Motriz, Rio Claro, v. 28, n. Especial 2, 2022, e10220001422 *DOI: http://dx.doi.org/10.1590/S1980-657420220001422*
Special Issue: Physical Training in Older Adults

Acute and Chronic Effects of Exercise in Health

Functional capacity and quality of life of older adults practitioners of *câmbio*: a cross-sectional study

Lucas Betti Domingues[1,2,3], Luciana Ribas Medeiros[3], Eduardo Lusa Cadore[1,2], Rodrigo Ferrari[1,2,3]

[1]*Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil;* [2]*Hospital de Clínicas de Porto Alegre, Grupo de Estudos em Treinamento Físico e Esportes, Porto Alegre, RS, Brazil;* [3]*Faculdade Sogipa de Educação Física, Porto Alegre, RS, Brazil.*

Associate editor: Eduardo Lusa Cadore. Universidade Federal do Rio Grande do Sul, (UFRGS), Porto Alegre, RS, Brazil. E-mail: edcadore@yahoo.com.br.

Abstract - Aim: This study aimed to evaluate the levels of functional capacity and quality of life in older adults practitioners of *câmbio*. **Methods:** This is a cross-sectional analytic study that evaluated men and women aged over 60 years, practitioners of *câmbio* in the Rio Grande do Sul, Brazil. The participants underwent a functional capacity assessment, composed of the sit- and stand-up and handgrip tests. In addition, quality of life was assessed through the WHOQOL-bref questionnaire. **Results:** Participants were 69 ± 6 years and had body mass index of 27.9 ± 4.1 kg/m^2. The participants practiced *câmbio* approximately 2.7 ± 1.2 times per week. Regarding the quality of life, results according to the domains of the questionnaire, it was observed that the participants presented values above 75% of the maximum possible. Regarding the performance in the sit- and stand-up test, participants had mean of 22 repetitions (95%CI: 20 to 23) and the average time for 5 repetitions was 7.1 s (6.8 to 7.5). In the grip strength test, participants had mean 35 kg (95%CI: 33.7 to 38.2). **Conclusion:** Older adults practitioners of *câmbio* presented satisfactory levels of quality of life and a good functional capacity.

Keywords: aging, physical activity, leisure activities, health-related quality of life.

Introduction

The aging process reduces the efficiency of the neuromuscular and cardiorespiratory systems[1-3], leading to a reduction in functional capacity, quality of life, and independence to perform daily living activities[4,5]. Regular physical exercise plays a major role in the improvement of different physical fitness components[6,7]. Additionally, the association between low levels of cardiorespiratory fitness and muscle strength with mortality reinforces the importance of exercise practice to maintain high levels of physical fitness in aging populations[8-10].

Older individuals with adequate levels of physical activity seem to maintain satisfactory levels of quality of life[11], a fact that highlights the importance of developing physical activity programs for this population. The positive association between physical activity and quality of life is well documented[12], which establishes a link with the health status in the aging process[13]. The benefit of physical activity practice includes improvement in the quality of life, functional capacity, independence, and other health-related outcomes[14].

Traditional physical exercises (i.e., resistance and aerobic training) are the main strategy for the development of several health-related components of older adults[13]. However, the long-term adherence to these traditional exercise interventions is often low[15], especially due to the monotony and smaller motivation that those activities provide. Recreational sports have become a good alternative, as it promotes good socialization and long-term adherence among their practitioners[16]. However, due to physical and motor limitations, some older individuals are unable to practice traditional sports. An interesting alternative in these cases is adapting some rules of traditional sports to improve safety and accessibility to practice. The *câmbio,* an adapted volleyball game developed mainly for older adults, is a promising alternative for any individual with physical limitations. The *câmbio* is played on a regular volleyball court with basic volleyball techniques[17], able to improve social aspects, and is an enjoyable option to achieve high adherence among its practitioners.

Although the decrease in functional capacity with age is inevitable, the regular practice of traditional and adapted sports may positively impact physical fitness and quality of life. However, there is a lack of studies investigating the levels of physical fitness and quality of life in older adult practitioners of *câmbio*. Therefore, the present study aimed to evaluate the levels of functional capacity

and quality of life in older adults practitioners of *câmbio*. Additionally, we also investigated the possible differences between men and women in functional capacity and quality of life.

Methods

Study design

This is a cross-sectional descriptive study in which older adults practitioners of *câmbio* underwent evaluations of functional capacity and quality of life. The present study was designed in accordance with the regulatory framework in Resolution 466/12 of the National Health Council, the Declaration of Helsinki, and was approved by the local human research ethics committee (Number 2.410.997). This study was reported following the STrengthening the Reporting of Observational Studies in Epidemiology (STROBE Statement)[18].

Participants

The study was conducted during the 20th Elderly Integration Games of Rio Grande do Sul (2018), an annual event for older adults in which *câmbio* is the main sport modality. All participants were recruited at the above-mentioned event, on the day before the beginning of the games. A sample consisting of men and women aged over 60 years, *câmbio* practitioners at least once a week took part in the study. Exclusion criteria include participants with cognitive and physical limitations preventing them from performing the tests. All the participants read and signed the consent form before carrying out the study procedures.

Assessments

All assessments were carried out on the first day of the event, before the first game of the day in order to avoid a possible residual effect of the fatigue on the performance of the tests. All tests were performed in an indoor court. One participant at the time was evaluated at each test, and the completed assessment lasted up to 20 min. Each participant underwent an anamnesis to collect sociodemographic, clinical, and anthropometric data and self-reported levels of blood pressure. To access body composition, body weight was measured using a digital scale and self-reported height. With these measurements, BMI was calculated using the equation weight (kg)/height^2 (m). Waist circumference was measured at the midpoint between the iliac crest and the last rib, using an inelastic tape (CESCORF, Brazil). Afterward, they were submitted for evaluation of the quality of life and nutritional status throughout WHOQOL-bref and mini nutritional assessment questionnaires, respectively. Lastly, the participants performed the handgrip and sit- and stand-up tests in order to access the functional capacity of the upper and lower limbs.

To access the quality of life, the WHOQOL-bref instrument was used, in its version validated for the Portuguese language. The WHOQOL-bref is a questionary made up of 26 items, which encompasses four domains: physical health, physiological, social relationship, and environment. The instrument has a final score from 0 to 100, divided by each of the domains, in which 0 is the worst general state of health-related quality of life and 100 is the best health status. To access nutritional status, the mini nutritional assessment (MNA) was used, a nutritional instrument validated in the Portuguese language for the elderly population. The MNA consists of 5 items, which were assessment of food intake, non-intentional weight loss, mobility, presence of emotional factors that interfere in an individual's diet, neuropsychological problems, and body mass index (BMI). The instrument has a final score from 0 to 14, with which 0 to 7 being malnutrition status, 8 to 11 being the risk of malnutrition, and 12 to 14 being adequate nutritional status.

During the sit- and stand-up test[20], the participant performed an attempt (up to 5 repetitions) without counting time in order to familiarize and warm up themselves to the test. The test started with the participant sitting in a chair, the back straight without chair support, feet shoulder-width apart, and flat on the floor. The upper limbs are crossed at the level of the wrists and against the chest. At the “start” command, participants rise to the maximum extension (vertical position) and return to the initial sitting position. Participants were instructed to perform the squats as fast as possible for 30 s. The test consisted of performing the maximum number of squats that the participants could perform for 30 s. In addition, the time (seconds) to perform the first five squats was also registered.

The handgrip strength was assessed through the handgrip test using a hydraulic dynamometer with a static reading indicator, with a scale of 0 to 90 kg and a resolution of 2 kg (Jamar, EUA). To standardize the data collection, participants were instructed to remain sit in a chair, knee, and hip at a 90° angle, feet flat on the floor and both arms along the body. Afterward, participants were instructed to flex the elbow to 90° and maintain the forearm in a fixed position and the wrist in a neutral position. At the “start” command, participants were instructed to perform the handgrip movement with the greatest possible production of force for 3 to 5 s, maintaining the initial position of the test. Three attempts were performed in each limb, with a 1-min interval between them. The highest value obtained in each limb was used for the analysis of handgrip strength.

Statistical analysis

Data were entered in duplicate by two independent researchers. Assumption of normality was accessed using

the Shapiro-Wilk test in combination with a visual inspection of histogram and Q-Q plots. Mean and standard deviation was used to describe continuous variables with parametric distribution, while median and interquartile ranges were used to describe continuous variables with a non-parametric distribution. Categorical variables were expressed by absolute and relative frequency. For sex comparisons, the Student T-test or Mann-Whitney U test was used to compare parametric or non-parametric data distribution, respectively. The significance level adopted in the study was $p < 0.05$. Statistical analyses were performed using SPSS software for social science, version 26 (IBM Corp, Armonk, NY, USA).

Results

Ninety participants were initially accessed for data collection, and eight were excluded from the study because they aged less than 60 years. Eight-two participants were considered in the final analysis. Participants were classified according to nutritional status using the cutoff points of the World Health Organization, in which BMI < 18.5 kg/m^2 being underweight, 18.6 to 24.9 kg/m^2 being eutrophic, 25 to 29.9 kg/m^2 being overweight, and > 30 kg/m^2 being obesity[19]. The sociodemographic and clinical characteristics of participants are shown in Table 1. Overall, the mean age was 69 ± 6 years and 48 (58.5%) were aged between 60 to 69 years, and 30 (36.6%) were aged 70 to 79 years, with similar relative distribution between sex. The participants practiced *câmbio* approximately 2.7 ± 1.2 times per week. Regarding BMI, participants had a mean of 27.9 ± 4.1 kg/m^2 with no difference between sex. Of the participants, 21 (25.6%) were classified as eutrophic, 40 (48.8%) were classified as overweight and 21 (25.6%) were classified as obesity[19].

Table 2 presents the result of the quality of life according to the WHOQOL-BREF domains. Participants showed a high quality of life in the physical health (75% of the maximum score), psychological (78% of the maximum score), social relationship (77% of maximum score), environment (75% of the maximum score) and general quality of life (76% of maximum score). There was no significant difference between men and women.

Table 3 presents the results of functional capacity according to the handgrip and sit- and stand-up tests. Regarding the parameters evaluated in the sit- and stand-up test, there was no significant difference in the number of repetitions performed in 30 s and time to perform 5 repetitions, when comparing men and women. However, when comparing men and women, there was a significant difference in the grip strength of the right arm (Δ 15.4 kg;

Table 1 - Sociodemographic and clinical characteristics of older adults practitioners of *câmbio*. Tramandaí, RS, Brazil, 2018.

Characteristics	Overall (n = 82)	Men (n = 25)	Women (n = 57)
Age (years)	68.8 ± 6.1	69.4 ± 6.2	68.5 ± 6.1
60-69, n (%)	48 (58.5)	14 (56)	34 (59.6)
70-79, n (%)	30 (36.6)	10 (40)	20 (35.1)
> 80, n (%)	4 (4.9)	1 (4)	3 (5.3)
Bodyweight (kg)	74.6 ± 12.5	81.7 ± 12.1	71.5 ± 11.4
Height (m)	1.6 ± 0.1	1.7 ± 0.1	1.6 ± 0.1
BMI (kg/m^2)	27.9 ± 4.1	27.7 ± 3.4	28.1 ± 4.2
Underweight, n (%)	0 (0)	-	-
Eutrophic, n (%)	21 (25.6)	5 (20)	16 (28.1)
Overweight, n (%)	40 (48.8)	14 (56)	26 (45.6)
Obesity, n (%)	21 (25.6)	6 (24)	15 (26.3)
Weist circunference (cm)	89.9 ± 11	99.6 ± 10.4	89.1 ± 9.7
Systolic BP (mmHg)	125 ± 12	130 ± 12	123 ± 12
Diastolic BP (mmHg)	79 ± 7	82 ± 6	78 ± 7
Normotension, n (%)	42 (51.2)	7 (28)	35 (61.4)
Pre-hypertension, n (%)	14 (17.1)	7 (28)	7 (12.3)
Hypertension, n (%)	26 (31.7)	11 (44)	15 (26.3)
Nutricional status	13.3 ± 1.4	13.6 ± 0.7	13.2 ± 1.6
Adequate	78 (95.1)	25 (100)	53 (93)
Risk of malnutrition	4 (4.9)	0 (0)	4 (7)
Malnutrition	0 (0)	-	-

Quantitative variables are presented in mean ± standard deviation (SD) and categorical variables are presented in absolute frequency (%). BMI, body mass index; BP, blood pressure.

Table 2 - Quality of life scores according to WHOQOL-bref domains in older adults practitioners of *câmbio*. Tramandaí, RS, Brazil, 2018.

Domains	Overall (n = 82)	Men (n = 25)	Women (n = 57)	p value
Physical health	75 (72 to 78)	77 (71 to 83)	74 (71 to 78)	0.426
Psychological	78 (75 to 81)	76 (70 to 82)	78 (75 to 82)	0.443
Social relationship	77 (74 to 81)	76 (69 to 82)	78 (73 to 83)	0.59
Environment	75 (72 to 78)	74 (69 to 79)	76 (72 to 79)	0.583
General quality of life	76 (74 to 79)	76 (71 to 80)	77 (74 to 80)	0.723

Variables are presented as mean (95% confidence interval). Comparisons between sex were performed using Student's t-test for independent samples. WHOQOL-bref: Quality of life questionnaire.

Table 3 - Results of sit- and stand-up, and handgrip tests of older adults practitioners of *câmbio*. Tramandaí, RS, Brazil, 2018.

Variables	Overall (n = 82)	Men (n = 25)	Women (n = 57)	p value
Sit- and stand-up				
Number of repetitions in the 30s	22 (20 to 23)	23 (21 to 24)	21 (20 to 22)	0.177
Time to 5 repetitions (s)	7.1 (6.8 to 7.5)	6.9 (6.3 to 7.5)	7.2 (6.8 to 7.7)	0.359
Grip strength (kg)				
Right arm	35.9 (33.7 to 38.2)	46.5 (42.5 to 50.5)	31 (29.6 to 32.5)	< 0.001
Left arm	34.5 (32.5 to 36.5)	44.7 (41.5 to 48)	29.7 (28.4 to 30.9)	< 0.001

Variables are presented as mean (95% confidence interval). Comparisons between sex were performed using the Mann-Whitney U test for independent samples.

95%CI: 12.1 to 18.9) and left arm (Δ 15 kg; 95%CI: 12.2 to 17.9).

Discussion

To the best of our knowledge, this is the first study evaluating the functional capacity and quality of life of older individuals who practice the *câmbio* modality. The main findings showed that the participants had satisfactory levels of quality of life and high levels of neuromuscular performance in the handgrip strength and sit-stand-up tests. These variables have an inverse association with all-cause mortality, cardiovascular mortality, and incidence of cancer[21,22]. Therefore, our data emphasize the importance of involving older individuals in regular physical exercise programs to maintain functional capacity and health-related quality of life. Furthermore, it was observed that the prevalence of self-reported hypertension in our participants was slightly lower than the prevalence in the elderly population in Brazil (48.8% vs 52.7% to 55%)[23].

Several studies suggest that adults with better levels of physical fitness have a lower level of blood pressure, blood glucose, cholesterol, obesity, and, in turn, lower cardiovascular risk[13,24]. Thus, regular physical activity seems to be a non-pharmacological intervention for the health of the general population, especially the elderly, since it presents benefits to maintaining a healthy lifestyle, as well as the promotion of functional capacity, physical independence, and body composition and quality of life[25,26]. In this sense, the practice of recreational sports appears to be an option to traditional physical exercise (i.e., systematic strength and endurance training) as a complementary intervention to maintain adequate levels of physical performance and provide psychosocial and motivational benefits, that increase retention of practitioners for long periods of time[27,28].

Quality of life is a key factor to be considered in the elderly population, as it encompasses the individual's perception of their role in life, in the context of culture, and relation to their goals, expectations, and concerns[29]. The assessment of the quality of life through the WHOQOL-BREF questionnaire showed that participants had high overall means in the different quality of life domains, showing that older adults practitioners of *câmbio* had considered satisfactory levels (> 75% of maximum score) of quality of life. In another study assessing the quality of life of older individuals in leisure activities, the general quality of life and social domain had the highest averages[30]. Regarding the quality of life in the physical domain, a higher mean was expected, since the participants referred to are active individuals. This fact may be related to different aspects that are considered in the assessment through the WHOQOL-BREF, such as pain and discomfort, mobility, energy and fatigue, sleep and rest, daily living activities, medication dependence, and work capacity, facts these are often present in the elderly individual[31].

Physical fitness tests are effective in the diagnosis of the needs of a given population and can help to develop targeted programs to maintain and develop physical independence, which depends on a good combination of various components of physical fitness, including muscle

strength and cardiorespiratory fitness[32]. Our study showed that the participants had high averages in handgrip strength and sit-stand-up tests[20,33]. In addition, when comparing the performance of men and women during the sit- and stand-up test, no difference was observed between the sexes, while during the handgrip test, a difference was observed between men and women. This difference observed in the performance of upper and lower limb tests is because the absolute strength of men in relation to women, regarding lower limbs, is closer when compared with upper limbs[34]. *Câmbio* is a sport that especially requires strength in the lower limbs to stand up, and upper limbs to throw the ball, and this adapted sport increases muscular strength and power. Therefore, it is suggested the participants can have this parameter matched by the regular practice of modality[33].

Regarding the nutritional assessment carried out through the MNA questionnaire, participants showed adequate nutritional status, similar to the results of a previous study that assessed the nutritional status of active elderly people, verifying adequate nutritional status in 100% of the sample evaluated[35]. On the other hand, in a cross-sectional study that enrolled 232 elderly people residing in geriatric clinics, it was found that 66.5% of the older individuals studied had inadequate nutritional status[36]. It is well documented that low weight control increases the risk of infection and mortality, and increases the risk of overweight and non-communicable diseases such as hypertension, diabetes mellitus type II, and hyperlipidemia[37,38]. In addition, it is suggested that both underweight and overweight are associated with reduced functional capacity, also influencing the quality of life[39,40].

Some limitations should be considered to properly interpret our findings. The convenience sample recruited in the study may present a possible selection bias and may not represent all the population who practice *câmbio*. This limitation may prevent us from the generalization of our findings to all older adults. The greater number of female participants in our study may be because women are more interested in participating in activities outside the home, such as gym, recreational sports, and manual activities when compared to elderly men. In addition, the participants' height and blood pressure data were obtained through self-report, which may impact less accurate estimates. The strengths of the study include a considerable sample of older practitioners of *câmbio,* and all assessments were carried out in the same location and with similar conditions for all participants, minimizing any possible measurement bias.

Conclusion

In summary, older adults practitioners of *câmbio* presented satisfactory levels of quality of life and a good functional capacity. Moreover, it was observed a significant difference between men and women in the performance of the handgrip test but not in the sit and stand test. Our data emphasize the importance of engaging older individuals in adapted game sports programs targeting to improve quality of life and functional capacity. Finally, future studies are necessary to ratify the efficacy of these adapted game modalities on physical and health parameters.

Acknowledgments

The authors would like to thank all the participants for their help and participation in the study and Kassius Nitzke, Renato Maynart, Carlos Eduardo Payano, Cheila Boeff, and Gabrielle Martins dos Santos for their support during the data collection.

References

1. Cadore EL, Pinto RS, Bottaro M, Izquierdo M. Strength and endurance training prescription in healthy and frail elderly. Aging Dis. 2014;5(3):183-95. doi
2. Izquierdo M, Häkkinen K, Antón A, Garrues M, Ibañez J, Ruesta M, et al. Maximal strength and power, endurance performance, and serum hormones in middle-aged and elderly men. Med Sci Sports Exerc. 2001;33(9):1577-87. doi
3. Izquierdo M, Hakkinen K, Ibanez J, Anton A, Garrues M, Ruesta M, et al. Effects of strength training on submaximal and maximal endurance performance capacity in middle-aged and older men. J Strength Cond Res. 2003;17(1):129-39. doi
4. Miszko TA, Cress ME, Slade JM, Covey CJ, Agrawal SK, Doerr CE. Effect of strength and power training on physical function in community-dwelling older adults. J Gerontol A Biol Sci Med Sci. 2003;58(2):171-75. doi
5. Miller ME, Rejeski WJ, Reboussin BA, Ten Have TR, Ettinger WH. Physical activity, functional limitations, and disability in older adults. J Am Geriatr Soc. 2000;48 (10):1264-72. doi
6. Marques A, Santos T, Martins J, Matos MGD, Valeiro MG. The association between physical activity and chronic diseases in European adults. Eur J Sport Sci. 2018;18(1):140-49. doi
7. Ozemek C, Lavie CJ, Rognmo Ø. Global physical activity levels - need for intervention. Prog Cardiovasc Dis. 2019;62 (2):102-07. doi
8. Blair SN, Kohl HW, Paffenbarger RS, Clark DG, Cooper KH, Gibbons LW. Physical fitness and all-cause mortality: a prospective study of healthy men and women. JAMA. 1989;262(17):2395-401. doi
9. Kokkinos P, Doumas M, Myers J, Faselis C, Manolis A, Pittaras A, et al. A graded association of exercise capacity and all-cause mortality in males with high-normal blood pressure. Blood Press. 2009;18(5):261-67. doi
10. Ruiz JR, Sui X, Lobelo F, Morrow JR, Jackson AW, Sjöström M, et al. Association between muscular strength and

mortality in men: prospective cohort study. BMJ. 2008;337 (7661):a439. doi
11. McAuley E, Konopack JF, Motl RW, Morris KS, Doerksen SE, Rosengren KR. Physical activity and quality of life in older adults: influence of health status and self-efficacy. Ann Behav Med Publ Soc Behav Med. 2006;31(1):99-103. doi
12. Vagetti GC, Barbosa VC, Moreira NB, Oliveira V de, Mazzardo O, Campos W de. Association between physical activity and quality of life in the elderly: a systematic review, 2000-2012. Braz J Psychiatry. 2014;36(1):76-88. doi
13. Chodzko-Zajko WJ, Proctor DN, Fiatarone Singh MA, Minson CT, Nigg CR, Salem GJ, et al. American College of Sports Medicine position stand. Exercise and physical activity for older adults. Med Sci Sports Exerc. 2009;41 (7):1510-30. doi
14. Haskell WL, Lee I-M, Pate RR, Powell KE, Blair SN, Franklin BA, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Med Sci Sports Exerc. 2007;39(8):1423-34. doi
15. Lin E, Nguyen CH, Thomas SG. Completion and adherence rates to exercise interventions in intermittent claudication: traditional exercise versus alternative exercise - a systematic review. Eur J Prev Cardiol. 2019;26(15):1625-33. doi
16. Eime RM, Young JA, Harvey JT, Charity MJ, Payne WR. A systematic review of the psychological and social benefits of participation in sport for children and adolescents: informing development of a conceptual model of health through sport. Int J Behav Nutr Phys Act. 2013;10:98. doi
17. Campos L, Nakamura P, Kokubun E. Comparison of physical fitness in elderly submitted to different physical exercise interventions. Rev Bras Ativ Fis Saude. 2016;21(1):78-84. doi
18. Elm E von, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. Strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. BMJ. 2007;335 (7624):806-8. doi
19. NHLBI. Obesity education initiative expert panel on the identification, evaluation, and treatment of obesity in adults. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: the evidence report. Bethesda, National Heart, Lung and Blood Institute; 1998. Available from: https://www.ncbi.nlm.nih.gov/books/NBK1988/ [Accessed 10th January 2022].
20. Rikli RE, Jones CJ. Development and validation of criterion-referenced clinically relevant fitness standards for maintaining physical independence in later years. Gerontologist. 2013;53(2):255-67. doi
21. Celis-Morales CA, Welsh P, Lyall DM, Steell L, Petermann F, Anderson J, et al. Associations of grip strength with cardiovascular, respiratory, and cancer outcomes and all-cause mortality: prospective cohort study of half a million UK Biobank participants. BMJ. 2018;361:k1651. doi
22. Kraschnewski JL, Sciamanna CN, Poger JM, Rovniak LS, Lehman EB, Cooper AB, et al. Is strength training associated with mortality benefits? A 15year cohort study of US older adults. Prev Med. 2016;87:121-27. doi
23. Barroso WKS, Rodrigues CIS, Bortolotto LA, Mota-Gomes MA, Brandão AA, Feitosa ADM, et al. Diretrizes brasileiras de hipertensão arterial - 2020. Arq Bras Cardiol. 2021;116 (3):516-658. doi
24. Saqib ZA, Dai J, Menhas R, Mahmood S, Karim M, Sang X, et al. Physical activity is a medicine for non-communicable diseases: a survey study regarding the perception of physical activity impact on health wellbeing. Risk Manag Healthc Policy. 2020;13:2949-62. doi
25. Matsudo VKR, Matsudo SMM, Araújo TL, Ribeiro MA. Dislipidemias e a promoção da atividade física: uma revisão na perspectiva de mensagens de inclusão. Rev Bras Ciênc Mov. 2008;13(2):161-70. doi
26. D'Agostino RB, Vasan RS, Pencina MJ, Wolf PA, Cobain M, Massaro JM, et al. General cardiovascular risk profile for use in primary care: the Framingham Heart Study. Circulation. 2008;117(6):743-53. doi
27. Krustrup P, Dvorak J, Junge A, Bangsbo J. Executive summary: the health and fitness benefits of regular participation in small-sided football games. Scand J Med Sci Sports. 2010;20(Suppl 1):132-5. doi
28. Carpes L, Jacobsen A, Domingues L, Jung N, Ferrari R. Recreational beach tennis reduces 24-h blood pressure in adults with hypertension: a randomized crossover trial. Eur J Appl Physiol. 2021;121(5):1327-36. doi
29. Boggatz T. Quality of life in older age - a concept analysis. Int J Older People Nurs. 2016;11(1):55-69. doi
30. Santos P, Marinho A, Mazo G, Hallal P. Atividades no lazer e qualidade de vida de idosos de um programa de extensão universitária em Florianópolis (SC). Rev Bras Ativ Fis Saude. 2014;19(4):494-503. doi
31. Fleck MP, Louzada S, Xavier M, Chachamovich E, Vieira G, Santos L, et al. Aplicação da versão em português do instrumento abreviado de avaliação da qualidade de vida 'WHOQOL-bref'. Rev Saúde Publ. 2000;34(2):178-83. doi
32. Mack-Inocentio D, Menai M, Doré E, Doreau B, Gaillard C, Finaud J, et al. Large-scale assessment of health-related physical fitness in french older adults: feasibility and validity. Front Public Health. 2020;8:487308. doi
33. Bess R, Colussi EL, Marchi ACBD. Efeitos do jogo de câmbio na capacidade funcional e na atenção de idosos. Estud Interdiscipl Envelhec. 2017;22(3):63-78. doi
34. Yee XS, Ng YS, Allen JC, Latib A, Tay EL, Abu Bakar HM, et al. Performance on sit-to-stand tests in relation to measures of functional fitness and sarcopenia diagnosis in community-dwelling older adults. Eur Rev Aging Phys Act. 2021;18(1):1-11. doi
35. Galego BV, Sehnem RC, Novello D, Santos EF dos. Mini avaliação nutricional (MAN) e índice de massa corporal (IMC) e sua associação com hipertensão arterial em idosos fisicamente ativos. Uniciências. 2013;17(1):11-5. doi
36. Rauen MS, Moreira EAM, Calvo MCM, Lobo AS. Avaliação do estado nutricional de idosos institucionalizados. Rev Nutr. 2008;21(3):303-10. doi
37. Alemán-Mateo H, Esparza-Romero J, Romero RU, García HA, Pérez Flores FA, Ochoa Chacón BV, et al. Prevalence of malnutrition and associated metabolic risk factors for cardiovascular disease in older adults from Northwest Mexico. Arch Gerontol Geriatr. 2008;46(3):375-85. doi

38. Rosa CB, Garces SBB, Hansen D, Brunelli ÂV, Bianchi PD, Coser J, et al. Malnutrition risk and hospitalization in elderly assisted in primary care. Ciênc Saúde Colet. 2017;22 (2):575-82. doi
39. Moreira PL, Boas PJFV. Nutritional status and functional capacity of institutionalized elderly in Botucatu/SP. Geriatr Gerontol Aging. 2011;5(1):19-23.
40. Nam S, Kuo Y-F, Markides KS, Al Snih S. Waist circumference, body mass index, and disability among older adults in Latin American and the Caribbean. Arch Gerontol Geriatr. 2012;55(2):e40-e47. doi

Corresponding author

Rodrigo Ferrari, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brazil.
E-mail: rodrigo.ferrari@ufrgs.br.

Manuscript received on January 24, 2022
Manuscript accepted on May 4, 2022