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Reproducibility of the Senior Fitness test and handgrip strength in older adults

Reprodutibilidade do "Senior Fitness test" e força de preensão manual em idosos

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Abstract – Reproducibility is defined as the ability to achieve similar results (agreement) when a study or test is repeated using the same protocol and under similar conditions. It is a critical aspect of research and clinical practice. The aim of this study was to evaluate the reproducibility of the Senior Fitness Test and handgrip strength assessments in older adults. The sample consisted of 72 untrained older adults (16 men and 56 women). All tests and retests were conducted by experienced and trained evaluators. The tests were performed in the following order: chair stand test (CST), biceps curl, sit and reach, timed up and go (TUG), back scratch, handgrip strength, and the six-minute walk test (6MWT), in accordance with the Senior Fitness Test protocol. An adjustable handgrip dynamometer was used to assess handgrip strength. The test chair sit and reach, TUG, handgrip strength, and back scratch demonstrated an intraclass correlation coefficient (ICC) classified as excellent (>0.9). The CST, 6MWT, and biceps curl tests showed ICCs classified as good, moderate, and low, respectively (0.76, 0.72, 0.51). In conclusion, the reproducibility of handgrip strength, sit-and-reach, back scratch, and TUG were classified as excellent. On the other hand, the CST, biceps curl, and 6MWT had ICCs below 0.77, indicating the need for retesting.

Key words: Reproducibility of results; Functional performance; Elderly; Functional status; Aging health.

Resumo – *A reprodutibilidade é definida como a capacidade de obter resultados semelhantes (concordância) quando um estudo ou teste é repetido com o mesmo protocolo e condições semelhantes, ou seja, é um aspecto crucial na pesquisa e na prática clínica. O objetivo deste estudo foi avaliar a reprodutibilidade dos testes (Senior Fitness Test) e força preensão manual de pessoas idosas. A amostra foi composta por 72 pessoas idosas não treinadas (16 homens e 56 mulheres). Todos os testes e retestes foram aplicados por avaliadores experientes e treinados. Os testes foram realizados na seguinte ordem: sentar e levantar, rosca bíceps, sentar e alcançar, timed up and go (TUG), alcançar atrás das costas, força de preensão manual e o teste caminhada de seis minutos (TC6M), de acordo com o protocolo do Senior Fitness test. O dinamômetro ajustável de preensão manual foi utilizado para avaliar a força de preensão manual. Os testes: sentar e alcançar, TUG, força de preensão manual e alcançar atrás das costas tiveram um coeficiente de correlação intraclasse (ICC) classificado como excelente (>0.9). Os testes: sentar e levantar, TC6M e rosca bíceps apresentaram um ICC classificado em escala boa, moderada e baixa respectivamente (0,76, 0.72, 0.51). Em conclusão, a reprodutibilidade na força de preensão manual, sentar e alcançar, alcançar atrás das costas e TUG foram classificadas como excelentes. Por outro lado, os testes: sentar e levantar, rosca bíceps e TC6M apresentaram um ICC abaixo de 0,77, necessitando assim do reteste.*

Palavras-chave: *Reprodutibilidade dos testes; Desempenho físico funcional; Pessoa idosa; Estado funcional; Saúde da pessoa idosa.*

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INTRODUCTION

Population aging is a global phenomenon, and when combined with sedentary behavior, it leads to a significant decline in physical capacities (strength, endurance, speed, flexibility) and an increased risk of morbidity, disability, and mortality[1]. The World Health Organization (WHO)[1] estimates that between 2015 and 2050, the proportion of the global population aged 60 years or older will nearly double, rising from 12% to 22%.

The evaluation of physical and functional capacity is a critical component in mitigating physical dependence, promoting active aging, and guiding clinical decision-making by healthcare professionals[2]. A widely recognized protocol for assessing functionality in older adults is the framework established by Rikli and Jones[3], encompassing a comprehensive battery of physical and functional tests. Commonly referred to as the "Senior Fitness Test", this protocol is specifically designed to evaluate physical and functional fitness in older populations. Moreover, the inclusion of handgrip strength assessments is paramount in geriatric evaluations, as it serves as a robust predictor of sarcopenia[4] and a significant marker of mortality risk[5].

The Senior Fitness Test comprises six assessments that evaluate key components of fitness, including cardiovascular endurance, lower and upper limb strength, flexibility, and dynamic balance[3]. These tests are simple to administer, require minimal equipment, and are effective in comprehensively assessing the functional capacity of older adults[2,3]. Furthermore, the test serves as a valuable tool for tailoring exercise programs and monitoring the progression of older individuals. However, the reliability and reproducibility of these tests are of utmost importance, as they ensure that the results obtained are consistent and replicable.

Reproducibility is defined as the ability to obtain similar results (agreement) when a study or test is repeated using the same protocol and under similar conditions. It is a crucial aspect of both research and clinical practice[6]. Reproducibility does not validate the utility of tests as assessment tools but ensures that different researchers can draw consistent conclusions, achieving better agreement and precision in their results. On the other hand, few studies[7,8] have assessed the reproducibility of physical and functional tests in older adults.

The retest at regular intervals allows for the monitoring of actual changes in physical fitness over time, the adaptation of exercise programs, and the implementation of health interventions, providing a more effective assessment. By understanding the consistency of these tests over time, we can strengthen the evidence base for evaluating physical fitness in older adults and contribute to more effective strategies for promoting health and well-being in this population. Therefore, the aim of this study was to evaluate the reproducibility of the Senior Fitness Test and handgrip strength assessments for evaluating the physical and functional fitness of older adults.

METHOD

This research was approved by a research ethics committee (CAAE: 04239518.5.0000.5701) in accordance with Resolution 466/2012 of the National Council for Research Involving Human Beings. All participants signed an Informed Consent Form (ICF).

Sample

This research was conducted at the State University of Pará (UEPA), Campus III, in the Laboratory of Resistance Exercise and Health (LERES). Recruitment was carried out through announcements in WhatsApp groups and posters within the institution, aiming to select individuals aged 60 years and older who were physically fit, as verified by a medical report.

A total of 86 untrained older adults were selected according to the following inclusion criteria: a) aged 60 years or older; b) no previous experience with physical exercise in the last 3 months; c) no osteoarticular diseases that would prevent participation in the tests; d) no audiovisual limitations (e.g., cataracts, labyrinthitis); e) able to complete the tests and retests.

Participants were excluded if they had limitations in lower limb movements, used walking aids (e.g. crutches), or had any prior injuries in areas directly related to the functionality of the lower and upper limbs that would limit or prevent them from performing the tests and/or physical assessments. Additionally, those who did not complete both the test and retest were excluded. Fourteen older adults were excluded (six had audiovisual limitations and eight did not complete the tests and/or retests). After applying the inclusion and exclusion criteria, 72 older adults (16 men and 56 women) participated in the study.

Assessments

All tests and retests were administered by experienced and trained evaluators, always between 8:00 AM and 11:00 AM. One session was carried out to reduce the learning effect. After 48h, a retest was carried out in the same order. The tests followed this order: chair stand, biceps curl, sit and reach, timed up and go (TUG), back scratch, handgrip strength, and the six-minute walk test (6MWT), all conducted in accordance with the Senior Fitness Test protocol. A three-minute interval was adopted between tests, and retests were conducted in the same order and by the same team of evaluators after 48 hours.

Chair Stand Test (CST) (30 seconds)

First, the older participant sat in the middle of the seat, with a straight spinal column, feet resting on the ground and arms crossed against the chest. When signaled, the participant was encouraged to fully sit and stand as many times as possible in 30 s. This valuation utilized a 43 cm-high chair according to Rikli and Jones[3]. After 48 hours, the retest was conducted by the same team of evaluators.

Biceps curl test (30 seconds)

Individually, each older participant lifted one dumbbell (4 and 2 kg for men and women, respectively) through a full elbow range of motion during 30 s. The test score constituted the maximal number of full curls with an extended arm position[3]. After 48 hours, the retest was conducted by the same team of evaluators.

Sit and Reach

Starting from a seated position, the participant leans forward, positioning themselves at the edge of the chair seat, with one leg bent and the other fully extended. The participant is instructed to raise their arms, take a deep breath, and perform a diving motion (trunk flexion) toward the toes of the extended leg, exhaling as they descend. Abrupt movements during the descent or ascent were excluded[3]. This test was performed in triplicate (right and left sides), and the best performance was recorded. After 48 hours, the retest was conducted by the same team of evaluators.

Timed up and go (TUG)

The test involved rising from a chair and walking as fast as possible to a cone 3 m away, circling around the cone, and returning to sit on the chair fixed to the ground. Initially, the volunteer stayed in the chair with his/her feet on the floor and their back against the chair[3]. At the beep "Go" sign, the older stood up and first moved right and around the cone, back to the chair and sat down again. This trial was carried out in triplicate, and the shortest time was documented. After 48 hours, the retest was conducted by the same team of evaluators.

Back scratch test

The participants were instructed to place one hand behind the shoulder and the other under the scapula. Additionally, it is emphasized that the hands should always be in a palmar position with fingers extended. The evaluator will ask the participant to reach as far as possible toward the middle of the back, attempting to touch or overlap their hands at the maximum distance. To measure the result, the evaluator should not move the participant's hands and will use an anthropometric tape to measure the distance between the middle fingers[3].

Negative results (-) indicate the shortest distance between the middle fingers, while positive results (+) represent the measurement of the overlap between the middle fingers. This test was performed in triplicate (right and left sides), and the best performance was recorded. After 48 hours, the retest was conducted by the same team of evaluators.

Handgrip strength

Handgrip strength was evaluated by dynamometer (Saehan Corporation, Yangdeok-Dong, Korea). Verbal encouragement was used for all participants and carried out the test while sitting. The participant squeezed the dynamometer with maximum isometric strength, sustaining a grip for 5 s. This assessment was carried out in triplicate for each hand with 1-minute rest intervals between measurements as used in the previous study[9]. The dynamometer handle was adjusted if required and the best value was recorded. After 48 hours, the retest was conducted by the same team of evaluators.

Six-Minute Walk Test (6MWT)

The participants were instructed to walk as far as they could within a 6-minute period. The evaluation begins with a brief explanation of the test and the

importance of walking at a comfortable and sustainable pace throughout the duration. During the execution, an evaluator times the test and encourages the participant to keep walking, providing positive feedback to maintain motivation.

The aim of this test is to measure cardiovascular endurance by evaluating how far the person can walk in 6 minutes. It is important to note that the emphasis is not on speed but rather on the distance covered. After 6 minutes, the evaluator records the distance walked in meters or other appropriate units[3]. After 48 hours, the retest was conducted by the same team of evaluators.

Statistical analysis

To assess the intra-rater reliability (test-retest), the intraclass correlation coefficient (ICC) type 3 was used, and the classifications were defined as: poor < 0.5; moderate 0.5–0.74; good 0.75–0.9, and excellent for values greater than 0.9[10]. Absolute reliability indices were examined using the standard error of measurement (SEM), coefficient of variation (CV), and Bland-Altman limits of agreement[10]. A CV value of ≤ 10% was considered acceptable. Additionally, the technical error of measurement (TEM) and the reliability coefficient (R) were calculated to understand the inherent variability of the physical test or the evaluator and the quality of the measurements[11].

All statistical analyses were conducted using R (version 4.3.2; R Foundation for Statistical Computing, Vienna, Austria) and the "SimplyAgree"[12] (version 0.1.2) and "ggplot2" (version 3.4.4) packages[13].

RESULTS

Seventy-two older adults participated in the study based on the established eligibility criteria. The average age of the participants was 71 ± 8 years, and the average Body Mass Index (BMI) was 27.8 ± 4.3, with higher BMI values observed in women 28.3 ± 4.2 (Table 1).

Table 1. Sample characteristics.

Variables	Women	Men	Total
	(n=56)	(n=16)	
Age	70.3 ± 7.4	73.8 ± 7.8	71 ± 8
Body weight (kg)	65.4 ± 11.4	71 ± 14.3	66.6 ± 12.2
Height (m)	1.52 ± 0.06	1.65 ± 0.06	1.55 ± 0.08
BMI	28.3 ± 4.2	26.2 ± 4.4	27.8 ± 4.3

Note. Legend: BMI = body mass index

In the handgrip dynamometry test, both for the right and left hand, notable correlation coefficients were achieved: 0.92 (0.88; 0.94) and 0.95 (0.92; 0.96), respectively. Similarly, the sit and reach test demonstrated consistency, with coefficients of 0.89 (0.85; 0.93) for the right leg and 0.91 (0.88; 0.95) for the left leg. The back scratch test also showed high reproducibility, with correlation coefficients of 0.90 (0.85; 0.93) and 0.92 (0.88; 0.94) for the right and left sides, respectively. Additionally, the TUG test showed a coefficient of 0.89 (0.88; 0.94) (Table 2).

The CST showed a correlation coefficient of 0.76 (0.66; 0.83), indicating good reliability, though lower than the other tests. On the other hand, the 6MWT revealed moderate reliability, with coefficients of 0.72 (0.62; 0.81), while the bicep curl test recorded the lowest coefficient, 0.51 (0.34; 0.64), with both tests classified as moderately reliable.

Table 2. Test reproducibility in older adults.

Test		Test	Retest	ICC (IC 95%)	SEM	CV (%)	Bias (95%)
		mean ± SD	mean ± SD				
Sit and stand (repetitions)		17 ± 4	19 ± 4	0.76 (0.66; 0.83)	2	12	-2 (-8; 5)
Biceps curl (repetitions)		21 ± 5	23 ± 4	0.51 (0.34; 0.64)	3	15	-2 (-10; 7)
Sit and reach (cm)	R	-1.7 ± 8	0.4 ± 8	0.89 (0.85; 0.93)	3	-396	-2 (-10; 5)
	L	– 2 ± 8.4	0.2 ± 8	0.91 (0.88; 0.95)	2	-256	-2 (-9; 4)
Timed up and go (s)		6.7 ± 1.4	6.9 ± 1.7	0.89 (0.85; 0.93)	0.6	8	0.9 (-1; 2)
Handgrip dynamometry (kg)	R	23.2 ±7.2	23 ± 7.2	0.92 (0.88; 0.94)	2	9	0.2 (-6; 6)
	L	21.2 ± 6.6	21.7 ± 6.8	0.95 (0.92; 0.96)	2	7	-0.5 (-5; 4)
Six-minute Walk test (m)		483 ± 87	489 ±78	0.72 (0.62; 0.81)	43	9	-6 (-127; 114)
Back scratch (cm)	R	-7.7 ± 9.9	-9.6 ± 11.3	0.90 (0.85; 0.93)	3	-39.2	2 (-7; 11)
	L	-14.4 ± 12.3	-15.5 ± 13.1	0.92 (0.88; 0.94)	4	-24.4	1 (-9; 11)

Note. Legend: CV = coefficient of variation; ICC = intraclass correlation coefficient; L = left; R = right; SEM = standard error of measurement.

DISCUSSION

The aim of our study was to analyze the reproducibility of the handgrip dynamometry and Senior Fitness Test. The main findings of the study were: 1) The sit and reach, TUG, handgrip dynamometry, and back scratch tests achieved an ICC classified as excellent (>0.9); 2) Tests performed in triplicate showed higher ICC reliability compared to tests that were not conducted in triplicate; 3) The CST, 6MWT, and biceps curl test presented ICCs classified as good, moderate, and low, respectively (0.76, 0.72, 0.51), emphasizing the importance of retest application.

The tests utilized in our study replicate daily living activities, are specifically designed for older adults, and are widely recognized and applied worldwide[2-5]. Furthermore, these tests have been applied in various studies related to the analysis of functionality, independence, and physical capacities[14,15]. Our study followed the same sequence of tests applied in the original article[3]. Additionally, the evaluators were trained and experienced in administering these tests.

The results of our study indicate that tests performed in triplicate presented higher ICC values, which may be attributed to the effect of improved learning through repeated testing. In this context, the sit and reach, TUG, handgrip dynamometry, and back scratch test demonstrated excellent reproducibility reliability, eliminating the need for retesting. For instance, the TUG test showed high ICC rates in two different studies[16,17], further supporting this test conducted in triplicate yield better learning and reliability outcomes. However, another study[18] reported an ICC of 0.56 for the TUG test, indicating that various factors may account for differences in reliability, such as the sex of the sample, age, weight, and whether the participants are physically active or not.

Among all the tests that were not performed in triplicate (sit-to-stand, biceps curl, and six-minute walk), only the sit-to-stand test showed an ICC considered to be of good quality (0.76). This reinforces that triplicate testing yields more reliable and consistent results. The tests with lower ICC values: 6MWT and biceps curl, might reflect participants' inadequate adaptation to the protocols, justifying the need for retesting due to their moderate (6MWT: 0.72) and low (biceps curl: 0.51) ICC classifications. Furthermore, the order in which the tests were administered could have significantly contributed to these lower ICC outcomes. It is worth noting that the 6MWT was the final test, and participants were likely fatigued from the preceding evaluations, potentially leading to reduced performance during its administration[17].

The present study presents some limitations:1) the sample distinction between male and female participants was limited, and we suggest larger and more balanced samples for future research. 2) future studies should consider the order of the tests conducted. In our study, we followed the sequence outlined in the Senior Fitness Test protocol[3]; however, the results might vary depending on the order in which the physical tests are administered.

CONCLUSION

The results of the present study indicate that the tests sit and reach, TUG, handgrip dynamometry, and back scratch test had an ICC classified as excellent (>0.9). On the other hand, the sit to stand, 6MWT, and biceps curl test showed ICC values classified as good, moderate, and low, respectively, thus requiring the application of retesting.

COMPLIANCE WITH ETHICAL STANDARDS

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Ethical approval

Ethical approval was obtained from the local Human Research Ethics Committee –Universidade do Estado do Pará and the protocol (no. 69848623.6.0000.5174), was written in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceived and designed the experiments: OA and RPRA; Performed the experiments: OA, RPRA and THMS; Analyzed the data: NSFS and OA; Contributed reagents/materials/analysis tools: NSFS, OA, RPRA and THMS; Wrote the paper: NSFS, OA, RPRA and THMS.

REFERENCES

1. World Health Organization. Ageing and health [Internet]. 2024 [cited 2025 Jan 14]. Available from: https://www.who.int/news-room/fact-sheets/detail/ageing-and-health.
2. Tomás MT, Galán-Mercant A, Carnero EA, Fernandes B. Functional capacity and levels of physical activity in aging: a 3-year follow-up. Front Med (Lausanne). 2018;4:244. http://doi.org/10.3389/fmed.2017.00244. PMid:29376052.
3. Rikli RE, Jones CJ. Development and validation of a functional fitness test for community-residing older adults. J Aging Phys Act. 1999;7(2):129-61. http://doi.org/10.1123/japa.7.2.129.
4. Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O, Cederholm T, et al. Sarcopenia: revised European consensus on definition and diagnosis. Age Ageing. 2019;48(1):16-31. http://doi.org/10.1093/ageing/afy169. PMid:30312372.
5. Huang YC, Dong Y, Tang CM, Shi Y, Pang J. Mortality and disability risk among older adults unable to complete grip strength and physical performance tests: a population-based cohort study from China. BMC Public Health. 2024;24(1):797. http://doi.org/10.1186/s12889-024-18258-7. PMid:38481165.
6. Cossio-Bolaños M, Vidal-Espinoza R, Caceres-Bahamondes J, de Campos LFCC, Urzua-Alul L, de Lázari MSR, et al. Translation, validity and reliability of the fall risk scale for older adults. BMC Geriatr. 2024;24(1):708. http://doi.org/10.1186/s12877-024-05292-8. PMid:39182050.
7. Intaruk R, Phadungkit S, Kanpai A, Pawanta K, Srihapol N, Saengsuwan J, et al. Test-retest reliability and minimal detectable change of four functional tests in community-dwelling older adults with high risk of falls. Turk J Phys Med Rehabil. 2024;70(2):164-70. http://doi.org/10.5606/tftrd.2024.12725. PMid:38948641.
8. Hesseberg K, Bentzen H, Bergland A. Reliability of the senior fitness test in community-dwelling older people with cognitive impairment. Physiother Res Int. 2015;20(1):37-44. http://doi.org/10.1002/pri.1594. PMid:24925585.
9. Roberts HC, Denison HJ, Martin HJ, Patel HP, Syddall H, Cooper C, et al. A review of the measurement of grip strength in clinical and epidemiological studies: towards a standardised approach. Age Ageing. 2011;40(4):423-9. http://doi.org/10.1093/ageing/afr051. PMid:21624928.
10. Cuenca-Garcia M, Marin-Jimenez N, Perez-Bey A, Sánchez-Oliva D, Camiletti-Moiron D, Alvarez-Gallardo IC, et al. Reliability of field-based fitness tests in adults: a systematic review. Sports Med. 2022;52(8):1961-79. http://doi.org/10.1007/s40279-021-01635-2. PMid:35064915.
11. Schlickmann Frainer DE, Adami F, Guedes de Vasconcelos FA, Altenburg de Assis MA, Marino Calvo MC, Kerpel R. Standardization and reliability of anthropometric measurements for population surveys. Arch Latinoam Nutr. 2007;57(4):335-42. PMid:18524317.

12. Caldwell AR. SimplyAgree: an R package and jamovi Module for Simplifying Agreement and Reliability Analyses. J Open Source Softw. 2022;7(71):4148. http://doi.org/10.21105/joss.04148.

13. Wickham H. ggplot2. Wiley Interdiscip Rev Comput Stat. 2011;3(2):180-5. http://doi.org/10.1002/wics.147.

14. Leal LC, Abrahin O, Rodrigues RP, da Silva MC, Araújo AP, de Sousa EC, et al. Low-volume resistance training improves the functional capacity of older individuals with Parkinson's disease. Geriatr Gerontol Int. 2019;19(7):635-40. http://doi.org/10.1111/ggi.13682. PMid:31037806.

15. Koivunen K, Portegijs E, Karavirta L, Rantanen T. Comparing the associations between muscle strength, walking speed, and mortality in community-dwelling older adults of two birth cohorts born 28 years apart. Geroscience. 2024;46(2):1575-88. http://doi.org/10.1007/s11357-023-00925-z. PMid:37656329.

16. Nordin E, Rosendahl E, Lundin-Olsson L. Timed "Up & Go" test: reliability in older people dependent in activities of daily living--focus on cognitive state. Phys Ther. 2006;86(5):646-55. http://doi.org/10.1093/ptj/86.5.646. PMid:16649889.

17. Ries JD, Echternach JL, Nof L, Gagnon Blodgett M. Test-retest reliability and minimal detectable change scores for the timed "up & go" test, the six-minute walk test, and gait speed in people with Alzheimer disease. Phys Ther. 2009;89(6):569-79. http://doi.org/10.2522/ptj.20080258. PMid:19389792.

18. Rockwood K, Awalt E, Carver D, MacKnight C. Feasibility and measurement properties of the functional reach and the timed up and go tests in the Canadian study of health and aging. J Gerontol A Biol Sci Med Sci. 2000;55(2):M70-3. http://doi.org/10.1093/gerona/55.2.M70. PMid:10737688.