Comparison of different protocols of resisted training in muscle force in elderly

Comparação de diferentes protocolos de treinamento resistido na força muscular em idosos

Comparación de diferentes protocolos de entrenamiento de fuerza en fuerza muscular en ancianos

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RESUMO

Objetivo: comparar o efeito de diferentes protocolos de treinamento resistido na dinapenia em idosos. **Método:** A amostra constituiu de sujeitos com idade igual ou superior 60 anos, voluntários, de ambos os sexos, os voluntários foram submetidos a dois programas diferentes de treinamento de força, um programa com variações de cargas ondulatório e outro com variações de cargas lineares. Após 12 semanas foi realizado teste de força de preensão palmar nos dois grupos que realizaram os protocolos de treinamento de força e um grupo controle. Para as comparações entre os grupos foi utilizado o teste de ANOVA**. Resultados:** Os resultados encontrados mostraram o que? para ambos os grupos em comparação ao controle, no entanto, sem diferença significativa entre eles. **Conclusão:** Conclui-se desta forma que ambos os modelos de periodização foram eficientes para gerar aumento de força em idosos saudáveis.

Descritores: Envelhecimento; Força Muscular; Dinapenia; Treinamento Resistido e Periodização

ABSTRACT

Objective: to compare the effect of different resistance training protocols on dinapenia in the elderly. **Method:** The sample consisted of subjects aged 60 years or older, volunteers, of both sexes, the volunteers were submitted to two different strength training programs, one with variations in wave loads and another with variations in linear loads. After 12 weeks, a handgrip strength test was performed in the two groups that performed the strength training protocols and a control group. For comparisons between groups, the ANOVA test was used. **Results:** The results found showed for both groups in comparison to the control, however, with no significant difference between them**. Conclusion:** It is concluded that both periodization models were efficient to generate increased strength in healthy elderly.

Descriptors: Aging; Muscular Strength; Dinapenia; Resistance Training and Periodization.

RESUMEN

Objetivo: comparar el efecto de diferentes protocolos de entrenamiento de fuerza sobre la dinapenia en ancianos. **Método:** La muestra estuvo conformada por sujetos de 60 años o más, voluntarios, de ambos sexos, los voluntarios fueron sometidos a dos programas de entrenamiento de fuerza diferentes, uno con variaciones en las cargas de oleaje y otro con variaciones en las cargas lineales. Después de 12 semanas, se realizó una prueba de fuerza de agarre manual en los dos grupos que realizaron los protocolos de entrenamiento de fuerza y un grupo de control. Para las comparaciones entre grupos se utilizó la prueba ANOVA. **Resultados: L**os resultados encontrados mostraron para ambos grupos en comparación con el control, sin embargo, sin diferencias significativas entre ellos. **Conclusión:** Se concluye que ambos modelos de periodización fueron eficientes para generar mayor fuerza en ancianos sanos.

Descriptores: Envejecimiento; Fuerza Muscular; Dinapenia; Entrenamiento de Resistencia Y Periodización.

ORIGINAL

Introduction

Population aging is proving to be a worldwide phenomenon with significant growth specifically in Brazil, where there are currently 30 million elderly people and it is estimated that it will reach 32 million this year.[1-2] The aging process can generate physiological changes that lead to a decline in muscle mass and strength. A study found that low muscle mass did not show a strong association with mortality, but the low level of muscle strength demonstrated a strong association with mortality risk.[3] In this context, the gradual reduction in muscle strength levels stands out, a phenomenon called dinapenia.[4] Several factors contribute to the worsening of dinapenia, among which stand out the reduction of the muscular mass (sarcopenia), alterations in the contractile properties or neurological function, among others.[5-6] A study of 139,691 individuals aged 35 to 70 years from different countries, ethnic groups and different socioeconomic backgrounds showed that muscle strength is a better predictor of mortality than systolic blood pressure.[7]

Resistance training stands out as an effective means to combat dinapenia and its deleterious effects.[8-9] In particular, models of strategic planning of resistance training significantly favor neuromuscular effects and are popularly called periodization models, that is, a progressive sequence, planned and organized in a cyclic[10] of the variables related to the volume and intensity of training. Among the periodization models, the linear one stands out, which consists in linearly increasing the workloads and the volume for each week or month[11], and the wave, characterized by the variance of the volume and intensity daily and even weekly.[12-13]

Some research has shown greater strength gains in wave periodization.[9,14] With this in mind, the hypothesis has been developed that the wave method is superior in terms of strength gain due to the constant change in volume and intensity. According to this information, it is extremely important to identify a strength training protocol that most attenuates the loss of strength in the elderly related to dinapenia. Therefore, the aim of the study is to compare two resistance training protocols on muscle strength in the elderly.

Method

The study is of an experimental nature and was submitted to the Research Ethics Committee of Centro Universitário UNIEURO (opinion nº 1.069.159). All signed an Informed Consent Form (ICF) containing all possible risks and benefits that the training may generate and an anamnesis containing general information.

Sample

Seventeen individuals over the age of 60 were selected, who did not perform any type of physical activity regularly, who did not have any type of motor or cognitive restriction and who were hemodynamically stable. As an exclusion criterion, a total frequency of less than 80% in training sessions will be adopted. These were stratified by sex and randomly distributed into: Control Group (CG), Linear Strength Training (TFL) and Wave Strength Training (TFO).

Instruments

The Handgrip Force (FPM) was measured with a dynamometer (Jamar® brand). The elderly person stands up, with the upper limb in a test position: shoulder in neutral position, elbow joint extended to 180 ° and forearm in neutral position according to the American protocol. The participant performed three prehensions interspersed for 1 minute and the average was observed between the three.

A period of familiarization of two weeks on the devices was respected before the test of the 10 Maximum Repetitions (RM) test was performed on all upper and lower limb exercises. After this period, the 10 RM tests were carried out with individuals oriented to perform 10 repetitions with the maximum possible load. To obtain this load, the sample had three attempts in each device, with an interval of five minutes between each attempt. To measure body mass and height, the Welmy digital scale and stadiometer, respectively, were used.

All groups performed the strength tests, however the CG was instructed to continue performing their training routines without the prior organization of their loads.

Training Protocol

Strength Training (TF) was performed twice a week for 12 weeks, with weekly periodic linear and wave progression, as shown in figure 1. Seven exercises were selected: two for upper limbs (bench press and machine stroke), three for lower limbs (Leg Press, flexor chair and extensor chair), and two for the trunk (hip and abdominal elevation). Based on the intention to treat principle, light, varied and non-systematized activities will be offered to the CG with cognitive, recreational tasks, balance exercises, stretching, gymnastics and walking. The individuals performed an activity per class, twice a week. The total workload shown in figure 1 was calculated using the formula: Series x Repetitions x% Load of 10 RM where the periodization was mounted on the total workload.

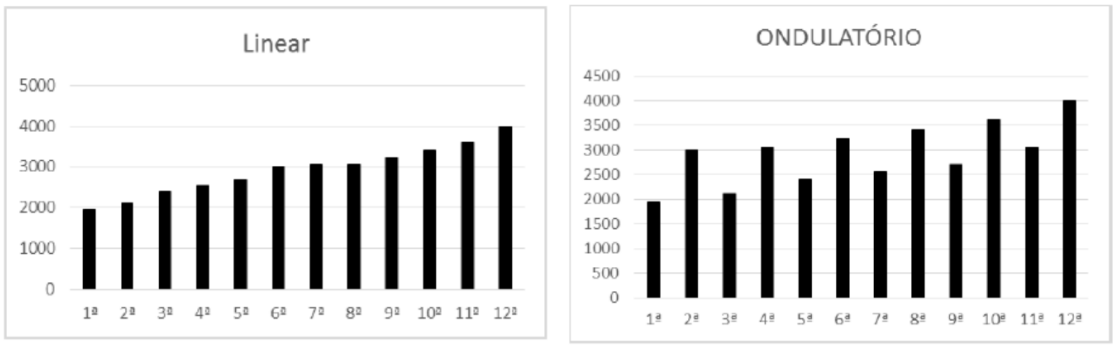

Figure 1- Graphical presentation of the workload progression models for the linear and wave periodizations given to the elderly in this study.

Statistical analysis

Initially, all data were submitted to the Shapiro-Wilk test in order to determine whether their sample distributions are normal. Values were expressed as the mean ± standard deviation (SD). To compare the behavior of the GC, TFL and TFO groups after the training period, according to each variable of interest, the analysis model of Anova Fatorial was used. The values

were considered statistically significant when p≤0.05. For all these procedures, the statistical program IBM SPSS Statistics version 24 was used.

Results

Table 1 presents the descriptive demographic and anthropometric data of the sample in each group in the pre and post-test, respectively, showing that, in general, the groups are similar in all variables.

Table 1- Characterization of the sample of elderly participants and stratified by intervention group.

Variables	Control (n=7)	Linear (n=6)	Wave (n=5)
Age (years)	70,8±4,7	69,3±8,8	67±6,4
Body Mass (kg)	70,8±11,4	68,1±13,2	72,5±10,6
Height (m)	1,59±0,06	1,57±0,07	1,6±0,11
BMI (kg/m²)	27,8±3,76	27,4±4,6	29,1±2,1

The anthropometric variables evaluated obtained parametric distribution for all groups (age, body mass, height and BMI). The BMI identified that 11.76% are of normal weight, 52.94% are in the overweight range and 35.29% are obese I according to the World Health Organization (WHO). The results found showed greater handgrip strength in the CG (FPM = 32.59 ± 10.13KgF) and TFO (FPM = 33.64 ± 11.85KgF), however, even when paired with TFL, there was no significant difference (p = 0.43) (Figure 2).

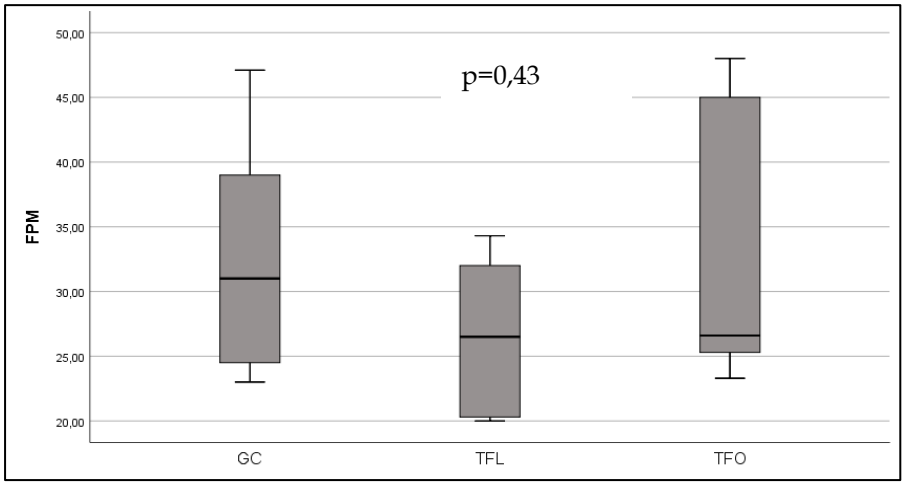

Figure 2- Manual Pressure Force presented by a blox plot for the different groups participating in the research.
Caption: GC- Control Group; TFL - Linear Strength Training Group; TFO - Wave Strength Training Group.

Regarding the baseline moments, all groups showed gains in muscle strength, however without significant (p> 0.05). Its percentage changes in muscle strength, respectively, 5.7%; 5.5% and 8.4% for GC, TFL and TFO.

Discussion

In the present study, a resistance training intervention was proposed to gain muscle strength in the elderly, where two models of linear and wave training protocol were compared. Although in this study, there were no significant differences between the training models, other studies have shown that wave strength training demonstrates greater effectiveness in terms of strength gain, probably due to the constant change in volume and intensity, which removes the body from the homeostasis status more frequently, enhancing muscle strength gain[9,11,15], as seen in percentage values.

There was a statistically significant improvement in handgrip strength (4%, p= 0.05) in the group of elderly people who performed a resistance exercise program for 12 weeks, three times a week, compared to the control group that did not perform any type of intervention.[16] Many studies[16] have evaluated the effectiveness of physical exercise in increasing handgrip strength by comparing the intervention group with a control group that is not subjected to any type of intervention. In this study, the control group performed muscle stretching exercises, participated in group activities, consequently improving the well-being that group activities promote.[17] In addition, stretching exercises provides a better reduction of muscle tension, improving posture, avoiding the discomfort that could arise with a bad posture, increases flexibility, allows wide movements, helps in relaxation, improves blood circulation among other benefits caused by muscle stretching.[17]

Weekly frequency

A study was carried out with 53 individuals divided into four groups: one who trained once a week; another who trained twice; a third who trained three times a week; and a fourth that was characterized as a control group.18 The training lasted 24 weeks and the authors found no significant differences between the experimental groups.

Exercises

Receiving less attention by scholars, to the order of exercises, of all the variables involved in resistance training, it seems to receive less attention, in this study seven exercises were selected: two for the upper limbs (bench press and machine stroke), three for the lower limbs (Leg Press, flexor chair and extensor chair), and two for the trunk (hip and abdominal elevation); no order was determined for carrying out the exercises. This makes any kind of inference or comment about the relative influence of this variable in the context of a dose-response relationship impossible.

Training load

The intensity of the load in the TF, represented by the percentage of 10 RM developed in the resistance training, is the variable that has taken more space in the study guidelines of the specialists in the area, in comparison with the others

It must be recognized that this study had some limitations without having dietary control, so there is no way to infer that the strength gain was only due to the training variable, low levels of muscle glycogen stock lead to a decrease in physical performance and fatigue.[19] We can therefore assume that individuals who ate a high-carbohydrate diet as opposed to individuals who did not eat enough were at an advantage in terms of performance during training, which may favor greater response to strength gain. The sample also has an insufficient number. The chances of better portraying reality more accurately, the study must present n greater than 100 individuals, however, according to the " law of large numbers", " with a sample of less than 30 observations if you are likely to find both an erroneous or outdated value as a value approaching reality ".[20]

The strength of this work is due to the scarce production of research regarding the two resistance training protocols applied to the elderly regarding the muscle strength gain measured by the handgrip, and, in comparison, also to a control group. It was also concerned with classifying the elderly not only by chronological age, but also by the age group table[21], which is important, because from what was shown by the present study, younger elderly people tend to have more strength than older elderly people, and classifying them, this is very stratified.

Conclusion

Thus, we concluded that the wave periodization obtained more expressive percentage results for the strength gain compared to the groups of linear periodization and without periodization, however, these results when observed in an absolute way, without significant difference. Based on these results, it is possible to confirm the initial hypothesis that TFO is more efficient in increasing muscle strength levels when compared to TFL in handgrip strength.

This group suggests that other studies should be developed with these characteristics, however, with the presence of a cohort, a longer intervention period and a larger sample.

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