



Determination of factors affecting exercise capacity in community-dwelling elderly people

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Abstract

Rationale: Exercise capacity declines with age. However, the effect of common geriatric symptoms, that are related to physical performance, on exercise capacity is unclear.

Aims: The study aimed to determine the impacts of sarcopenia, frailty, balance, and depression on both overall and abnormal exercise capacity.

Methods: One hundred and nineteen community-dwelling older adults over 65 years of age were included in the cross-sectional study. Sarcopenia and frailty status were determined according to the “European Working Group on Sarcopenia in Older People2” and “Fried frailty criteria”, respectively. Exercise capacity, balance and depression were assessed with the 6-min walk test (6MWT), the Timed Up and Go Test (TUG) and the Geriatric Depression Scale (GDS), respectively.

Results: Of the participants, 5% were sarcopenic, 32.8% were frail, and 29.4% had abnormal exercise capacity (6MWT < 82% pred). According to multivariate linear regression analysis, the model consisting of sarcopenia, frailty, TUG and GDS was explained 53% of the variation in 6MWT ($R = 0.73$, $R^2 = 0.53$, $p < 0.001$), and all variables except GDS were independent predictors of exercise capacity ($p < 0.05$). Sarcopenia was the strongest predictor of 6MWT ($\beta = -79.76$, $p = 0.011$). The model including sarcopenia, TUG, frailty, and GDS provided 29% prediction of abnormal exercise capacity (Nagelkerke $R^2 = 29.7$, $p < 0.001$), while TUG was the sole significant predictor in the model (Odd Ratio:1.32, $p < 0.002$), according to logistic regression analysis.

Conclusions: This study indicates that changes in exercise capacity are more influenced by the presence of sarcopenia, and that poor TUG performance is the greatest risk factor for the impaired exercise capacity.

KEYWORDS

exercise capacity, frailty, sarcopenia, TUG, 6MWT

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1 | INTRODUCTION

Exercise capacity is an essential measure of health and longevity in community-dwelling elderly people, as it reflects the functional reserves of several physiological systems.¹ A decline in exercise capacity is associated with aging and can be influenced by various diseases or conditions, including hypertension, frailty, cardiovascular disease, pain, diabetes mellitus, and nutritional status.¹⁻⁴

Exercise capacity, the highest level of physical performance older adults can endure, is commonly viewed as a key indicator of rehabilitation progress.¹ Skeletal muscles are necessary for optimal physical performance.⁵ However, activity levels and functional aerobic capacity both drop steadily with age.⁶ Furthermore, physiological changes that occur such as motor unit loss, fiber type changes, muscle fiber atrophy, and decreased neuromuscular activation with aging can all have an impact on movement speed and strength, resulting in diminished physical performance.^{5,7} A longitudinal observational study found an 11% decline in 6 min walking distance (6MWD), a test that measures exercise capacity, in healthy older individuals after 3 years of follow-up.⁸ Another study showed that low physical performance is independently linked to exercise capacity in elderly individuals with heart failure.⁹

Many geriatric syndromes associated with physical performance have been identified in the older adults.^{8,10-12} Skeletal muscle mass loss, also known as sarcopenia, is one of the common age-related geriatric syndromes that can lead to decreased muscle performance.¹⁰ Frailty is linked to diminished functional reserves, leading to lower ability to adjust to external or internal stressors.¹¹ In addition, psychosocial factors such as depression also reduce physical performance in older adults. A study reported that depressive symptoms and frailty were associated with 6MWD results.¹² Balance dysfunction, another geriatric syndrome seen with aging, causes an increased risk of falling and impaired functionality.⁸ These geriatric syndromes may affect exercise capacity in older adults.

Determination of factors affecting exercise capacity in older adults is important to identify individuals at higher risk of disability, negative outcomes like institutionalization, falls, and hospitalization and for effective rehabilitation approaches. There are limited studies in the literature about geriatric syndromes that affect exercise capacity in older adults.^{4,13} Frailty, sarcopenia, postural balance, and depression can predict exercise capacity in older adults. The research aims to respond to the following question: (a) which geriatric syndrome is more effective on exercise capacity in older adults? and (b) what are the risk factors for abnormal exercise capacity?

2 | METHODS

2.1 | Study design and participants

This cross-sectional study was carried out at Physical Therapy and Rehabilitation outpatient clinic of Giresun Training and Research

Hospital. This study was conducted in line with the Helsinki Declaration and the STROBE statement and was approved by the local hospital ethics committee (Approval number: 25.12.2023/07). All participants provided written informed consent.

The inclusion criteria were being 65 years of age or older, living in community dwelling, having cognitive skills for communication, and volunteering to participate in the study. Exclusion criteria were having an orthopaedic, neurological, and/or cardiopulmonary problem that prevents participation in the exercise test; and being hospitalized patients.

2.2 | Outcome measures

Participants' age, gender, education level, marital status, perceived income status and body mass index were recorded. Comorbidities were evaluated with the Charlson Comorbidity Index (CCI).¹⁴ Polypharmacy was defined as the use of five or more concurrent, distinct prescription drugs in older adults. All assessment was performed by a physiotherapist with eleven years of experience.

2.3 | Exercise capacity

The 6-min walk test (6MWT) was utilised to determine participant exercise capacity. The test was performed in a 30-metre corridor according to American Thoracic Society guidelines.¹⁵ The distance walked in 6 minutes (m) was recorded and, also percentage of predicted values (6MWD%) using Enright et al. regression equation.¹⁶ Older adults with 6MWD < 82% of predicted were defined as having abnormal exercise capacity.¹⁷ The 6MWT is a valid assessment tool for exercise capacity in older adults.¹⁶

2.4 | Balance performance

The Timed Up-and-Go (TUG) test was utilised to assess balance performance. For the TUG test, a person is required to get up from a chair, move 3 metres as quickly as possible, turn around a cone, walk back, and sit down. The time began with the instructor's "Go" command and concluded when the person returned to their starting position.¹⁸ The balance test was performed at least half an hour following the exercise capacity assessment.

2.5 | Depressive symptoms

The Geriatric Depression Scale (GDS-30) is a self-administered questionnaire that evaluates the participant's mood. The questionnaire consists of 30 items, each scored with one point, resulting in a total score of 30. A score of 0-11 indicates no depression, 11-14 indicates "probable depression," while ≥ 14 indicates "definite depression".¹⁹



2.6 | Sarcopenia

Sarcopenia was defined using the “European Working Group on Sarcopenia in Older People2” (EWGSOP2) criteria. Sarcopenia was classified based on EWGSOP2 recommendations as probable sarcopenia (low muscle strength), confirmed sarcopenia (low muscle quantity/quality and low muscle strength), and severe sarcopenia (low muscle strength, quantity/quality, and physical performance).

Fat-free mass (FFM) was evaluated with bioimpedance analysis (BIA) on a Tanita BC 532 model body analysis monitor. The formula for calculating total skeletal muscle mass (SMM) is: $SMM (kg) = FFM * 0.566$.²⁰ Skeletal muscle mass index (SMMI) (kg/m^2) was calculated by dividing the absolute total SMM by the square of height. Low SMMI was categorised by taking the cut-off values determined for the Turkish population ($<9.2 kg/m^2$ in men and $<7.4 kg/m^2$ in women).²¹

A validated technique was used to measure muscle strength using a Jamar hand dynamometer (BASELINE; Elmsford, New York, USA) for handgrip strength. Patients were instructed to sit with their elbow at 90° and their wrist in neutral posture during measurement.²² The test was performed three times unilaterally on the dominant side.

Results are presented as the best of three values. The EWGSOP2 cut-off criteria of 35 kg for men and 20 kg for women were used.²¹

The participants walked 4 metres at their normal speed during physical performance. The cut-off criterion of 0.8 m/s was chosen for both genders.²³

2.7 | Frailty

Unintentional weight loss, self-reported weariness, limited physical activity, slow gait speed, and weakness were the five criteria that Fried et al. established for the diagnosis of frailty syndrome. People were categorised as frail if they had three or more of these factors, and prefrail if they had one or two.²⁴

2.8 | Sample size and statistical analysis

The sample size was calculated with the G-Power 3.1 programme (Universitat Dusseldorf, Germany). Using multiple regression analysis, it was determined that minimum of 85 participants to obtain an effect with 80% power, at 95% confidence interval, and a medium effect size of 0.15 (f^2).

Statistical analysis was conducted with SPSS 22.0 (IBM Corp., Armonk, NY, USA). Chi-square test or Fisher's exact test were used to compare categorical variables, which are presented as frequencies (percentages). The student T-test was utilised to compare continuous variables that were reported as mean \pm standard deviation. To analyze the relationship between SMMI, handgrip strength, gait speed, Fried score, TUG, GDS, and exercise capacity, the Pearson correlation coefficient was utilised. Correlation coefficients were assessed as weak (0.1–0.49), moderate (0.5–0.69) and strong (0.7–0.89)

correlations.²⁵ To determine the 6MWD predictors, two multivariate linear regression models were constructed. In the first model, age, sex, confirmed sarcopenia, frailty, TUG and GDS were used as independent variables, and 6MWD was used as the dependent variable. In the second model, only changeable variables (confirmed sarcopenia, frailty, TUG and GDS) were added as independent variables for prediction of 6MWD. To determine the factors influencing abnormal exercise capacity, univariate and multivariate logistic regression analyses were carried out. For multivariate logistic regression analysis, two models were created with the same variables as multivariate linear regression analysis. For all analyses, statistical significance was defined as $p < 0.05$.

3 | RESULTS

A total of 147 community-dwelling older participants were evaluated. For 28 participants, sarcopenia data were missing. As a result, 119 participants (43 female, 76 male) were included in the analysis. The sociodemographic characteristics of participants are presented in Table 1.

Of the participants, 29.4% (23.7% female, 39.5% male) had abnormal exercise capacity. The sarcopenia and frailty prevalences among all participants were 5% and 32.8%, respectively. The body composition, exercise capacity, balance, physical function, sarcopenia, and frailty status of participants are shown in Table 2.

TABLE 1 Sociodemographic characteristics of participants ($n = 119$).

Characteristic	Mean (SD)/n (%)
Age	69.84 (8.65)
Gender	
Female	43 (36.1)
Male	76 (63.9)
Marital status	
Married	83 (69.7)
Widowed or divorced	36 (30.3)
Length of education	
Illiterate	6 (5)
1–8 years	60 (50.5)
>8 years	53 (44.5)
Income	
Low	49 (41.2)
Moderate	43 (36.1)
Good	27 (22.7)
Charlson comorbidity score >3	59 (49.6)
Polypharmacy	68 (57.1)

TABLE 2 Body composition, exercise capacity, balance, physical function, sarcopenia and frailty status of participants.

Variables	Overall (n = 119)	Female (n = 43)	Male (n = 76)
BMI (kg/m ²)	29.02 ± 4.57	30.68 ± 5.60	28.08 ± 3.59
SMM/height ² (kg/m ²)	10.84 ± 1.67	10.06 ± 1.13	11.28 ± 1.76
Handgrip (kg)	27.82 ± 11.87	18.30 ± 10.81	33.20 ± 8.67
Gait speed (m/s)	1.12 ± 0.28	1.01 ± 0.27	1.19 ± 0.28
6MWD (m)	405.39 ± 103.11	342.15 ± 115.66	441.17 ± 75.13
% 6MWD	88.92 ± 19.30	87.19 ± 23.94	89.90 ± 16.20
Abnormal exercise capacity	35 (29.4)	18 (23.7)	17 (39.5)
TUG (s)	9.98 ± 4.40	12.54 ± 6.12	8.53 ± 1.88
GDS (0–30)	8.65 ± 4.35	8.58 ± 4.65	8.68 ± 4.20
Sarcopenia status			
Sarcopenia	6 (5)	0 (0)	6 (7.9)
Probable sarcopenia	68 (57.1)	25 (58.1)	43 (56.6)
Non-sarcopenia	45 (37.8)	18 (41.9)	27 (35.5)
Frailty status			
Frail	39 (32.8)	30 (69.8)	9 (11.8)
Prefrail	49 (41.1)	12 (27.9)	37 (48.7)
Robust	31 (26.1)	1 (2.3)	30 (39.5)

Note: Data are presented as mean ± standard deviation or n (%).

Abbreviations: BMI, body mass index; GDS, geriatric depression scale; SMM, skeletal muscle mass; TUG, timed up and go; 6MWD, 6-min walk distance.

The comparisons of demographics, exercise capacity, sarcopenia, and frailty status between participants with abnormal and normal exercise capacity are presented in Table 3. There were significant differences in handgrip strength, gait speed, TUG, and frailty status between participants with normal and abnormal exercise capacity ($p < 0.05$). Sarcopenia status and GDS score were similar between the groups ($p > 0.05$).

The relationships of 6MWD with sarcopenia components, Fried score, and GDS are shown in Figure 1. The 6MWD for all participants was moderately correlated with handgrip strength ($r = 0.56$, $p < 0.001$) and Fried score ($r = 0.550$, $p < 0.001$) and strongly correlated with gait speed ($r = 0.750$, $p < 0.001$). GDS score ($r = 0.005$, $p = 0.56$) and SMMI (kg/m², $r = 0.170$, $p = 0.065$) were not correlated with 6MWD.

According to multivariate linear regression analysis, model 1 explained 57% of the variance in exercise capacity. Sarcopenia ($\beta = -80.00$, $p = 0.010$), female gender ($\beta = -35.78$, $p = 0.038$), TUG ($\beta = -11.50$, $p < 0.001$), and age ($\beta = -2.52$, $p = 0.042$) were independent predictors of 6MWD. Model 2 explained 53% of the

TABLE 3 Comparison of demographic, exercise capacity, sarcopenia, and frailty status between participants with abnormal and normal exercise capacity.

Variables	Abnormal exercise capacity (n = 35)	Normal exercise capacity (n = 84)	p value
Age	72.34 ± 11.24	68.80 ± 7.12	0.091
Female gender	17 (48.6)	26 (31.0)	0.054
BMI (kg/m ²)	29.95 ± 5.85	28.63 ± 3.90	0.154
SMM/height ² (kg/m ²)	10.69 ± 1.95	10.90 ± 1.54	0.533
Handgrip (kg)	23.97 ± 15.24	29.42 ± 9.83	0.022
Gait speed (m/s)	0.87 ± 0.19	1.23 ± 0.25	<0.001
6MWD (m)	300.78 ± 99.21	448.98 ± 67.42	<0.001
%6MWD	67.53 ± 11.80	97.84 ± 14.11	<0.001
TUG (s)	12.92 ± 6.38	8.75 ± 2.38	<0.001
GDS (0–30)	8.91 ± 4.90	8.54 ± 4.13	0.668
Sarcopenia status			
Sarcopenia	2 (5.7)	4 (4.8)	0.795
Probable sarcopenia	21 (60.0)	47 (56.0)	
Non-sarcopenia	12 (34.3)	33 (39.3)	
Frailty status			
Frail	19 (54.3)	20 (23.8)	0.003
Prefrail	12 (34.3)	37 (44.0)	
Robust	4 (11.4)	27 (32.1)	

Note: Data are presented as mean ± standard deviation or n (%).

Abbreviations: BMI, body mass index; GDS, geriatric depression scale; SMM, skeletal muscle mass; TUG, timed up and go; 6MWD, six-minute walk distance.

variance in exercise capacity. In this model, sarcopenia ($\beta = -79.76$, $p = 0.011$), frailty ($\beta = -39.52$, $p = 0.022$) and TUG ($\beta = -14.07$, $p < 0.001$) were independent determinants for 6MWD (Table 4).

Results of multivariate logistic regression analysis of factors associated with abnormal exercise capacity (6MWT < 82% pred) showed that TUG was the only significant variable ($p < 0.05$) for abnormal exercise capacity in both model 1 (consisting of age, female gender, GDS, sarcopenia, frailty) and model 2 (consisting of TUG, GDS, sarcopenia and frailty) (Table 5).

4 | DISCUSSION

In the current study, 5% of community-dwelling elderly people were sarcopenic and 32.8% were frail. According to multiple linear regression analysis, sarcopenia, frailty, and TUG score were associated with exercise capacity, and sarcopenia was the strongest predictor of 6MWD among the variables. Additionally, 29.4% of all

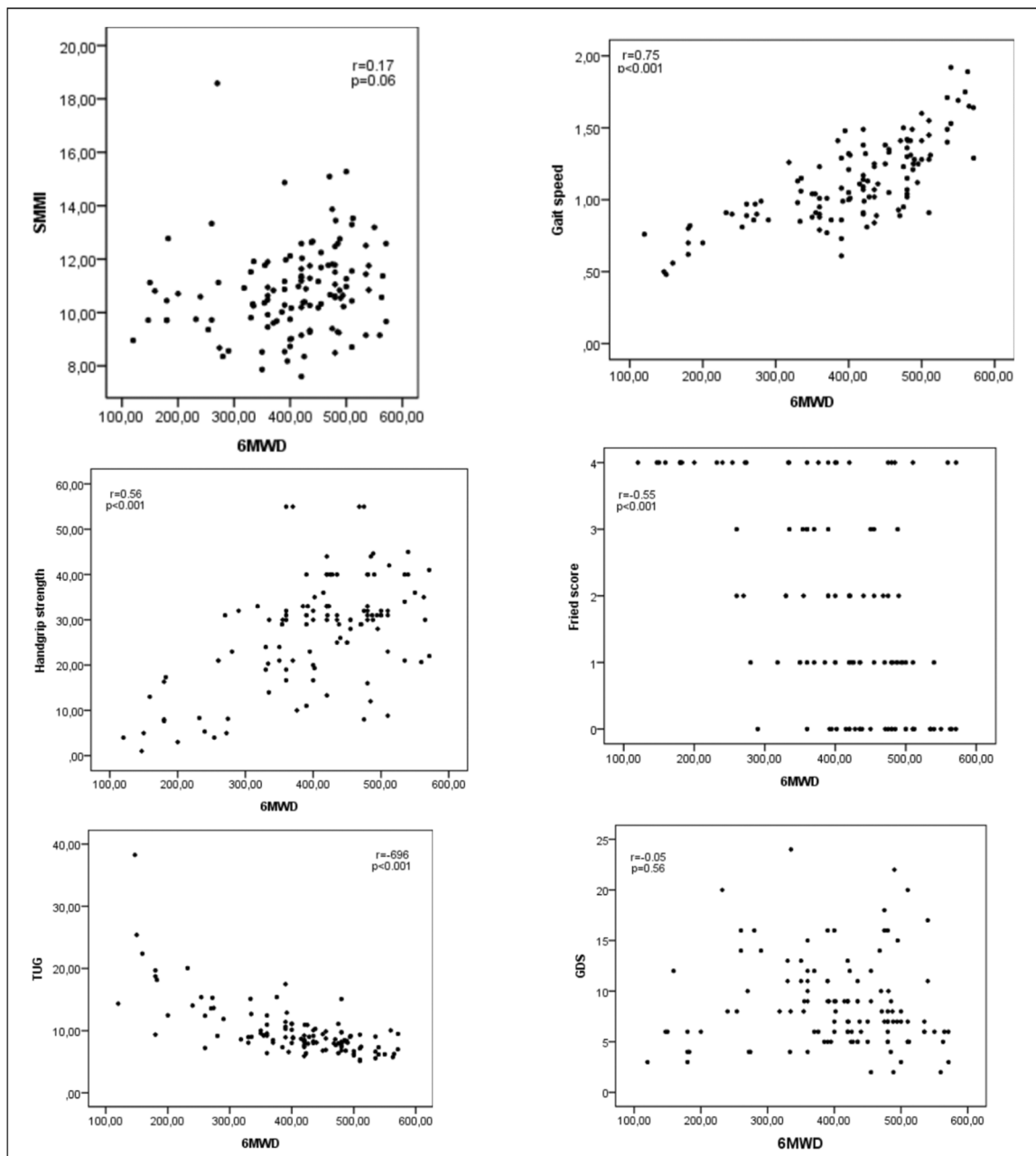


FIGURE 1 Association between 6MWD and GDS, fried score and sarcopenia criteria. GDS, geriatric depression scale; SMMI, skeletal muscle mass index; TUG, timed up and go.

participants exhibited abnormal exercise capacity. Participants with abnormal exercise capacity had higher frailty rates and lower balance scores. Nonetheless, those with normal and abnormal exercise capacity were not different in terms of sarcopenia status and GDS score. Only the TUG score was a significant risk factor for abnormal exercise capacity prediction.

Sarcopenia and frailty are two geriatric syndromes related to adverse outcomes in older people, such as mortality, disability, and reduced quality of life.¹¹ Sarcopenia is based on physical disorders characterised by progressive declines in muscle mass and strength with aging. Frailty is a problem with prevalence rising with age and is

defined as a reduction in physiological reserve that affects multiple systems.¹¹ The muscular deterioration that occurs in sarcopenia may be a risk factor for frailty; while weight loss and sedentary lifestyle known to cause frailty may also predispose a person to sarcopenia.²⁶ These syndromes are linked to conditions that might impact exercise capacity, such as reduced mobility, falls, and physical function.^{10,26} Consistent with this knowledge, the current study clearly demonstrated for the first time that sarcopenia and frailty were associated with exercise capacity in community-dwelling elderly people.

Another common symptom related to adverse outcomes in the elderly is impairments in balance control, which requires multi-system

TABLE 4 Multiple linear regression analysis of factors associated with 6-min walk distance.

	β	p	R	R ²	ΔR^2
Unadjusted Model (Univariate analysis)					
Age, years	-7.08	<0.001	0.59	0.35	0.34
Female gender	-99.02	<0.001	0.46	0.21	0.20
TUG (s)	-16.31	<0.001	0.69	0.48	0.48
GDS (0-30)	-1.26	0.565	0.05	0.003	-0.006
Sarcopenia (yes)	-64.48	0.136	0.13	0.01	0.01
Frailty (yes)	-105.32	<0.001	0.48	0.23	0.22
Adjusted Model 1					
Constant	729.51	<0.001			
Age, years	-2.52	0.042			
Female gender	-35.78	0.038			
TUG (s)	-11.50	<0.001			
GDS (0-30)	-1.85	0.239			
Sarcopenia (yes)	-80.00	0.010			
Frailty (yes)	1.22	0.953			
Adjusted Model 2					
Constant	569.52	<0.001			
TUG (s)	-14.07	<0.001			
GDS (0-30)	-0.73	0.614			
Sarcopenia (yes)	-79.76	0.011			
Frailty (yes)	-39.52	0.022			

Abbreviations: GDS, geriatric depression scale; TUG, timed up and go.

integration, particularly of the visual, vestibular, somatosensory, and musculoskeletal systems.²⁷ The association between exercise capacity and balance was the subject of few studies in the literature; however, the findings are controversial. According to a study, there was no relationship between exercise capacity and balance performance in independent older adults.¹³ Contrary to this, another study suggested that Berg balance score was strongly associated with incremental shuttle walk test (ISWT) performance.²⁸ According to the current study, exercise capacity and balance performance were associated, and the TUG score was an independent predictor of exercise capacity assessed with the 6MWT.

In the current study, multiple linear regression analysis results showed that sarcopenia was the strongest predictor of exercise capacity. This may be explained by the fact that the sarcopenia definition criteria are more closely related to physical disorders.²¹ In skeletal muscles, sarcopenia leads to various cellular, metabolic, vascular, and inflammatory alterations such as raised oxidative stress, reduced motor units, muscle capillarity, and mitochondrial compartment.^{5,10} In addition, these alterations are among the reasons for exercise intolerance.⁵ Parallely, low muscle capillarization was shown to be associated with the presence and severity of sarcopenia in older adults.²⁹ Similar to our

TABLE 5 Logistic regression analysis of factors associated with abnormal exercise capacity (6MWD < 82% pred).

Variable	OR	95% CI	p value
Unadjusted model (Univariate regression)			
Age (years)	1.04	1.01-1.09	0.044
Female (yes)	2.01	0.93-4.72	0.071
TUG	1.35	1.16-1.56	<0.001
GDS	1.02	0.93-1.11	0.665
Sarcopenia (yes)	1.21	0.21-6.94	0.829
Frailty (yes)	3.80	1.65-8.74	0.002
Adjusted Model1 (Nagelkerke R ² = 36.00)			
Age (years)	0.86	0.78-0.96	0.007
Female (yes)	0.71	0.19-2.66	0.619
TUG	1.65	1.27-2.14	<0.001
GDS	0.96	0.86-1.08	0.573
Sarcopenia (yes)	1.72	0.21-13.74	0.605
Frailty (yes)	3.72	0.84-16.45	0.082
Adjusted Model 2 (Nagelkerke R ² = 29.7)			
TUG	1.32	1.11-1.58	0.002
GDS	1.02	0.92-1.13	0.614
Sarcopenia (yes)	1.31	0.20-8.67	0.774
Frailty (yes)	1.20	0.39-3.71	0.740

Abbreviations: GDS, geriatric depression scale; TUG, timed up and go; 6MWD, six-minute walk distance.

findings, sarcopenia was revealed to be an independent predictor of exercise capacity in patients with pulmonary hypertension and community-dwelling older men.^{4,30} However, contrary to this research,^{4,30} skeletal muscle mass was not associated with exercise capacity in our analysis. The mean SMMI in this study was lower than ours, but our SMMI value was consistent with the findings of research conducted in the geriatric population in Turkey.²¹

The reduction in exercise capacity is one of the major physiological changes that occur with aging. There was a longitudinal decrease in maximum aerobic capacity in both genders in the 60s, and although the rate of decline varies over the age range, it was over 20% per decade after the age of 70.⁶ A study conducted in community-dwelling elderly people over 80 years of age reported that 39.3% of participants had peak oxygen uptake below the mortality predicted cut-off of 80%.³¹ According to another study that involved 157 adults over 60, 20.38% of the participants had low exercise capacity (ISWT < 80% predicted).¹³ In the current study, 29.4% of participants exhibited abnormal exercise capacity (6MWD < %80 predicted).

Gait speed, which is considered a vital sign of functional mobility,³² was reported to be related to aerobic capacity in elderly individuals.³³ Age-related declines in aerobic capacity lead to



insufficiency in meeting the energy required to walk at a usual speed. This suggests that lower preferred walking speed is a compensatory mechanism for lower aerobic capacity in older people.³⁴ In parallel, gait speed was strongly correlated with 6MWD and was significantly reduced in older people with abnormal exercise capacity in the current study.

Handgrip strength is a frequently used physical fitness test in the elderly population, and there are correlations between handgrip strength and other physical fitness factors such as gait speed and disability.³⁵ It is hypothesised that other physical fitness parameters will decline in correlation with a decline in handgrip strength.³⁵ Additionally, research conducted with home-dwelling middle-older adults and patients with chronic obstructive pulmonary disease showed a correlation between handgrip strength and exercise capacity assessed by 6MWD.^{36,37} Consistently, the current study showed that handgrip strength was lower in our abnormal exercise capacity group and there was a strong relationship between handgrip strength and 6MWD in community-dwelling elderly people. The result can be explained by the fact that decreased skeletal muscle strength clearly affects 6MWD performance.³⁸

Sarcopenia and frailty may be the cause of physical dysfunction, as well as also representing the consequences of permanent disruption of homeostasis in the disability situation. In the setting of disability, sarcopenia is more associated with the effects of cachexia, whereas frailty is mainly influenced by the disorder that leads to disability.¹⁰ In our study, frailty increased the risk of abnormal exercise capacity 3.8 times, whereas sarcopenia was not a determinant of abnormal exercise capacity. This situation, in parallel with the above suggestion, may be related to the fact that none of our participants was cachectic.

TUG, a valid tool to assess balance in the elderly, is also used to test lower extremity mobility and performance to estimate the risk of falls.¹⁸ In community-dwelling elderly people with mobility limitations without significant cardiovascular or respiratory disease, 6MWD was found to be weakly correlated with submaximal aerobic capacity but was strongly associated with lower extremity physical performance. In this population, lower extremity physical performance was also a predictor of 6MWD.³⁸ Another study conducted with community-dwelling elderly people found that (6MWD = 554 ± 95 m) heart rate variability (HR%), forced expiratory volume in one second (FEV₁), lean muscle %, and lower extremity performance were independent predictors of 6MWD in elderly males. That study also found that in older women (6MWD = 525 ± 65 m), HR%, appendicular lean mass, FEV₁ and age were independent predictors of 6MWD.³⁹ These findings indicate that whereas the factors related to aerobic capacity were independent predictors of overall 6MWD performance, lower extremity performance was a predictor of 6MWD in situations with disabilities. In parallel, only TUG was an independent predictor in the model constructed for abnormal exercise capacity, even though sarcopenia, frailty, and TUG were independent predictors for overall 6MWD performance in our study.

Depression is another health issue for the aging process.¹⁹ Research findings about the relationship between depression and

exercise capacity vary in community-dwelling elderly people. In a study evaluating exercise capacity with the 2-min walk test (2MWT), the GDS score was found to be closely related with 2MWT performance.¹² However, another study revealed that depression was not a significant variable in explaining the change in 6MWD, similar to our result.⁴⁰ Further investigation into how depression affects exercise capacity is required.

4.1 | Limitation

As a limitation, only TUG was employed to assess balance performance, which was variable. It is unclear whether the significant TUG score represents lower extremity physical performance or balance. Hence, assessing balance in multiple dimensions –possibly with a posturography device– will clarify our results. Given this, when interpreting our results, the expression TUG score was chosen instead of balance performance.

5 | CONCLUSION

To the best of our knowledge, this is the first study to describe the determinants of overall exercise capacity and abnormal exercise capacity in community-dwelling elderly people. Our findings indicate that sarcopenia, frailty, and TUG performance were independent predictors of 6MWD and that 53% of the variance in 6MWD was explained by the model comprising these factors. While the TUG score and frailty status differ significantly between older adults with normal and abnormal exercise capacity, the sarcopenia and depression status were similar. The model comprising TUG, GDS, sarcopenia, and frailty variables explained 29% of the variance in exercise capacity, and among the model components, only the TUG score was revealed to be a significant risk factor for the prediction of abnormal exercise capacity in this population.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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