Effects of different physical activity programs for elderly women

Efeitos de diferentes programas de atividade física para mulheres idosas

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ABSTRACT

There is strong evidence of the benefits of physical activity (PA) for elderly. However, there is still no consensus as to whether one modality is superior to the others. The objective of this study was to compare three different PA programs for elderly women. The study included 107 participants between 60 and 75 years old that practiced PA in three different programs, which were: Strength Training Group (STG), Aerobic Training Group (ATG) and Adapted Sports Group (ASG). To evaluate body composition, we used the Body Mass Index (BMI) and the Total Muscle Mass Index (TMSI), and for the functional tests we used the Sit-to-Stand Test (SST) and the Timed Up Go Test (TUGT). All participants of the three groups presented good physical performance, as the STG presented the best result in the SST, while in the TUGT the ASG was better. The study reinforces the need to stimulate the practice of PA for elderly, and that intrinsic motivation should be considered to offer something that is pleasurable and maintains their adherence to the program.

Keywords: Physical Activity; Exercise; Aged; Health Promotion.
RESUMO
Há fortes evidências dos benefícios da atividade física (AF) para idosos. No entanto, ainda não há consenso sobre a superioridade de uma modalidade em relação às outras. O objetivo deste estudo foi comparar três programas diferentes de AF para mulheres idosas. O estudo incluiu 107 participantes entre 60 e 75 anos de idade que praticavam AF em três programas diferentes, que foram: Grupo de Treinamento de Força (GTF), Grupo de Treinamento Aeróbico (GTA) e Grupo de Esportes Adaptados (GEA). Para avaliar a composição corporal, usamos o Índice de Massa Corporal (IMC) e o Índice de Massa Muscular Total (IMMT) e, para os testes funcionais, usamos o Sit-to-Stand Test (SST) e o Timed Up Go Test (TUGT). Todos os participantes dos três grupos apresentaram bom desempenho físico, sendo que o GTF apresentou o melhor resultado no SST, enquanto no TUGT o GEA foi melhor. O estudo reforça a necessidade de estimular a prática de AF para idosos, e que a motivação intrínseca deve ser considerada para oferecer algo que seja prazeroso e mantenha a adesão ao programa.

Palavras-chave: Atividade Física; Exercício; Idoso; Promoção da Saúde.

INTRODUÇÃO
The population transition phenomenon occurs due to the reduction in birth and mortality age ranges, causing visible modifications in the age groups of the world population (MELO et al., 2017; MIRANDA; MENDES; SILVA, 2016).
In fact, population aging consists of a worldwide phenomenon, and is considered a natural process of human life (OLIVEIRA; DUARTE; REIS, 2016; MOREIRA et al., 2019). However, the way in which the individual goes through this stage of life depends on his genetic heritage and his life habits during this journey (OLIVEIRA; DUARTE; REIS, 2016). It is known that sedentary lifestyle and poor eating habits are negative factors for health, and may imply the development of various diseases, and consequently of dysfunctions disabilities, hospitalizations, and loss of autonomy (OLIVEIRA; DUARTE; REIS, 2016).
Advancing age brings with it changes in body composition, reduction of physiological reserves, causing progressive physical disability and favoring a health condition with more fragility (MARQUES et al., 2019; MIRANDA; MENDES; SILVA, 2016; SILVA; PEDRAZA; MENEZES, 2015). Body composition changes are characterized by fat redistribution and reduced lean mass, changes in the locomotor apparatus that induce muscle hypotrophy.
With the association of these factors occurs the reduction of muscle strength, and as a result the reduction of physical performance, having a negative impact on the life of the elderly, and may also develop a muscle disease called sarcopenia, where there is a
reduction of muscle quantity and its quality (MARQUES et al., 2019; CRUZ-JENTOFT et al., 2019; PAULA et al., 2016; SILVA; PEDRAZA; MENEZES, 2015).

The most prescribed therapy for health maintenance and disease treatment is PA, which is defined as any movement produced by the body, through skeletal muscles with energy expenditure (CASPERSEN; POWELL; CHRISTENSON, 1985; WOODS et al., 2020; SALLIS et al., 2021). According to WHO (2020), it is recommended that the practice of PA for the elderly is at least 150 to 300 minutes of aerobic PA from moderate to intense, and for activities considered vigorous, 75 to 150 minutes per week is recommended.

Resistance and aerobic training have the function of improving the overall functional capacity and may delay or prevent the progression of a particular disease (BATISTA; SANTANA, 2020). The aerobic exercise has the functionality to use large muscle groups, being continuous and its energy supply happens through the oxidative system (BATISTA; SANTANA, 2020). This type of exercise aims to make changes in weight and body composition (BATISTA; SANTANA, 2020; SILVA et al., 2014).

Exercises that involve muscle strength, endurance and require mobilization of loads, which are determined by machines, elastics, free weights, even the body weight itself, are called weight training (KUSTER et al., 2021; SILVA et al., 2014). The benefits that accompany this modality is the improvement of coordination, balance, power, strength, endurance, metabolic and cardiorespiratory improvements, as well as in the aspects of health and quality of life of the elderly (KUSTER et al., 2021; SILVA et al., 2014).

Another possibility to promote and encourage increased PA for the elderly is through sports. However, especially for the elderly population, this strategy requires a redoubled attention being necessary appropriate adaptations to physical, psychological, social, and cultural characteristics (SILVA et al., 2014). The benefits that adapted sports generate for the elderly population is the improvement of physical conditioning, balance, besides the promotion of independence and autonomy of this population (FINGER, TEIXEIRA, 2020).

Therefore, based on this rationale, the objective of this study was to compare three PA programs adapted for the elderly population in two cities in southern Brazil.

METODOLOGIA
Research design and participants

This is an observational study of descriptive type, involving elderly women between the age range of 60 to 75 years, who were regularly enrolled in three different physical activity programs for the elderly, which offer PA practices with the aim of improving the quality of life of the population. The study was approved by the Research Ethics Committee (number 4.593.781).

The study comprised 107 women, divided into three distinct groups: 37 in the Strength Training Group (STG), 30 in the Aerobic Training Group (ATG), and 40 in the Adapted Sports Group (ASG).

The purpose of the ATG is to perform systematic PA in groups, involving gymnastics, dancing, monitored walking, postural exercises, breathing, stretching, and relaxation, always with a physical education professional to supervise, with an average duration of 60 minutes (1 hour), and performed twice a week.

With the STG group, 10 minutes of stretching, warm-up, after global resistance and aerobic exercises lasting 40 minutes, and the final 10 minutes of stretching, totaling 60 minutes, were performed twice a week.

Finally, in the ASG, the sports performed were volleyball, basketball, and handball for a group of seniors aged 60 and older, with a frequency of twice a week and a duration of 50 minutes each day.

The study excluded elderly people who, at the time of the functional test evaluation, had acute musculoskeletal and/or cardiorespiratory complaints, preventing them from performing the tests.

Assessment procedure and measurement instruments

Initially, an anthropometric evaluation (weight, height, Body Mass Index, and Total Muscle Mass Index) and functional tests (Sit and Stand Test and Timed Up Go Test) were performed.

To collect body weight, a digital scale (model 2096PP, Toledo Brand®, BR) was used, and to measure their height, a Stadiometer (model ES2020 of Sanny March®, BR) was used. With this information it was possible to define the Body Mass Index (BMI), which is an anthropometric indicator, non-invasive, low cost and easy to apply (SASS; MARCON, 2015). For classification, the recommendation made by the Nutrition Screening Initiative and Nutrition (SISVAN) was used, which indicates low weight with BMI <22 kg/m², eutrophic 22 to 27 kg/m², and overweight >27 kg/m².
The evaluation of the Total Muscle Mass Index (TMSI) was performed through a predictive equation (Lee equation), which aims to evaluate the mass through the variables of body weight, height, age, gender, and ethnicity. Its range is between 5.9 and 9.5 kg.m\(^2\) (Rech et al., 2012).

The SST has the purpose of evaluating the muscular strength and power of the lower limbs. Therefore, the objective is to quantify the maximum number of repetitions in 30 seconds of activity, being performed in a chair with a straight back, with a height of 43 cm from the floor to the seat and the elderly should have their arms crossed at chest height. The reference values used for the elderly population are equal to or greater than 19 repetitions (OLIVEIRA et al., 2017). The TUGT aims to assess the functional mobility of the elderly. This test consists of getting up from a chair, walking for 3 meters, turning, returning to the chair, and sitting down again (RUZENE; NAVEGA, 2014). The reference values used were a time equal to or greater than 12 seconds is considered a low physical performance (MARTONE et al., 2019).

**Data Analysis**

The data were analyzed using GraphPad Prism 8\(^\text{®}\) software. Descriptive statistics were used (mean, standard deviation, minimum and maximum values). The Shapiro-Wilk test was used to verify data normality. ANOVA was used for intergroup analysis (Tukey’s Multiple Comparisons Test). A 5% significance level was adopted for all tests (p< 0.05).

**RESULTS**

Table 1 shows the summary results of the comparison of the three different PA programs for the elderly. The mean values and standard deviations of each variable controlled in the study are presented, as well as the ANOVA values with the multiple comparisons test.
**Table 1** Summary of the results of the comparison between the groups

<table>
<thead>
<tr>
<th></th>
<th>ATG (n=30)</th>
<th>STG (n=37)</th>
<th>ASG (n=40)</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>66.3 (3.6)</td>
<td>67.0 (4.2)</td>
<td>66.5 (4.4)</td>
<td>0.24</td>
<td>0.786</td>
</tr>
<tr>
<td>BMI</td>
<td>29.7 (3.7) *</td>
<td>27.6 (5.1)</td>
<td>26.9 (3.9)</td>
<td>4.04</td>
<td>0.020</td>
</tr>
<tr>
<td>TMSI</td>
<td>8.4 (0.9) *</td>
<td>7.6 (1.3)</td>
<td>7.5 (1.0)</td>
<td>5.73</td>
<td>0.004</td>
</tr>
<tr>
<td>SST</td>
<td>17.9 (3.7)</td>
<td>20.3 (5.3) *</td>
<td>17.8 (4.1)</td>
<td>3.61</td>
<td>0.031</td>
</tr>
<tr>
<td>TUGT</td>
<td>6.4 (0.7)</td>
<td>6.4 (1.3)</td>
<td>5.8 (1.0) *</td>
<td>4.78</td>
<td>0.010</td>
</tr>
</tbody>
</table>

**Legend:** ATG, Aerobic Training Group; STG, Strenght Training Group; ASG, Adapted Sports Group; Age in years (SD); BMI, Body Mass Index (kg/m$^2$); TMSI, Total Muscle Mass Index (kg.m$^2$); SST, Sit and Stand Test (number of repetitions); TUGT, Timed Up and Go Test (seconds); * significant difference.

Analyzing Table 1 the ATG was overweight, as indicated by a higher average BMI than the other groups. The STG showed a better performance in the SST, which may have occurred due to the specificity of the resistance training. The ASG showed a better performance in functional mobility as evaluated by the TUGT. In fact, in general, this is something required in the practice of team sports.

**DISCUSSION**

Collective PA programs are strategies beyond the already known benefits to the locomotor and cardiorespiratory systems (MOURA et al., 2020; OLIVEIRAS; VINHAS; RABELLO, 2020). This interaction among the elderly promotes good social interaction and generates collective motivation that expands the possibilities of lasting and effective adherence, promoting health in a broad sense and in all spheres of life. However, knowing individual tastes can be useful to screen the elderly and offer different possibilities for PA practice (MOURA et al., 2020; OLIVEIRAS; VINHAS; RABELLO, 2020). However, the differentiation of the groups occurred due to the specificity of training, but it is worth noting that all groups of elderly who practice PA showed satisfactory results, especially in physical performance tests.

When analyzing the results found in this research, it was possible to verify that the group STG presented a higher BMI when compared to the other groups. This increase in BMI is commonly found in elderly women, due to the late deposition of fat mass,
resulting from menopause, where there is a drop in estrogen levels causing an accumulation of fat, and thus, reflecting in BMI values (PEREIRA; SPYRIDES; ANDRADE, 2016). Consequently, the BMI variable was higher in STG, because it is evaluated by an equation that uses anthropometric data, a calculation studied by Rech and collaborators (2012), who evaluated 180 elderly people, who presented a basis for estimating the amount of muscle mass in this population. There is a high correlation between BMI and TMSI, and this can be justified using variables such as weight and height for applications in BMI and TMSI calculations, i.e., the higher the BMI the higher the TMSI (LEE et al., 2000).

In the SST all the groups showed a good performance, but the STG performed better because it is a specific training that involves resistance exercises, corroborating our findings, the study by Souza et al. (2014) compared levels of muscular strength of the lower limbs of elderly people, doing exercises twice a week for 12 months, and found that the group that did weight training showed an improvement in strength performance. According to the study by Rabelo et al. (2020), the specificity of resistance training provides the elderly with increased muscle strength and endurance, improved balance, and cognitive ability, as well as improved performance of activities of daily living, making the elderly more independent, and thus improving their quality of life.

According to the results found in the study by Oliveira, Bertolini, and Junior (2014), weight training is evidenced as a benefactor tool in the lives of the elderly, but the authors mention that this practice requires greater public policies to encourage and support its adherence, providing structured exercises, equipment, and appropriate professional monitoring.

It is known that the lack of physical exercise practices during the aging process enables a more intense musculoskeletal physiological decline, resistance training acts as an ally for the promotion of the individual's quality of life (CARMO, 2019).

Several requirements guide the context about quality of life during the aging process, the capacity for functional autonomy is a condition sometimes insufficient, because of sarcopenia, resistance exercise can be understood as a determining element for the maintenance of physical integrity (RIBEIRO; DANTAS, 2020).

Regarding the TUGT, the group of ASG showed superior results, however the other groups showed values within normal parameters, i.e., elderly who practice ASG have reduced risks of falls and improved functional mobility, being of great importance for the maintenance of health and quality of life (LIMA et al., 2019).
Team sports due to its basic characteristics (cooperation, sociability, playfulness, competition, unpredictability) are appropriate for the elderly, and are well accepted. The motivation that encourages the elderly to participate in an adapted team sport is strictly interconnected with the possibilities of social interaction and health goals (SEPULCHRO, 2017; GONÇALVES; FILHO, 2017).

From the perspectives of well-being, health, and social interaction, adapted sports are one more possibility of physical exercise to avoid the aggravations of sedentary lifestyles, besides ensuring the elderly their totality as individuals. According to a study by Rodrigues et.al, (2017), elderly people who practice adapted team sports have more effective performance in stationary walking, with better respiratory capacity compared to the sedentary group.

This is a diversity of advantages in adapted sport for health promotion during the aging process, positively enhancing physical failures (LIMA et al., 2019).

These data, coupled with the recommendations available in the literature favoring PA practice to prevent and treat sarcopenia and frailty in the elderly (Bray et al., 2016), make programs supervised by trained physical education professionals who have extensive knowledge of exercise recommendations for this special population very prestigious.

CONCLUSION

Based on the data presented, we can consider that these exercise programs presented clear favorable effects for elderly individuals who seek healthy habits, better quality of life and to be motivated to practice PA, bringing the possibility of exercise variability, such as gymnastics, weight training and adapted sports that have a wide range of modalities and possibilities, besides promoting social interaction.

Considering that the public in this research belongs to the risk group for sarcopenia and frailty, we can observe that the individuals in this study are potentially protected, because all of them performed very well in the physical and functional tests to which they were submitted.

These results should further encourage health professionals to promote PA practice for the elderly in its various forms, and above all, represents an invitation to all seniors who seek to improve their health integrally, and for this, should insert exercise in their routines as something fundamental and irreplaceable to achieve this goal.


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