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Timed Up and Go test as a sarcopenia screening tool in home-dwelling elderly persons

Lidiane Isabel Filippin[1]
Fernanda Miraglia[1]
Vivian Nunes de Oliveira Teixeira[2]
Márcio Manozzo Boniatti[1]

Abstract

Objective: to evaluate the performance of the Timed Up and Go test (TUG) as a screening tool for sarcopenia in elderly persons living in a city in the south of Brazil. *Method:* A cross-sectional, home-based study was conducted with 322 elderly persons. The diagnosis of sarcopenia was based on the criteria proposed by the European Working Group on Sarcopenia in Older People (EGWSOP). A Receiver Operating Characteristic (ROC) curve was constructed to assess the discriminatory power of the TUG on sarcopenia screening. *Results:* With a cutoff point of 7.5 seconds, the test had an area under the curve (AUC) of 0.66 (CI 0.56-0.76; p=0.002) and adequate sensitivity and negative predictive values (88.9% and 93.2%, respectively). *Conclusion:* Due to its ease of use and rapid execution, in addition to its low cost, this test is useful for the screening of sarcopenia, especially among elderly persons with good physical and cognitive abilities. The early identification of individuals with probable sarcopenia may allow for preventive or directive interventions for the management of this geriatric syndrome.

Keywords: Sarcopenia. Aging. Primary Health Care.

[1] Universidade La Salle, Programa de Pós-graduação em Saúde e Desenvolvimento Humano. Canoas, RS, Brasil.

[2] Universidade Federal de Ciências da Saúde de Porto Alegre, Laboratório de Imunologia, Programa de Pós-graduação em Ciências da Saúde. Porto Alegre, RS, Brasil.

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Correspondence
Lidiane Isabel Filippin
E-mail: lidiane.filippin@unilasalle.edu.br

INTRODUCTION

Aging causes physiological changes in body composition, with sarcopenia and increased fat mass common in this process. With advancing age, there is a loss of muscle mass of around 1 to 2% per year and a loss of muscle strength of 1.5 to 5% per year[1]. Decreased muscle strength and potency may influence the autonomy, well-being, and quality of life of the elderly. In a longitudinal five-year study, it was found that the reduction of muscle strength (dynapenia) was considered an independent risk factor for death among the elderly (HR=2.04; CI95%: 1.24–3.37)[2]. Physical performance parameters (strength and muscle mass) have been associated with significant health outcomes, such as a worsening of quality of life, falls, hospitalizations, frailty and sarcopenia[3]. Sarcopenia is a multifactorial syndrome with impairment of mobility, cognitive decline and early mortality[2]. In the last two decades, several diagnostic criteria have been proposed for the diagnosis of sarcopenia, involving muscle mass and strength, as well as gait speed[3-5].

In this scenario, the Timed Up and Go test (TUG) represents a possible screening tool for sarcopenia, as by allowing the evaluation of muscle strength and gait speed in a signal test it is inexpensive and easy to apply. TUG is used to assess the risk of falls in the elderly and is considered a good predictor of the frailty syndrome[6]. However, to our knowledge only one study has evaluated the use of TUG in isolation to screen for sarcopenia in a sample of hospitalized patients[7]. To identify a clinically accessible and low-cost test, the present study evaluated the performance of the TUG test as a screening tool for sarcopenia in community-dwelling elderly persons.

METHOD

A cross-sectional home-based study was conducted in a municipal region in the south of Brazil. The participants were selected as follows: a) 20% of the 51 census tracts were randomly selected; b) to ensure self-weighted sampling, a convenience sample of 40% of the target population was drawn from the selected sectors; c) an evaluation (questionnaires and physical examination) was conducted at the residences of the participants by researchers trained in standardized individual interview techniques. A total of 322 elderly persons (≥60 years) of both genders, living in the urban area of the municipality were included in the study. Of these, 111 individuals with uncontrolled hypertension (blood pressure>140/90 mmHg) and/or physical and cognitive impairment (a history of strokes and/or neurological diseases such as Parkinson's and Alzheimer's) were excluded, as such conditions made it impossible to perform the test proposed in the study. The sample was characterized by sociodemographic information (age, gender, skin color/ethnicity, education, marital status and family income), and health status was evaluated through the self-reporting of chronic diseases (number of morbidities).

The diagnosis of sarcopenia was performed according to the criteria of the European Working Group on Sarcopenia in Older People (EWGSOP)[3]: a) functional capacity measured by gait speed; b) muscle strength measured by manual grip strength measured by the Jamar hydraulic dynamometer (Sammons Preston Rolyan, 4, Sammons Court, Bolingbrook, IL, 60440); c) Lean muscle mass was assessed by the anthropometric equation proposed by Lee et al[8]. The reference points adopted were: gait speed was considered reduced when below 0.8m/s; a decrease in manual grip strength was considered to be <20kg for women and <30kg for men; total lean muscle mass was considered low when below ≤6.37kg/m^2 for women and ≤8.90kg/m^2 for men. In this study, individuals who presented a reduction in muscle mass plus a reduction in manual grip strength and /or gait speed were considered sarcopenic[2].

The TUG test was evaluated as a screening tool for sarcopenia. This test quantifies functional mobility in seconds through the task of getting up from a standardized chair, walking a three-meter linear course, turning around, and returning to sit in the chair again. The period taken to execute the test is timed.

Statistical analysis was presented as means, standard deviation and absolute frequencies for the sociodemographic and state of health characteristics.

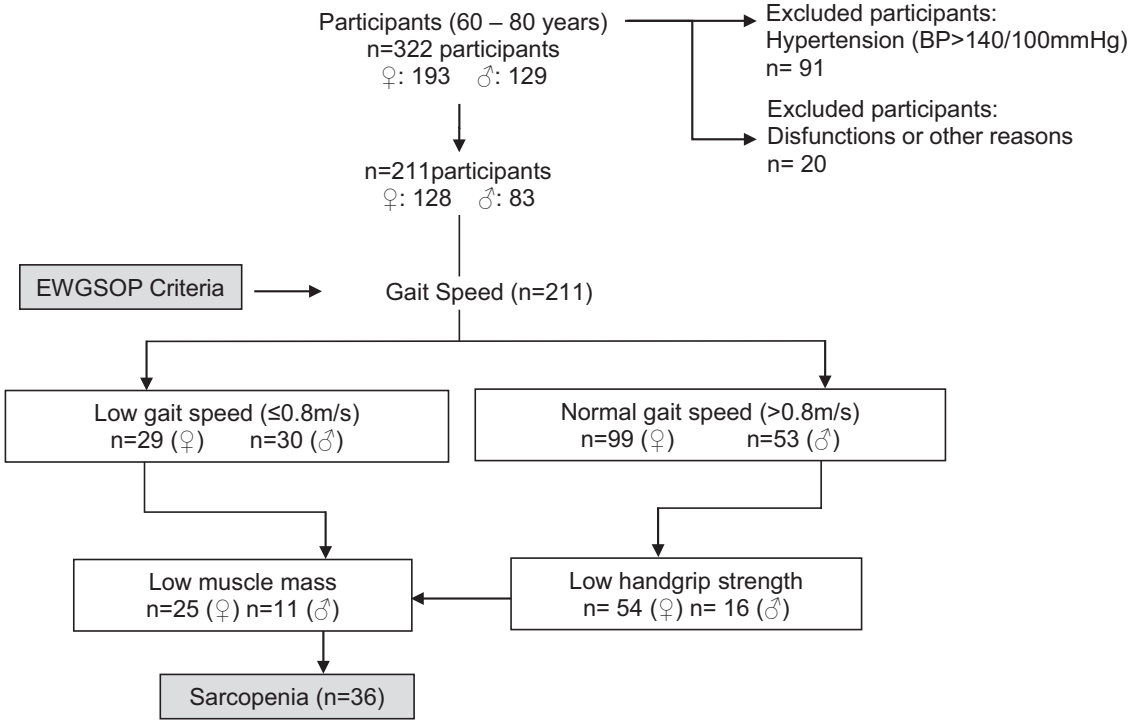
The statistical differences between the groups were analyzed with the Student's t-test for independent samples. A Receiver Operating Characteristic (ROC) curve was constructed to evaluate the discriminatory power of the TUG test for the determination of sarcopenia. The cut-off point was determined based on the requirement for high sensitivity in screening tests. In all analyzes the level of significance adopted was 5% (α=0.05).

The study was approved by the Ethics Research Committee of Unilasalle (protocol nº: 30236314.0.0000.5307). All the participants signed a Free and Informed Consent Form in compliance with Resolution 466/2012.

RESULTS

A total of 211 subjects took part in the study (flowchart 1). The sociodemographic variables are presented in Table 1. The diagnosis of sarcopenia was established in 17.1% (n=36) of such individuals using the EWGSOP criteria (table 1).

The area under the ROC curve for the TUG test when discriminating between individuals with and without sarcopenia was 0.66 (CI 0.56-0.76, p=0.002) (Figure 1). For a cut-off point of 7.5 seconds, sensitivity (88.9%), specificity (31.4%), and positive (20.9%) and negative (93.2%) predictive values were found.



Flowchart 1. Selection and exclusion criteria of sample and prevalence of sarcopenia using the EWGSOP proposed criteria among elderly residents of the community (n=211). Rio Grande do Sul, 2015.

Table 1. Sociodemographic and anthropometric characteristics of elderly population diagnosed with sarcopenia based on EWGSOP criteria (n=211). Rio Grande do Sul, 2015.

Variables	Without sarcopenia (n=175; 82.9%)	With sarcopenia (n=36; 17.1%)	All n (%)	*p*-value
Age (years)**	67.05±5.18	71.05±5.78*	67.73±5.59	<0.0001
Gender (female). n (%)	105 (49.8)	23 (63.9)	128 (60.7)	
Skin color/ethnicity (white) n (%)	150 (71.1)	34 (94.4)	184 (87.2)	
Schooling (years)**	5.51±3.55	5.23±2.58	5.46±3.40	0.603
Marital status (married). n (%)	103 (48.8)	16 (44.4)	119 (56.4)	
Family income (<3 minimum salaries). n (%)	151 (71.6)	33 (91.7)	184 (87.2)	
Number of comorbidities**	3.91±2.10	4.72±2.03*	4.05±2.11	0.036
Total muscle mass (kg)**				
Men	29.25±4.63	24.86±2.39*	28.57±4.63	<0.001
Women	19.91±3.70	15.08±1.88*	19.05±3.91	<0.0001
Total muscle mass index** (kg/m²)				
Men	10.35±1.15	8.87±0.49*	10.11±1.20	<0.0001
Women	8.14±1.27	6.42±0.73*	7.83±1.36	<0.0001
Manual grip strength ** (kgf)				
Men	38.52±7.35	24.72±4.37*	36.36±8.59	<0.0001
Women	22.23±5.86	14.97±3.69*	20.92±6.19	<0.0001
Timed Up and Go (seconds)	9.09±4.42	10.69±3.32*	9.36±3.45	0.011

*t-test for independent samples; **data presented in mean ± standard deviation; skin color/ethnicity: (determined by evaluator as white or non-white); Marital status (married or single); Family income (stratified in minimum salaries: <3 or >3); Number of comorbidities: determined by self-reported chronic diseases [diabetes, hypertension (140/90mmHg), minor psychiatric disorders, chronic bronchitis, anxiety or depression, osteoporosis, osteoarthritis, tumors]; Kg/m²: kilogram per square meter; Kgf: kilogram-force

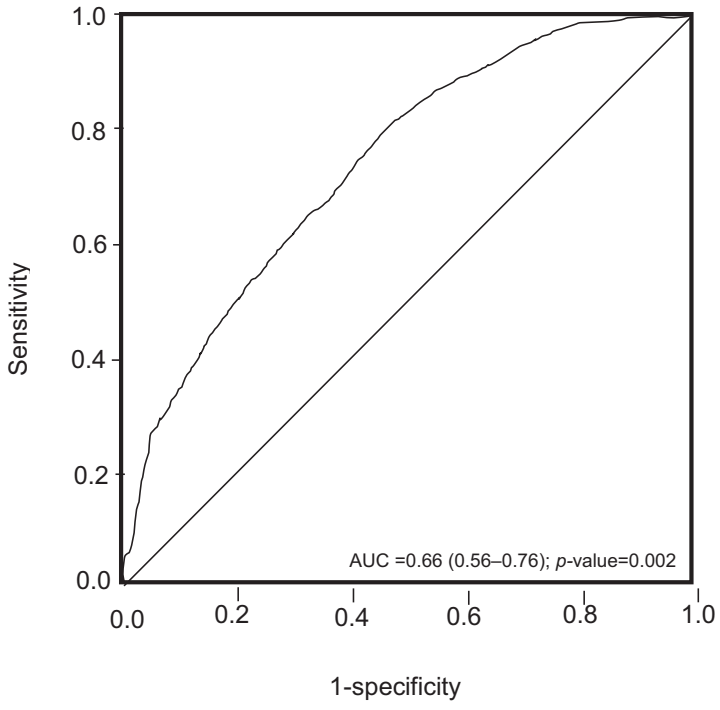


Figure 1. Accuracy of Timed Up and Go test for prediction of sarcopenia in a sample of 211 individuals living in the community. Rio Grande do Sul, 2015.

DISCUSSION

The present study demonstrated that the TUG test has adequate sensitivity for the prediction of sarcopenia in the elderly and can be used to screen for the condition. While some criteria for identifying sarcopenia have been described in literature, one of the main obstacles for early identification is the scarcity of easily applicable methods with suitable standards of validity for screening for this condition.

There is major interest in this syndrome in the aging process due to its high prevalence, as it affects a third of the elderly population[2,3]. The prevalence found in this study was similar to other studies, including research in Brazil[2,10]. Using sensitive tests for the early diagnosis of a clinical disease or syndrome is of fundamental importance, as it allows patients who could benefit from a confirmatory diagnostic evaluation and specific early intervention to be identified. The present study demonstrated the performance of TUG as a screening test for sarcopenia. The TUG is an easy-to-apply, fast and inexpensive test. These characteristics, combined with the high sensitivity demonstrated, make the test an attractive clinical tool for the screening of sarcopenia, especially in primary health care. In a smaller study of hospitalized patients, Martinez et al.[7] identified the discriminatory power of the TUG to predict sarcopenia with a cutoff point above 10.85s, (AUC: 0.80, CI=0.66-0.94, p= 0.002). However, specificity and sensitivity were 88.7% and 67.0%, respectively. It is believed that the main value of the TUG in sarcopenia is as a screening test and not as a substitute for definitive diagnosis. The test is therefore required to have high sensitivity, even with a reasonable loss of specificity.

In the present study, the cutoff point for screening for sarcopenia was lower (7.5s) than that of the study by Martinez et al.[7], which was expected, as the subjects surveyed were not hospitalized. In addition, the TUG test presented a lower false negative (11.1%) and a higher false-positive (68.8%) rate than the Martinez et al.[7] study, which identified values of 33.3% and 11.3%, respectively. A screening test is expected to have a higher sensitivity and, consequently, higher false-positive results, so that the patient is then referred for specific evaluation. A likely explanation for the discrepancies found in this study is the profile of the subjects involved in the research: the study by Martinez et al.[7] consisted predominantly of male patients admitted to hospital with clinical conditions, with a high Charlson comorbidity index (5.35±1.97), who remained hospitalized for an average of 2.76 days. In the present study, the participants lived in the community, were mostly female, had a lower number of morbidities (4.05±2.11) and, on average, were 2.7 years younger.

One of the possible reasons for the strong performance of the TUG test in sarcopenia screening is its evaluation of muscle capacity. Recently, studies have shown that a decrease in muscle strength is more easily identified than a reduction in muscle mass in the elderly and is considered a good indicator of physical disability[2]. In contrast, age-related muscle mass loss begins around the age of 30, with a decrease of 1 to 2% per year after 50 and more than 50% after 80. Thus, TUG seems to be an adequate tool for screening for sarcopenia, considering the variables of strength and gait speed[6].

The present study provides original and relevant data for public health, since the evaluations were performed in individuals living in a community, where the TUG test has not yet been tested as a screening tool for sarcopenia. The study has some limitations, however: (1) the TUG test is also used to evaluate balance and mobility in the elderly population, which may result in bias in the result, since it is not possible to dissociate the variable of balance from the variable being evaluated, sarcopenia; (2) the evaluation of elderly individuals was carried out in a single municipality in a metropolitan area in the south of Brazil, making it difficult to generalize the results; (3) the study excludes the possibility of evaluating sarcopenia in elderly persons with low physical and cognitive capacity, due to the necessity of conducting and understanding the TUG test.

CONCLUSION

The TUG test can be used for the screening of sarcopenia in elderly persons with good physical and cognitive capacity. Adequate screening has the potential to enable intervention planning, minimizing unfavorable outcomes, health care costs, functional decline and, above all, promoting successful aging.

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