



REVISTA DE LA FACULTAD DE CIENCIAS DE LA SALUD

Vol. 28(1):179-186, April-July 2025
i-ISSN 0123-7047 e-ISSN 2382-4603



Original article

Functional physical condition assessment with the Senior Fitness Test in people performing a gymnastics program for older adults

Valoración de la condición física funcional mediante el Senior Fitness Test, en personas que realizan un programa de gimnasia para adultos mayores

Avaliação da condição física funcional por meio do Senior Fitness Test, em pessoas que participam de um programa de ginástica para idosos

Alejandra Elizabeth Zárate

alezaratekinesiologa@hotmail.com

Dr. Julio Méndez Municipal Hospital ObSBA. Ciudad Autónoma de Buenos Aires, Argentina.

Claudia Rodríguez

claudia_rod@live.com.ar

Dr. Julio Méndez Municipal Hospital ObSBA. Ciudad Autónoma de Buenos Aires, Argentina.

Christian Adrián Ayude

cayude@hotmail.com

Dr. Julio Méndez Municipal Hospital ObSBA. Ciudad Autónoma de Buenos Aires, Argentina.

Christian Marcelo Belleri

chrisbelleri76@gmail.com

Dr. Julio Méndez Municipal Hospital ObSBA. Ciudad Autónoma de Buenos Aires, Argentina.

Nora Lucrecia Gutiérrez

Lic.noragutierrez@gmail.com

Dr. Julio Méndez Municipal Hospital ObSBA. Ciudad Autónoma de Buenos Aires, Argentina.

Marcelo Ariel Messina

messinamarcelo@hotmail.com

Dr. Julio Méndez Municipal Hospital ObSBA. Ciudad Autónoma de Buenos Aires, Argentina.

Guillermo Germán Lovazzano

yiyilovazzano@hotmail.com

Dr. Julio Méndez Municipal Hospital ObSBA. Ciudad Autónoma de Buenos Aires, Argentina.

Silvia Maranzano

silviamaranzano@hotmail.com

Fundación RAFAM Argentina e Internacional. Ciudad Autónoma de Buenos Aires, Argentina.

ARTICLE INFORMATION:

Article received: July 28, 2024

Article accepted: July 31, 2025

DOI: <https://doi.org/10.29375/01237047.5116>



How to Cite. Zárate AE, Gutiérrez NL, Rodríguez C, Messina MA, Ayude CA, Lovazzano GG, et al. Functional physical condition assessment with the Senior Fitness Test in people performing a gymnastics program for older adults. MedUNAB [Internet]. 2025;28(1):179-186. doi: <https://doi.org/10.29375/01237047.5116>

Author Contributions

AEZ.

Conceptualization, methodology, formal analysis, writing of the original draft, revision and editing. NLG. Data collection. CR.

Methodology. MAM.

Conceptualization, formal analysis.

CAA. Data

collection. GGL.

Methodology, formal analysis. CMB.

Methodology. SM.

Conceptualization,

formal analysis,

writing of the

original draft.

ABSTRACT

Introduction. In exercise programs for older adults, it is recommended to measure functional physical fitness, and the Senior Fitness Test (SFT) was designed to assess it in independent individuals aged 60 to 94. The objective of this study was to describe baseline functional fitness using the SFT and explore sex-related differences among older adults entering a physical activity program in Argentina. **Methodology.** Cross-sectional study of adults over 60 who participated in the Older Adults Gymnastics Program (GAMA) in 2022–2023. SFT results were categorized as “Low,” “Normal,” or “High” based on the test manual reference values. **Results.** Data from 115 participants (95 women and 20 men) were analyzed, with a mean age of 68.3 years (SD 7.2). The tests with the highest proportion of high scores were arm strength (73.9%), agility (50.4%), and 6-minute walk (50.4%). The tests with the highest proportion of low scores were leg flexibility (34.8%), arm flexibility (34.8%), and leg strength (25.2%). Women showed significantly greater agility than men (high scores: 55.8% vs. 25.0%; $p = 0.029$). **Discussion.** The SFT proved to be a simple and suitable tool for evaluating functional physical fitness. **Conclusions.** Overall, performance was favorable in arm strength, agility, and cardiovascular endurance, while leg strength and flexibility (arms and legs) emerged as areas for targeted interventions.

Keywords:

Physical and Rehabilitation Medicine; Exercise; Physical Fitness; Exercise Therapy; Muscle Stretching Exercises; Aged; Sex; Physical Functional Performance.

RESUMEN

Introducción. En programas de ejercicio para personas mayores es recomendable medir la condición física funcional; el Senior Fitness Test (SFT) fue diseñado para medirla en personas independientes de 60 a 94 años. El objetivo del estudio fue describir la condición física funcional basal medida con SFT y explorar diferencias entre grupos según sexo en adultos mayores que ingresan a un programa de actividad física en Argentina. **Metodología.** Estudio de corte transversal en mayores de 60 años, quienes participaron en el Programa de Gimnasia para Adultos Mayores (GAMA) en 2022–2023. Los valores se categorizaron en “bajo”, “normal” o “alto” según valores de referencia del manual del SFT. **Resultados.** Se analizaron los datos de 115 personas (95 mujeres y 20 varones) con edades promedio de 68.3 (desviación estándar [DE] 7.2) años. Las pruebas con mayor proporción de valores altos fueron fuerza de brazos (73.9%), agilidad (50.4%) y caminata de 6 minutos (50.4%). Las pruebas con mayor proporción de valores bajos fueron flexibilidad de piernas (34.8%), flexibilidad de brazos (34.8%) y fuerza de piernas (25.2%). Las mujeres presentaron mayor agilidad que los varones (puntuación alta en 55.8% vs 25.0%) en forma estadísticamente significativa ($p = 0.029$). **Discusión.** El SFT mostró ser una herramienta sencilla de administrar y adecuada para la evaluación de la condición física funcional. **Conclusiones.** Se identificó un rendimiento general favorable en las pruebas de fuerza de brazos, agilidad y resistencia cardiovascular, y un posible déficit en fuerza de piernas y flexibilidad (brazos y piernas), lo que representa un área de oportunidad para intervenciones específicas.

Palabras clave:

Medicina Física y Rehabilitación; Ejercicio Físico; Aptitud Física; Terapia por Ejercicio; Ejercicios de Estiramiento Muscular; Anciano; Sexo; Rendimiento Físico Funcional.

RESUMO

Introdução. Em programas de exercícios para pessoas idosas, é aconselhável medir a condição física funcional; o Senior Fitness Test (SFT) foi desenvolvido para mensurar esse aspecto em pessoas independentes com idades entre 60 e 94 anos. O objetivo deste estudo foi descrever a condição física funcional basal medida com o SFT e explorar as diferenças entre grupos, divididos por sexo, em idosos que ingressam em um programa de atividade física na Argentina. **Metodologia.** Estudo transversal com pessoas com mais de 60 anos de idade que participaram do Programa de Ginástica para Idosos (GAMA) em 2022–2023. Os valores foram categorizados como “baixo”, “normal” ou “alto”, de acordo com os valores de referência do manual do SFT. **Resultados.** Foram analisados os dados de 115 pessoas (95 mulheres e 20 homens) com média de idade de 68.3 anos (desvio-padrão [DP] 7.2). Os testes com maior proporção de valores altos foram de força de braço (73.9%), agilidade (50.4%) e caminhada de 6 minutos (50.4%). Os testes com maior proporção de valores baixos foram flexibilidade de pernas (34.8%), flexibilidade de braços (34.8%) e força de pernas (25.2%). As mulheres apresentaram maior agilidade do que os homens (pontuação alta em 55.8% vs. 25.0%), o que foi estatisticamente significativo ($p = 0.029$). **Discussão.** O SFT provou ser uma ferramenta simples de aplicar e adequada para a avaliação da condição física funcional. **Conclusões.** Foi identificado desempenho geral favorável nos testes de força de braço, agilidade e resistência

cardiovascular, e um possível déficit em força de pernas e flexibilidade (braços e pernas), o que representa uma área de oportunidade para intervenções específicas.

Palavras-chave:

Medicina Física e Reabilitação; Exercício Físico; Aptidão Física; Terapia por Exercício; Exercícios de Alongamento Muscular; Idoso; Sexo; Desempenho Físico Funcional.

Introduction

Population aging, along with the increasing proportion of people over 60 years of age, represents a challenge for most countries worldwide, which must adapt to promote the health and functionality of this group. The World Health Organization (WHO) estimates that the population over 60 years of age will reach 2.1 billion by 2050, doubling the 1 billion recorded in 2020. This demographic phenomenon is accompanied by an increase in functional dependence, which is attributable both to the natural aging process and to the high prevalence of sedentary lifestyles (1).

In Argentina, according to data from the last census, older adults represent approximately 14% of the population, although this proportion exceeds 22% in regions such as the Autonomous City of Buenos Aires (2). This age group's growth is expected to continue steadily. In addition to this, according to the 4th National Survey of Risk Factors (ENFR, 2018), 61.6% of Argentine adults do not reach the minimum recommended levels of physical activity. This trend increases as age advances (3).

It is estimated that about 30% of older adults have some type of limitation in performing basic activities of daily living. This situation is associated with an increased risk of premature mortality and institutionalization (4) and increases the risk of falls (5). Many of these limitations can be prevented, reduced or controlled through regular physical exercise, which has been shown to provide physical benefits by improving muscle strength, endurance, joint mobility and balance. On a psychological and social level, it has a positive impact on mood, self-esteem and interpersonal interactions (6).

For exercise programs to be safe, effective and sustainable over time, it is advisable to adapt the indications to the functional capacities, clinical conditions and preferences of each elderly person. Functional fitness, defined as the physical capacity to perform normal activities of daily living safely, independently and without excessive fatigue, is a determinant of quality of life in older adults (7-9).

The Senior Fitness Test (SFT), a tool developed in 2001 by Roberta Rikli and Jessie Jones to measure functional mobility by means of a battery of six tests and designed specifically for independent elderly people between 60 and 94 years of age (10), is used to evaluate functional physical condition.

The study's objective was to describe baseline functional fitness measured with the SFT, as well as to explore differences between groups according to sex in older adults entering a physical activity program in Argentina.

Methodology

A descriptive cross-sectional study was carried out in older adults who were referred to the Kinesiology Service to take part in the Gymnastics Program for Older Adults (GAMA, for the Spanish original) in a Hospital of a Social Welfare Institution in the city of Buenos Aires (Argentina). The GAMA Program consisted of 45-minute physical exercise sessions performed in groups two days a week. A multidisciplinary team made an initial assessment of the referred people to apply eligibility criteria. For this study, the results of the evaluation before starting the exercise program were analyzed in a consecutive sample of female and male patients over 60 years of age, who signed informed consent forms and were admitted during the 2022-2023 period. People with the physical inability to perform any of the tests, who could not follow instructions, or those with any medical condition that made participation impossible (heart failure, uncontrolled hypertension, dizziness, chest pain, joint pain) were excluded.

Demographic data (age, sex) were systematically recorded in the initial evaluation, and a group of kinesiologists and physical education teachers trained to perform it applied the SFT. This test evaluates cardiovascular aerobic endurance with a 6-minute walk (the meters walked are recorded), muscular strength in upper limbs with an elbow flexion test with 2.27 kg or 5 lb weights for women and 3.63 kg or 8 lb weights for men (recording the number of repetitions in 30 seconds), muscular strength in lower limbs with sitting-rising test from a chair (recording the number of repetitions in 30 seconds), flexibility of the upper limbs by testing the ability to clasp hands behind the back (recording the distance in cm between the tips of the middle or longest fingers. A negative score [-] was given when the fingers did not touch, while a positive score [+] was given when fingers overlapped). Lower limb flexibility was tested using the chair trunk flexion test (the number of centimeters that the person is short of touching their big toe was recorded with a negative score, while the number of centimeters they could reach beyond their big toe was recorded with a positive score), and agility was tested using the stand and walk test (recording the time

in seconds it takes to return to sitting after circling a cone placed 2.45 meters away). According to the reference values of the SFT manual, each test was categorized into “low,” “normal” and “high” (Table 1). Body composition

was measured by body mass index (BMI) in kg/m². Low weight categories were defined: BMI less than 18.5; normal: BMI of 18.5 to 24.9; overweight: BMI of 25 to 29.9, and obesity: BMI greater than or equal to 30 (10).

Table 1. Reference values of the Senior Fitness Test (SFT) in women and men by age group.

Women	Age in years						
	60-64	65-69	70-74	75-79	80-84	85-89	≥90
6-minute walk in meters	545 a 660	500 a 635	480 a 615	435 a 585	385 a 540	340 a 510	275 a 440
Arm strength in repetitions	13-19	12-18	12-17	11-17	10-16	10-15	8-13
Leg strength in repetitions	12-17	11-16	10-15	10-15	9-14	8-13	4-11
Arm flexibility in centimeters	-7.6 a +3.8	-8.9 a +3.8	12.7 a +1.3	-14.0 a 0.0	-16.5 a -1.3	-17.8 a -2.5	-20.3 a -2.5
Leg flexibility in centimeters	1.3 a +12.7	-1.3 a +11.4	2.5 a +10.2	3.8 a +8.9	-5.1 a +7.6	-6.4 a +6.4	11.4 a +2.5
Agility in seconds	6.0-4.4	6.4-4.8	7.1-4.9	7.4-5.2	8.7-5.7	9.6-6.2	11.5-7.3
Men	Age in years						
	60-64	65-69	70-74	75-79	80-84	85-89	≥90
6-minute walk in meters	558-672	512-640	498-622	430-585	407-553	347-521	279-457
Arm strength in repetitions	16-22	15-21	14-21	13-19	13-19	11-17	10-14
Leg strength in repetitions	14-19	12-18	12-17	11-17	10-15	8-14	7-12
Arm flexibility in centimeters	-16.5 a 0.0	-19.1 a -2.5	-20.3 a -2.5	22.9 a -5.1	-24.1 a -5.1 cm	-24.1 a -7.6	-26.7 a -10.2
Leg flexibility in centimeters	-6.4 a +10.2	-7.6 a +7.6	-7.6 a +7.6	-10.2 a +5.1	-14.0 a +3.8	-14.0 a +1.3	-16.5 a -1.3
Agility in seconds	5.6-3.8	5.9-4.3	6.2-4.4	7.2-4.6	7.6-5.2	8.9-5.5	10.0-6.2

Source: prepared by authors.

The SFT measurement was based on exactly monitoring standardized protocols in the application and recording the results, as well as the examiners' preliminary familiarization with the guidelines for each test. To ensure maximum safety and performance, participants were given a series of instructions the day before the evaluation: a) not to engage in intense physical activity the day or two days before the assessment; b) to avoid drinking excessive alcohol the day before the tests; c) to eat a light meal one hour before the evaluation; d) to wear appropriate clothing and footwear for physical activity; e) to inform the evaluator of any circumstance that could affect the results.

To improve the accuracy of the results, it was necessary to take the following steps: a) perform the aerobic endurance test beforehand to determine the individual work rate; b) perform the tests in the following order to minimize fatigue: sitting-rising from a chair, arm flexion with weights, sitting

and reaching with their foot extended, reaching hands behind the back, laps with the 6-minute walking test, height and weight at any time; c) consider environmental condition measures (pleasant temperature/humidity to favor safe conditions); d) perform light intensity warm-up and stretching exercises for 5 to 8 minutes before starting the test with activities involving large muscle groups; e) before each test the examiner should have shown the correct way to perform the test at a slow pace to make sure each participant understood the instructions, and then at a fast pace, to demonstrate that the objective was for them to try their best within safety limits.

Statistical analysis. The mean and standard deviation (SD) were reported for numerical variables, as well as the percentage (%) with absolute frequency for categorical variables. Numerical variables were tested for normality by means of graphs and the Shapiro-Wilks

test. Categorical variables were compared with Fisher's exact test, and numerical variables were compared with the t test for independent samples or the Mann-Whitney U test, as appropriate. A p value of less than 0.05 was considered statistically significant. Stata software version 13 (StataCorp, Texas, USA) was used.

Results

We analyzed data from 115 older adults (95 women and 20 men), who participated in the GAMA Program in the 2022-2023 period, with an average age of 68.3 years (SD 7.2). Table 2 shows the baseline characteristics of the entire sample and groups according to sex.

Table 2. Baseline characteristics in the overall sample and comparison of groups according to sex in patients over 60 years of age in the GAMA Program during the 2022-2023 period.

	Overall (n = 115)	Male (n = 20)	Female (n = 95)	P Value
Mean age, years (SD)	68.3 (7.2)	71.3 (6.1)	67.7 (7.3)	0.1080
Mean weight, kg (SD)	70.7 (13.1)	83.3 (11.6)	68.1 (11.9)	<0.001
Mean BMI, kg/m² (SD)	28.6 (4.6)	30.6 (4.9)	28.2 (4.5)	0.0334
BMI categories, n(%)				
Normal	21 (18.3)	1 (5)	20 (21.1)	0.070
Overweight	54 (46.9)	8 (40)	46 (48.4)	
Obesity	40 (34.8)	11 (55)	29 (30.5)	

Abbreviations: SD: standard deviation; kg: kilograms; m²: square meters; BMI: body mass index. Decimals were rounded to the nearest decimal place. Statistically significant values are in bold.

Source: eprepared by authors.

In the overall sample, the mean for each domain of the SFT was: walk 566.3 m (SD 60.3), arm strength 20.5 repetitions (SD 3.6), leg strength 13.9 repetitions (SD 2.4) arm flexibility -4.8 cm (SD 9.8), leg flexibility 2.4 cm (SD 7.5), agility 5.0 seconds (SD 0.6).

Table 3 shows the baseline SFT values in the overall sample and the comparison of groups according to sex. Females presented a statistically significant greater leg flexibility than males (-1.7 vs. +3.3 cm).

Table 3. Baseline values of the Senior Fitness Test (SFT) in the overall sample and comparison of groups according to sex in patients over 60 years of age in the GAMA Program during the 2022-2023 period.

	Overall (n = 115)	Male (n = 20)	Female (n = 95)	P Value
6-minute walk in meters	566.3 (60.3)	589.2 (82.5)	561.7 (54.2)	0.2684
Arm strength in repetitions	20.5 (3.6)	20.9 (4.3)	20.5 (3.4)	0.6169
Leg strength in repetitions	13.9 (2.4)	14.4 (2.1)	13.8 (2.4)	0.1993
Arm flexibility in centimeters	-4.8 (9.8)	-9.6 (13.6)	-3.9 (8.6)	0.1234
Leg flexibility in centimeters	2.4 (7.5)	-1.7 (7.5)	3.3 (7.2)	0.0067
Agility in seconds	5.0 (0.6)	4.8 (0.7)	5.1 (0.6)	0.1067

Results are expressed as the mean (standard deviation). Decimals were rounded to the nearest decimal place. Statistically significant values are in bold.

Source: eprepared by authors.

Table 4 shows the description of the SFT by categories in the overall sample and the comparison of groups according to sex. The tests with the highest proportion of high values were arm strength (73.9%), agility (50.4%) and 6-minute walk (50.4%). The tests with the highest

proportion of low values were leg flexibility (34.8%), arm flexibility (34.8%) and leg strength (25.2%). Females presented a statistically significant greater agility than males (high score of 55.8% vs. 25.0%).

Table 4. DCategories of the baseline values of the Senior Fitness Test (SFT) in the overall sample and comparison of groups according to sex in patients over 60 years of age in the GAMA Program during the 2022-2023 period.

	Overall (n = 115)	Male (n = 20)	Female (n = 95)	P Value
6-minute walk				0.227
Arm strength				0.081
Leg strength				0.599
Arm flexibility				0.645
Leg flexibility				0.175
Agility				0.029

Statistically significant values are in bold.

Source: eprepared by authors.

Discussion

Physical exercise programs adapted to the particular needs of older adults aim to optimize their functionality, prevent physical deterioration and promote active and healthy aging (8,11).

The SFT, a test battery for assessing functional fitness in older adults, is characterized by being easy to administer, requires few materials, and is safe for most older adults (10).

In this study, when comparing the SFT values obtained in the sample with the normative values established for the older adult population and considering Rikli and Jones' standards, a favorable overall performance was identified in the arm strength, agility (standing, walking and sitting down again) and cardiovascular aerobic endurance (6-minute walk) tests. However, a possible deficit was observed in leg strength and flexibility (arms and legs).

A study by Carrillo et al. (12) in Cali (Colombia), evaluated physical fitness with SFT in 32 older adults (12 men and 20 women) aged between 60 and 85 years. The results showed an aerobic capacity above the 50th percentile in women, and high values of lower and upper limb strength and prehensile strength for both groups. In our study, the aerobic endurance test reached high levels in 50.4% of the sample.

In Colombia, the study by Benavides et al. (13) evaluated 253 older adults between the ages of 60 and 94 years, revealing significant reductions in physical fitness due to aging. When analyzing the functional physical condition of institutionalized older adults, it was found that they are below the reference values from the age of 80 onwards. A decrease of 20 to 23% was observed in upper and lower limb strength, respectively, as well as a reduction of 9 to 19% in agility and balance and 7 to 11% in aerobic endurance.

García et al. (14) conducted a study in Armenia (Colombia), with 468 older adults participating in physical activities. The authors reported low levels of flexibility and aerobic endurance.

Carrillo et al. (12) observed results surpassing the values considered normal in the evaluation of lower and upper limb strength in both women and men. In our study, 73.9% presented high values in the upper body strength test and 55.7% presented normal values in the lower body strength test. Having good results in cardiovascular aerobic endurance, together with agility, implies good functional capacity, which is associated with a lower rate of falls and better quality of life (15).

In this study, when exploring the differences in groups according to sex, men had less leg flexibility than women. However, when categorized according to the normative values established for the age-adjusted older adult population, only differences in agility were observed in favor of women.

A study in Bremen, Germany, with a sample of 1,583 non-institutionalized older adults, used the SFT and found that women performed better in flexibility, while men excelled in strength and endurance (7).

In Colombia, García et al. (14) showed a higher frequency of normal values in lower body strength and low values in upper body strength in both men and women.

In Chile, Tapia and Molina (5), in a sample of 52 older adults with an average age of 70, showed normal and high values in upper body strength tests (14.82) and lower body strength tests (17.45) in both sexes.

Gait disorders have a great impact on the elderly and have increased in frequency as a consequence of population aging. Health care teams should inquire

about gait problems, perform good evaluations and guide etiological studies (15). Interventions carried out through an interdisciplinary team help obtain positive results in locomotion and improve global functionality. Many of the interventions for balance and gait are simple to implement, with low-cost equipment (16).

This study has a number of limitations. First, the SFT was developed in the United States, so the reference values are for the U.S. population. However, validity and reliability (face validity, internal consistency and replicability) have been evaluated for the Spanish version (17,18), as well as construct validity in other languages (19). The population participating in the program belongs to a social project, which is characterized by behaving as a closed cohort of a medium socio-cultural level, which is health-conscious. This could be a limitation when validating the results externally, since healthy and trained older adults were evaluated. Although the overall sample included 115 people, the small number of men may have affected the study's impact when making comparisons by sexes.

Future studies will be necessary, with a greater measurement in a larger group of older adults, in order to verify whether the previously explained trend is a global reality or just a local finding. It is also suggested for interventions meant to improve the physical and functional condition of the elderly to be aimed at continuing to work on physical capacities, especially upper and lower limb flexibility. This work is part of a program, and a second evaluation is planned six months after the intervention to assess the maintenance and eventual improvement of the SFT.

Conclusions

The SFT proved to be a simple tool to administer that is suitable for assessing functional fitness in functionally independent older adults. The results of this study show that the evaluated sample presented a favorable overall performance compared to the normative values established for the older adult population. However, a lower relative score was observed in leg muscle strength and flexibility indicators, which represents an area of opportunity for specific interventions.

Conflicts of interest

The authors declare that there is no conflict of interest.

Funding

No external funding was provided to the authors for this study.

Ethical Considerations

Protection of persons and animals: this study is considered risk-free due to its nature. The program was presented to and approved by the institution's authorities.

Data confidentiality: The authors declare that they have followed their center's protocols on publishing patient data.

Right to privacy and informed consent: The authors have obtained the informed consent of patients or subjects mentioned in the article. This document is in the possession of the corresponding author referred to in the article.

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