 weekly sessions to 3rds and 5ths; 01 h/session, 02 sets/exercise; 08-12 RM; 01' to 02' interval between sets; exercises: bench press, leg press 45°, lat pull-down, leg dead lift, rowing standing, calf a foot, power lifting, abdominal and military press.

Data analysis methods were applied by means of descriptive statistical measures of central tendency and variation.

RESULTS

Table 2 - Evaluation of MIP of sedentary and resistance exercises.

	TRAINED		SEDENTARY	
	Mal (n=6)	Fem (n=13)	Mal (n=7)	Fem (n=13)
Minimum	-90	-50	-80	-50
Maximum	-240	-110	-110	-80
Median	-95	-80	-80	-60
Average	-120	-83.1	-87.1	-65.4
Desv Pad	59.3	21.4	11.1	12.7

Source: study protocol

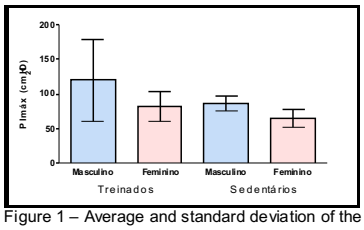


Figure 1 – Average and standard deviation of the MIP

Table 3- Evaluation of MEP of sedentary and resistance exercises.

	TRAINED		SEDENTARY	
	Mal (n=6)	Fem (n=13)	Mal (n=7)	Fem (n=13)
Minimum	110	60.0	70.0	40.0
Maximum	150	130.0	120.0	100.0
Median	125	90.0	90.0	60.0
Average	128.3	88.5	94.3	66.9
Desv Pad	14.7	23.0	17.2	17.0

Source: study protocol

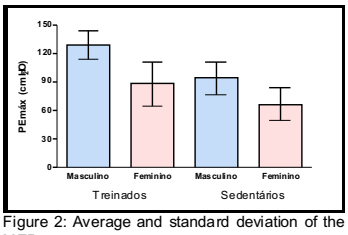


Figure 2: Average and standard deviation of the MEP.

Table 4 - Trained and sedentary groups by gender and average age of MIP and MEP results obtained and expected according Neder (1999).

	TRAINED		SEDENTÁRY	
	MAL	FEM	MAL	FEM
AVERAGE AGE	**70,5**	**65.5**	**65.6**	**64.2**
MIP MAX OBTAINED	-120	-83.1	-87.1	-65.4
MIP MAX EXPECTED	-98.9	-78.3	-102.8	-79
MEP MAX OBTAINED	128.2	88.5	94.3	66.9
MEP MAX EXPECTED	108.2	75.6	112.2	74.5

Source: study protocol

ANALYSIS AND DISCUSSION

Compared to patients with respiratory diseases, considering the object of this study, the application of research with aerobic exercise has become a maxim almost absolute and unquestioned, by their acute and chronic effects on heart rate and hence the frequency, respiratory volumes and capacities (SANTARÉM 2000; GUISELINE, 2007; CARNEVALI JR, LIMA, ZANUTO, 2011). However, there are so fed up when the intention is to establish a relationship with the respiratory muscles, but those who do, can help us better understand the results of this study.

Gonçalves et al. (2006), investigated the influence of the free walking practice twice a week in the increased inspiratory and expiratory muscle strength in elderly women, compared with the control group. The group engaged in physical activity significantly increased MIP at ages 65-69 years ($p = 0.0001$), 70-74 years ($p = 0.0046$) and 75-80 years ($p = 0.0240$) and the MEP in the age groups of 70-74 years ($p = 0.0114$) and 75-80 years ($p = 0.0101$). They concluded that physical activity for non-specific respiratory muscles resulted in increased respiratory muscle strength in the majority of older women participating in the study.

Cader et al. (2006) compared the MIP and quality of life of elderly sedentary and practicing gymnastics water. In the analysis, were found at $p < 0.05$, significant differences for the variables of the older group practicing gymnastics water in relation to sedentary ($p = 0.006$), suggesting that the indirect work of the inspiratory muscles through resistance of the water can minimize loss of respiratory muscle mass and strength due to aging as it increases the value of MIP.

The study of Cader et al. (2006) showed the importance of gymnastics water in the improvement of MIP, makes it possible relative importance of resistance training for the development of respiratory muscle strength, when combined with results of Nascimento, Guimarães and Oliveira (2010) in a study that aimed to compare the respiratory muscle strength in elderly women aged 60 to 79 years, practicing aerobics and bodybuilding, where there was no evidence for $p < 0.05$, significant difference in MIP ($p = 0.7823$) and MEP ($p = 0.3344$) between the groups.

Other aspects to be considered on resistance exercise programs developed with seniors and their direct relationships with the respiratory muscles, can be set according to Nascimento and Sousa (2010), when performing biomechanical analysis of resistance exercises, particularly those developed in this study: a) exercise the abdominal part of a resistance training program, provides significant strengthening of expiratory muscles b) in all other exercises done, no need abdominal muscle acting stabilizer through isometric contractions, promoting continuous requirement of these muscles maintenance of body posture, contributing to their improved strength and endurance c) Request for the exercises in the concentric phase of expiration and inspiration on the eccentric phase, this phase implies, need to isometric contraction of the abdominal muscles to maintain stability trunk, providing a mechanical disadvantage controlled diaphragm to overcome this resistance d) the exercise of developing dynamically worked demand uses synergistic muscles trapezium (upper portion) and scalene, important auxiliary muscles of respiration e) Other non-specific exercises the action of the respiratory muscles, such as the bench press and rowing in phases eccentric (lengthening contraction on), promote resistance against the action of the inspiratory muscles, particularly the diaphragm f) the request expiration in the concentric phase of the exercises and inspiration in the eccentric phase, with two sets of 8 to 12 RM, constitute breathing exercise directly related to the inspiratory and expiratory muscles.

CONCLUSIONS

The purpose of comparing the strength of respiratory muscles between older men and women practicing resistance exercise and sedentary individuals with indicators of equations proposed by Neder (1999), showed: a) men trained in MIP and MEP than expected in 21.3% (-21.1 cmH2O) and 18.5% (20 cmH2O) respectively and MIP and MEP sedentary lower than expected at 15.3% (-15.7 cmH2O) and 15.9% (17.9 cmH2O) respectively; b) women trained in MIP and MEP than expected at

6.3% (4.9 cmH2O) and 17% (12.9 cmH2O) respectively and MIP and MEP of sedentary lower than expected at 17.2% (-13.6 cmH2O) and 10.1% (7.6 cmH2O) respectively.

The results favorable showed that performance of the respiratory muscles of elderly people who practiced resistance exercises contribute to a better characterization of these exercises as possible alternative therapeutic and prophylactic measure, in particular, the benefits that the method provides this group, undermined by weaknesses musculoskeletal system, associated with pain conditions, restrictive for practical exercises cyclic.

To better characterize the relationship between the variables and the population under study, it is recommended the intensification of research in which the sample number can be increased to meet the demands of results statistical generalization.

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EFFECTS OF RESISTANCE TRAINING ON INDICATORS OF NORMAL RESPIRATORY MUSCLE STRENGTH IN ELDERLY

ABSTRACT

Regular practice of resistance exercise is an important to the maintenance of the physical abilities that contribute to improving the quality of life in human. Among the different age groups that benefit from these practices that is situated from 60 years of age, particularly when correlations are established with the force development as predictive indicator of health. The study aimed to compare the effect of resistance exercise and sedentary lifestyle indicator of normal respiratory muscle strength in the elderly of both genders. Character of field research was observational and cross-sectional quantitative. The sample consisted of 19 elderly practitioners of resistance training, 13 women and 6 men and another group consisting of 20 sedentary elderly people of the community, 13 women and 7 men. The purpose was to analyze the respiratory muscle strength by maximal inspiratory pressure (MIP) and maximal expiratory pressure (MEP), used a manometer. The normal values of (MIP) and (MEP) were determined by Neder (1999). The analysis was performed by descriptive statistical methods. The results obtained from men MIP and MEP of trills than expected in 21.3% and 18.5% respectively and MIP and MEP sedentary lower than expected in 15.3% and 15.9% respectively. Older women who trained with resistance exercises had improved by 6.3% expected MIP and MEP% and 17% among sedentary elderly women had reduced MIP expected at 17.2% and 10.1% expected MEP. We conclude that resistance exercises promote positive adaptations in the development of normal levels of respiratory muscle strength in the elderly, when verified by manovacuometry, contrasting the sedentary lifestyle that promotes negative adaptations.

KEYWORDS: Respiratory Muscles. Elderly. Resistance Training.

EFFETS DE L'ENTRAÎNEMENT EN RÉSISTANCE SUR LES INDICATEURS DE LA FORCE MUSCULAIRE NORMALE DES VOIES RESPIRATOIRES CHEZ LES PERSONNES ÂGÉES

RÉSUMÉ

La pratique régulière d'exercices de résistance est un allié important pour le maintien des capacités physiques qui contribuent à l'amélioration de la qualité de la vie humaine. Parmi les différents groupes d'âge qui profitent de ces pratiques qui se trouve à partir de 60 ans, en particulier lorsque les corrélations sont établies avec le développement de la force comme indicateur prédictif de la santé. L'étude visait à comparer l'effet des exercices de résistance et l'indicateur de mode de vie sédentaire de la force musculaire respiratoire normale chez les personnes âgées des deux sexes. A nature des recherches sur le terrain, d'observation et transversale quantitative. L'échantillon se composait d'un groupe de 19 pratiquants âgés de musculation, 13 femmes et 6 hommes et un autre groupe composé de demande spontanée de 20 personnes âgées sédentaires appartenant à la communauté, 13 femmes et 7 hommes. Aux fins de la vérification de la force des muscles respiratoires par pression inspiratoire maximale (PIM) et de la pression expiratoire maximale (PEM), a utilisé un manomètre. Les valeurs normales de (PIM) et (PEM)

ont été déterminées par Neder (1999). L'analyse a été réalisée par des méthodes statistiques descriptives. Les résultats obtenus à partir des trilles hommes PIM et PEM de plus que prévu à 21,3% et 18,5%, respectivement, et PIM et PEM sédentaire plus faible que prévu à 15,3% et 15,9% respectivement. Les femmes plus âgées qui se sont entraînés avec des exercices de résistance s'est améliorée de 6,3% attendue PIM et PEM de 17% en sédentaires femmes plus âgées ont eu une réduction de 17,2% attendu en PIM et PEM attendu à 10,1%. Nous concluons que des exercices de résistance promouvoir les adaptations positives dans le développement des niveaux normaux de force des muscles respiratoires chez les personnes âgées, lors de la vérification par manocacuometria, contrairement au mode de vie sédentaire qui favorise des adaptations négatives.

MOTS-CLÉS: muscles respiratoires. Personnes âgées. Entraînement en résistance.

EFECTOS DEL ENTRENAMIENTO DE RESISTENCIA SOBRE LOS INDICADORES DE LA FUERZA NORMAL DEL MÚSCULO RESPIRATORIO EN PERSONAS DE EDAD AVANZADA

RESUMEN

La práctica regular de ejercicio de resistencia es un aliado importante para el mantenimiento de las capacidades físicas que contribuyan a mejorar la calidad de la vida humana. Entre los diferentes grupos de edad que se benefician de estas prácticas, que están situadas de 60 años de edad, especialmente cuando las correlaciones se establecen con el desarrollo de la fuerza como indicador predictivo de la salud. El objetivo del estudio fue comparar el efecto de los ejercicios de resistencia y estilo de vida sedentario en la indicación normal de la fuerza muscular respiratoria en las personas mayores de ambos sexos. Tenía naturaleza de la investigación de campo, observacional y cuantitativo de corte transversal. La muestra estuvo conformada por un grupo de 19 médicos de edad avanzada de entrenamiento de resistencia, 13 mujeres y 6 hombres y otro grupo compuesto por demanda espontánea de cada 20 personas mayores sedentarias que pertenecen a la comunidad, 13 mujeres y 7 hombres. A los efectos de la verificación de la fuerza muscular respiratoria por la presión inspiratoria máxima (PIM) y presión espiratoria máxima (PEM), que se utiliza un manómetro. Los valores normales de (PIM) y (PEM) se determinaron por Neder (1999). El análisis se realizó por métodos estadísticos descriptivos. Los resultados obtenidos de los hombres y el PIM PEM entrenado de lo esperado en 21,3% y 18,5% respectivamente, y el IMP y sedentario PEM inferior a la esperada en el 15,3% y 15,9% respectivamente. Las mujeres mayores que entrenaron con ejercicios de resistencia han mejorado PIM esperado en el 6,3% y el 17% del PEM en mujeres mayores sedentarias habían reducido PIM esperado en 17,2% y 10,1% en espera PEM. Llegamos a la conclusión de que los ejercicios de resistencia promover adaptaciones positivas en el desarrollo de los niveles normales de la fuerza muscular respiratoria en las personas mayores, cuando son verificadas por manocacuometria, a diferencia del estilo de vida sedentario que promueve adaptaciones negativas.

PALABRAS CLAVE: músculos respiratorios. Personas Mayores. Entrenamiento de resistencia.

EFEITOS DOS EXERCÍCIOS RESISTIDOS NOS INDICADORES DE NORMALIDADE DE FORÇA DOS MÚSCULOS RESPIRATÓRIOS DE IDOSOS

RESUMO

A prática regular de exercícios resistidos constitui importante aliada à manutenção das capacidades físicas que concorrem à melhoria da qualidade de vida do ser humano. Entre as diversas faixas etárias que se beneficiam com estas práticas encontra-se aquela situada a partir dos 60 anos de idade, em particular, quando são estabelecidas correlações com o desenvolvimento de força enquanto capacidade preditiva indicadora de saúde. O estudo objetivou comparar o efeito dos exercícios resistidos e do sedentarismo no indicador de normalidade de força dos músculos respiratórios de idosos de ambos os gêneros. Teve caráter de pesquisa de campo, observacional, quantitativa e de corte transversal. A amostra foi constituída por um grupo composto por 19 idosos praticantes de exercícios resistidos, sendo 13 mulheres e 6 homens e outro grupo constituído por demanda espontânea de 20 idosos sedentários pertencentes à comunidade, sendo 13 mulheres e 7 homens. Para fins de verificação da força dos músculos respiratórios através da pressão inspiratória máxima (PImax) e pressão expiratória máxima (PEmax), utilizou-se um manovacuômetro. Os valores de normalidade de (PImax) e (PEmax) foram determinados pelas equações de Neder (1999). A análise foi realizada através de métodos estatísticos descritivos. Nos resultados de homens obteve-se PImax e PEmax de trinados superior ao esperado em 21,3% e 18,5% respectivamente e PImax e PEmax de sedentários inferior ao esperado em 15,3% e 15,9% respectivamente. Mulheres idosas que treinaram com exercícios resistidos tiveram melhora da PImax esperada em 6,3% e de PEmax em 17% e mulheres idosas sedentárias tiveram redução da PImax esperada em 17,2% e PEmax esperada em 10,1%. Conclui-se que os exercícios resistidos promovem adaptações positivas no desenvolvimento dos níveis de normalidade de força dos músculos respiratórios de idosos, quando verificados através da manovacuometria, ao contrário do sedentarismo que promove adaptações negativas.

PALAVRAS-CHAVE: Músculos Respiratórios. Idoso. Treinamento de Resistência.