

## Ballroom and circular dancing may improve the functional fitness of older senior women: a cross sectional study

IASMIN BOZZI DA ROCHA<sup>1</sup>; RUTH CALDEIRA DE MELO<sup>1</sup>; SUÉLEN GOMES DOS SANTOS MARQUES<sup>1</sup>; LILIANE FARIA MACON<sup>1</sup>; MÔNICA DIAS FRANCISCO<sup>1</sup>; MARIA CRISTINA MUTARELLI PONTES<sup>5</sup>; ROBERTA LUKSEVICIUS RICA<sup>2</sup>; ALEXANDRE LOPES EVANGELISTA<sup>3</sup>; DANILO SALES BOCALINI<sup>4</sup>; FRANCISCO LUCIANO PONTES JÚNIOR<sup>1</sup>

<sup>1</sup>Post Graduate Program in Gerontology, School of Arts, Sciences and Humanities (EACH), University of São Paulo (USP), São Paulo, BRAZIL

<sup>2</sup>Post Graduate Program in Physical Education, São Judas Tadeu University, São Paulo, BRAZIL

<sup>3</sup>Physical Education Division, Department of Education, Nove de Julho University, São Paulo, BRAZIL

<sup>4</sup>Experimental Physiology and Biochemistry Laboratory of the Physical Education and Sports Center, Federal University of Espírito Santo, Vitoria, BRAZIL

<sup>5</sup>Estácio de Sá University, São Paulo, BRASIL

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### Abstract:

**Introduction:** Aging is inevitable and irreversible, but with the advancement of technology, life expectancy is increasing every year, bringing with it proposals for various interventions to improve the quality of life. One such intervention is physical exercise programs. **Objective:** Evaluated the functional fitness of senior female practitioners of ballroom and circular dancing. **Methods:** Senior women were recruited and distributed into three groups: ballroom dancing (BD,  $n=15$ ); circular dancing (CD,  $n=16$ ); control (C,  $n=10$ ). Those in the dancing groups performed 60-minute dancing sessions three times a week over a 24-week period. Participants underwent anthropometric parameters and functional fitness tests (chair stand, arm curl, sit and reach, back scratch, agility, 6-minute walk) were performed. **Results:** No differences ( $p > 0.05$ ) were found on anthropometric and body composition parameters between groups. However, the values of chair stand and 6-minute walk tests by BD ( $13 \pm 2$  repetitions,  $432 \pm 103$  meters) and CD ( $13 \pm 4$  repetitions,  $384 \pm 88$  meters) respectively was higher ( $p < 0.01$ ) than C ( $10 \pm 3$  repetitions,  $300 \pm 77$  meters). No differences between groups ( $p > 0.05$ ) were found on arm curl (C:  $17 \pm 5$ , BD:  $19 \pm 3$ , CD:  $19 \pm 6$ ; repetitions), sit and reach (C:  $-12 \pm 12$ , BD:  $-11 \pm 12$ , CD:  $-6 \pm 9$ ; cm), back scratch (C:  $-14 \pm 17$ , BD:  $-3 \pm 12$ , CD:  $-8 \pm 17$ ; cm) and agility (C:  $8 \pm 4$ , BD:  $9 \pm 1$ , CD:  $7 \pm 3$ ; seconds) tests. **CONCLUSION:** Both ballroom and circular dancing can be useful to improve the muscular strength of inferior members and endurance capacity of senior women.

**Key words:** Dance, Functiononal capacity, Elderly, Physical activity

### Introduction

Aging is a natural and progressive process in which there is a decline in biological, social and psychological aspects. As for biological aspects, what stands out is a decline in functional capacity and of the physiological systems, as this process can be accelerated by factors that cause physical inactivity or by the presence of chronic diseases, such as cardiovascular diseases, diabetes, obesity, osteoarthritis and neurodegenerative diseases, which may affect the autonomy and independence of older seniors (Coubard et al., 2011; Kattenstroth et al., 2010). Moreover, older individuals tend to change their daily routines and habits with less active activities and occupations, partly because of the gradual decline of their physical fitness over the course of aging (Montero-Fernandez et al., 2013). Physical inactivity has direct effects on the reduction of physical and cognitive capacities, resulting in processes of apathy, social isolation, self-devaluation, insecurity, loss of motivation and solitude (Lee and Don, 2018). The practice of regular physical activity in older seniors, when well targeted, promotes several benefits, such as maintenance of independence and autonomy, reduction in the rate of decline of physiological functions and lower prevalence of chronic diseases (Fan et al., 2013; Krampe et al., 2010; Keogh et al., 2009). Studies developed by our group (Rica et al., 2013; Mora and Valencia., 2018) have shown that regular physical activity improves the functional capacity of older seniors and is one of the main ways to reduce the declines associated with aging.

According to other studies (Fan et al., 2013; Kranpe et al., 2010; Marin et al., 2009), dance can also be a strategy of physical activity strongly indicated for older seniors because it stimulates adherence, social interaction, sensory stimulation and causes improvement in the health of older seniors. However, despite the positive report of authors, little is known about the impact of different dance modalities on the functional

capacity of seniors. Based on the evidence presented, the main objective of the study was to evaluate the functional capacity of older senior women who were part of a regular program of ballroom and circular dancing.

## Material and methods

### Sample

This was a cross-sectional quantitative study. The sample consisted of older senior women who were 60 years of age and older and had participated for at least 12 months, 3 times a week, during 60 minutes of a ballroom dance (BD,  $N = 15$ ) and circular dance (CD,  $N = 16$ ) program that was held at the Juventus Athletic Club, São Paulo, Brazil. In addition, a group of older senior women (C,  $N = 10$ ) were added to the study who did not dance or perform any type of physical activity. The present study complies with the determinations of the Declaration of Helsinki and Resolution 196/96 of the National Health Council and only those who gave their written consent were admitted to the study. The project was previously approved by the research ethics committee of the School of Arts, Sciences and Humanities of the University of São Paulo. Considered as exclusion criterion for the two groups studied were senior women who presented dementia, psychiatric disorders, neurological disorders, mental deficiency, cerebrovascular accident with impairment, blindness, deafness and recent hospitalization. As inclusion criterion, only those women who were in good health and who had an attendance of at least 85% in the dance sessions were allowed to participate.

### Body composition

Height (m) and body mass (kg) were measured to calculate body mass index ( $BMI = \text{weight}/\text{height}^2$ ). Body fat percentage was derived with skin folds as previously mentioned from our group (BOCALINI et al., 2010a)

### Functional fitness

This evaluation was composed by six tests previously reported in the literature to assess physical performance parameters in older seniors and frequently utilized in our group (Bocalini et al., 2010b; Bocalini et al., 2012; Rica et al., 2013; Suzuki et al., 2018). The arm curl test was used to evaluate upper limb fitness, with the analyzed score as the total number of hand weight curls through the full range of motion. The chair stand test was used to evaluate lower limb strength, scored by the number of stands executed correctly within 30 seconds. Agility was evaluated by the 8-foot up-and-go test, and the score was considered as the shortest time to rise from a seated position, walk eight feet, turn back and return to the seated position. The sit and reach test was used to evaluate the lower body flexibility scored by the shortest distance achieved between the extended fingers and the toe when seated with extended leg and the heel resting on the floor. The back scratch test assessed upper body flexibility and the score was considered the shortest distance achieved between the extended middle fingers when reaching behind the head with one hand and behind the back with the other hand. Additionally, functional exercise capacity was measured by the 6-minute walk test (6MWT), in accordance with the guidelines of the American Thoracic Society (2002).

### Statistical analyses

All statistical analyses were carried out using the SPSS for Windows software (version 12.0; SPSS, Chicago, IL, USA). All data are expressed as means and standard errors. The D'Agostino–Pearson test was used to determine normality. Analysis of comparisons between groups along the time periods was carried out using one-way ANOVA followed by Bonferroni post-hoc test. Statistical significance was established at  $\alpha \leq 0.05$ .

## Results

As shown in Table 1, there were no differences found on anthropometric and body composition parameters among groups.

Table 1. Anthropometric parameters of control, circular and social dancing groups

Parameters	Control	Ballroom dancing	Circular dancing
Age (years)	65 ± 6	67 ± 5	69 ± 8
Body mass (kg)	73 ± 22	67 ± 12	65 ± 9
Height (m)	1.66 ± 9	1.58 ± 7	1.52 ± 7
BMI ( $\text{kg}/\text{m}^2$ )	27 ± 5	27 ± 4	29 ± 10
Body fat (%)	47 ± 7	43 ± 5	44 ± 5
Fat mass (kg)	34 ± 13	29 ± 8	29 ± 7
Lean mass (kg)	39 ± 12	38 ± 6	37 ± 5
WC (cm)	109 ± 7	98 ± 11	95 ± 10
HC (cm)	116 ± 13	105 ± 7	106 ± 9
WHR	0.94 ± 0.09	0.93 ± 0.06	0.90 ± 0.06

Values are presented as mean  $\pm$  standard deviation. BMI: body mass index. WC: waist circumference. HC: hip circumference. WHR: waist-hip ratio.

Table 2 shows the functional parameters of functional fitness. Similar results were found on chair stand and 6-minute walk tests by ballroom and circular dancing; however, the values of the dance groups were higher ( $p < 0.01$ ) than control. No differences between groups ( $p > 0.05$ ) were found on arm curl, sit and reach, back scratch and agility tests.

Table 2. Functional fitness parameters of control, ballroom and circular dancing groups

Parameters	Control	Social dancing	Circular dancing
Chair stand (rep)	10 $\pm$ 3	13 $\pm$ 2*	13 $\pm$ 4*
Arm curl (rep)	17 $\pm$ 5	19 $\pm$ 3	19 $\pm$ 6
Sit and reach (cm)	-12 $\pm$ 12	-11 $\pm$ 12	-6 $\pm$ 9
Back scratch (cm)	-14 $\pm$ 17	-3 $\pm$ 12	-8 $\pm$ 17
Agility (sec)	8 $\pm$ 4	9 $\pm$ 1	7 $\pm$ 3
6MWT (m)	300 $\pm$ 77	432 $\pm$ 103*	384 $\pm$ 88*

Values are presented as mean  $\pm$  standard deviation. 6MWT: 6-minute walk test.

\* $p < 0.01$  compared to control group.

## Discussion

According to the American Dance Therapy Association, dance makes use of psychotherapeutic movement to promote emotional, cognitive, physical and social integration of the individual (Hwang & Braun, 2015). According to Keogh et al., 2009, dance can take on different forms, be applied in individuals of all ages and does not require expensive equipment. The author further states that dance is a physical activity with lower potential of risk for older practitioners when compared to other forms of physical activity, as it is important in promoting health and successful aging. For Connor, (2000); Lima & Vieira, (2007); Galloza et al, (2017), dance allows older seniors to maintain a connection with daily life, as it encourages fun by promoting social interaction and a sense of community. Accordingly, dance seems to be a form of physical activity more likely to be adopted as part of physical exercise programs of many older seniors.

The main objective of our study was to compare the functional capacity of older senior women who were already practicing circular and ballroom dancing during a period of 12 months. The results obtained demonstrated improvements in lower limb resistance strength (BD = 13  $\pm$  2, CD = 13  $\pm$  4) in both dance groups when compared to control (C = 10  $\pm$  3). Our results are in agreement with the results obtained by cross-sectional studies conducted by Uusi-Rase et al., (1999) and Verguese (2006), as the latter found a 13% increase in lower limb resistance strength in the sit and stand from chair test and 10% increase in the manual grip test.

The results obtained in longitudinal studies also found similar results. McKinley et al., 2008, found improvement in resistance strength (11%) determined by the sit and stand test in older senior subjects submitted to a 10-week Argentine tango training program, performed twice a week for 120 minutes. Additionally, Eyigor et al., 2009 analyzed an 8-week program, performed 3 times a week for 60 minutes with folkloric dance from Turkey and found a 19% improvement in resistance strength in the older seniors. More recently, Borges et al. (2012) found increased strength of the lower limbs in institutionalized older individuals who participated in a dance training program that was performed 3 times a week, lasting 50 minutes for a period of 8 months.

Our results are important because aging is associated with a change in body composition that causes increased body fat and reduced muscle strength. After the fifth decade of life, the rate of progression of reduction is around 8 to 15% per decade (Deschenes, 2004; Rossi et al, 2017). In addition, the loss of strength significantly affects the quality of life of older seniors, causing difficulties in activities of daily living, leading to loss of autonomy and independence. Kauffman (2001) further states that chronic diseases, hospitalizations and physical inactivity can accelerate the decline of muscle strength. In this way, Judge (2003), Keogh, 2009, Krampe, 2010, Gillespie, 2012, affirm that dance can be a beneficial form of physical activity for older seniors since it reduces the risk of falls by means of muscular strengthening and improvement of balance.

Another important response obtained with the study was the improvement of the cardiorespiratory function evaluated by the 6-minute walk test, which reflects efforts commonly performed by older seniors in the activities of daily living. The results of the dance and ballroom dance groups were significantly higher (BD = 432  $\pm$  103 m, CD = 384  $\pm$  88 m) when compared to control (C = 300  $\pm$  77 m). Our results were important because few studies were able to find an improvement in cardiopulmonary capacity of elderly individuals undergoing a dance program. In a recent systematic review by Hwang and Braun (2015), the authors demonstrated that only one study (Hui et al., 2009) showed a positive dance effect on aerobic capacity determined by the 6-minute walk test. Similarly, Eyigor et al (2009) also found a 17% increase in aerobic

capacity. We believe that because the training was performed over a 12-month period, it may have contributed to the improvement of cardiorespiratory fitness.

These findings are important because reductions in cardiorespiratory fitness are associated with an increased risk of cardiovascular disease, especially coronary artery disease and stroke (Mampuya, 2012; Myers, 2002). In addition, Cabrera et al. (2007) found that the main cause of death in older Brazilian individuals is cardiovascular diseases. Hongan, (2005) in a review article states that cardiorespiratory fitness appears to be positively related to cognitive performance, namely, age-related reductions in cardiorespiratory function seem to result in tissue hypoxia and that aerobic activity, as in the case of dance, would have a protective effect. Increased cerebral blood flow would provide greater supply of oxygen and energetic substrates to the brain (Hongan, 2005; Condello et al., 2017).

Conversely, there were no statistically significant differences in flexibility determined by the sitting and reaching and back scratch tests, nor in the "up and go" test that evaluates the integration of neuromuscular parameters (speed, agility and dynamic balance). As for flexibility, the result obtained is somewhat expected because both ballroom and circular dancing do not have the improvement of these parameters as their primary objective and are in accordance with the results obtained by Dewhurst et al., 2014 in Scottish country dance participants.

### Conclusion

The findings of this study support the use of ballroom dancing and circular dance as an alternative of physical activity for older seniors, bringing benefits in cardiorespiratory capacity and lower limb muscle strength. In addition to the physical benefits, dance also brings to its practitioners gains in the form of social interaction.

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**Conflict Of Interest:** The authors declare that they have no conflicts of interest.

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