

# New Get-Up Test as an Indicator of Sarcopenia, Sarcopenic Obesity, and Cardiovascular Disease Risk Factors

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## ABSTRACT

**PURPOSE:** To investigate the associations of get-up test time with sarcopenia, sarcopenic obesity (SO), and cardiovascular disease (CVD) risk factors. **METHODS:** This cross-sectional study included 269 older adults (56% female) aged ≥65 years (mean age 72, ranged 65-95). The get-up test was newly developed as a physical function test in which the participant should lie down to the floor and back up to standing as fast as possible, and categorized into three tertiles (fast, moderate, and slow) based on the get-up test time in seconds. Sarcopenia was defined as low appendicular lean mass index (men, ≤7.23 kg/m<sup>2</sup>; women, ≤5.67 kg/m<sup>2</sup>) plus either slow gait speed (≤0.8 m/s) or weak handgrip strength (men, <30 kg; women, <20 kg), according to the European Working Group on Sarcopenia in Older People. SO was defined as the coexistence of sarcopenia and obesity based on % body fat (men, ≥25%; women, ≥30%) using Dual Energy X-Ray absorptiometry. **RESULTS:** Mean (SD) get-up test time was 7.2 (3.2) seconds, and 29 (11%) and 27 (10%) older adults had sarcopenia and SO, respectively. Each one second increase (slow) in get-up test time was associated with unfavorable sarcopenia variables and CVD risk factors, specifically with 0.02 m/s slower gait speed, 0.67 kg weaker handgrip strength, 0.87% increased body fat, 0.64 mg/dl increased fasting glucose, and 0.71 kg/m<sup>2</sup> increased body mass index (all p<0.05) in the linear regression after adjusting for age, sex, smoking status, and alcohol intake. Compared to the fast get-up test group, odds ratios (95% confidence intervals) in moderate and slow get-up test groups were 4.42 (1.17-16.74) and 5.86 (1.60-21.41) for sarcopenia, and 4.00 (1.04-15.34) and 5.41 (1.47-19.92) for SO, respectively, in the multivariable logistic regressions. Although mostly not statistically significant, older adults in the moderate and slow get-up test groups had increased odds ratios for the prevalence of hypertension, diabetes, hypercholesterolemia, and obesity, compared to the older adults in the fast get-up test group. **CONCLUSION:** This study suggests that faster get-up test physical performance in older adults is associated with lower prevalence of sarcopenia, SO, and CVD risk factors. Get-up test can be used as a significant indicator of sarcopenia, SO, and CVD risk factors in older adults.

## INTRODUCTION

For sarcopenia and sarcopenic obesity, which is a rising global health problem, a simple, reliable, and valid measure of physical function in older adults is still lacking.

## METHODS

- Study Design:** Cross-sectional study
- Participants:** 269 older adults, ≥65 years (mean age 72, range 65-95 years).
- Get-Up test** is a physical function test in which the participant should lie down to the floor and back up to standing as fast as possible, and **categorized into three tertiles (fast, moderate, and slow)** based on the **get-up test time** in seconds.



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## METHODS

- Sarcopenia** was defined as low appendicular lean mass (ALM) index (men, ≤7.23 kg/m<sup>2</sup>; women, ≤5.67 kg/m<sup>2</sup>) plus either slow gait speed (≤0.8 m/s) or weak handgrip strength (men, <30 kg; women, <20 kg), according to the European Working Group on Sarcopenia in Older People. **ALM** was derived as the sum of the lean mass of the four limbs, then normalized by dividing by height squared to yield appendicular lean mass index using Dual Energy X-Ray absorptiometry (DXA).
- Sarcopenic obesity** was defined as the coexistence of sarcopenia and obesity based on % body fat (men, ≥25%; women, ≥30%) using Dual Energy X-Ray absorptiometry (DXA).
- Cardiovascular disease (CVD) risk factors** include blood pressure (hypertension), fasting glucose (diabetes), total cholesterol (hypercholesterolemia), and body mass index (obesity).

**Statistical Analysis:** Multivariable linear regression and multivariable logistic regression.

## RESULTS

**Table 1. Baseline Participant Characteristics**

	All (n=269)	Tertile of Get-Up Test Speed (second)		
		Low (n=89)	Middle (n=90)	High (n=90)
<b>Age, years</b>	72.1 (5.7)	72.1 (5.7)	71.8 (5)	72.4 (6.4)
<b>Female, % (n)</b>	56 (151)	57 (51)	56 (50)	56 (50)
<b>Ever smoking, % (n)</b>	34 (91)	27 (24)	42 (38)	33 (29)
<b>Heavy alcohol drinking, % (n)</b>	6 (17)	8 (7)	7 (6)	4 (4)
<b>Slow gait speed, % (n)</b>	2 (5)	1 (1)	2 (2)	2 (2)
Gait speed, m/s	1.1 (0.2)	1.2 (0.2)	1.1 (0.2)	1.1 (0.1)
<b>Weak handgrip strength, % (n)</b>	18 (47)	0 (0)	7 (6)	14 (13)
Handgrip strength, kg	30.2 (10.3)	32.4 (9.4)	30.5 (10.3)	27.8 (10.8)
<b>Low muscle mass, % (n)</b>	47 (125)	10 (9)	19 (17)	41 (37)
ALM, kg	18.8 (5.5)	18.9 (6.3)	18.4 (4.9)	19.1 (5.2)
ALM index, kg/m <sup>2</sup>	6.5 (1.4)	6.5 (1.8)	6.4 (1.1)	6.7 (1.3)
<b>Sarcopenia, % (n)</b>	11 (29)	3 (3)	12 (11)	17 (15)
<b>Sarcopenic obesity, % (n)</b>	10 (27)	3 (3)	11 (10)	16 (14)
<b>Hypertension, % (n)</b>	46 (124)	39 (35)	49 (44)	50 (45)
Peripheral SBP, mmHg	124 (18)	123 (17)	125 (20)	124 (17)
Peripheral DBP, mmHg	73 (8)	71 (7)	73 (7)	73 (8)
Central SBP, mmHg	118 (16)	117 (15)	119 (17)	117 (17)
Central DBP, mmHg	74 (8)	74 (8)	75 (7)	74 (8)
<b>Diabetes, % (n)</b>	9 (24)	6 (5)	10 (9)	11 (10)
Fasting glucose, mg/dl	98.7 (15.7)	96.2 (16.4)	100.0 (14.8)	99.8 (15.6)
<b>Hypercholesterolemia, % (n)</b>	49 (132)	48 (43)	52 (47)	47 (42)
Total cholesterol, mg/dl	187.4 (36.4)	191.7 (36.6)	185.4 (35.0)	185.3 (37.6)
<b>Obesity, % (n)</b>	21 (55)	7 (6)	14 (13)	40 (36)
Body mass index, kg/m <sup>2</sup>	26.7 (4.8)	24.9 (3.5)	26.0 (3.6)	29.1 (5.8)

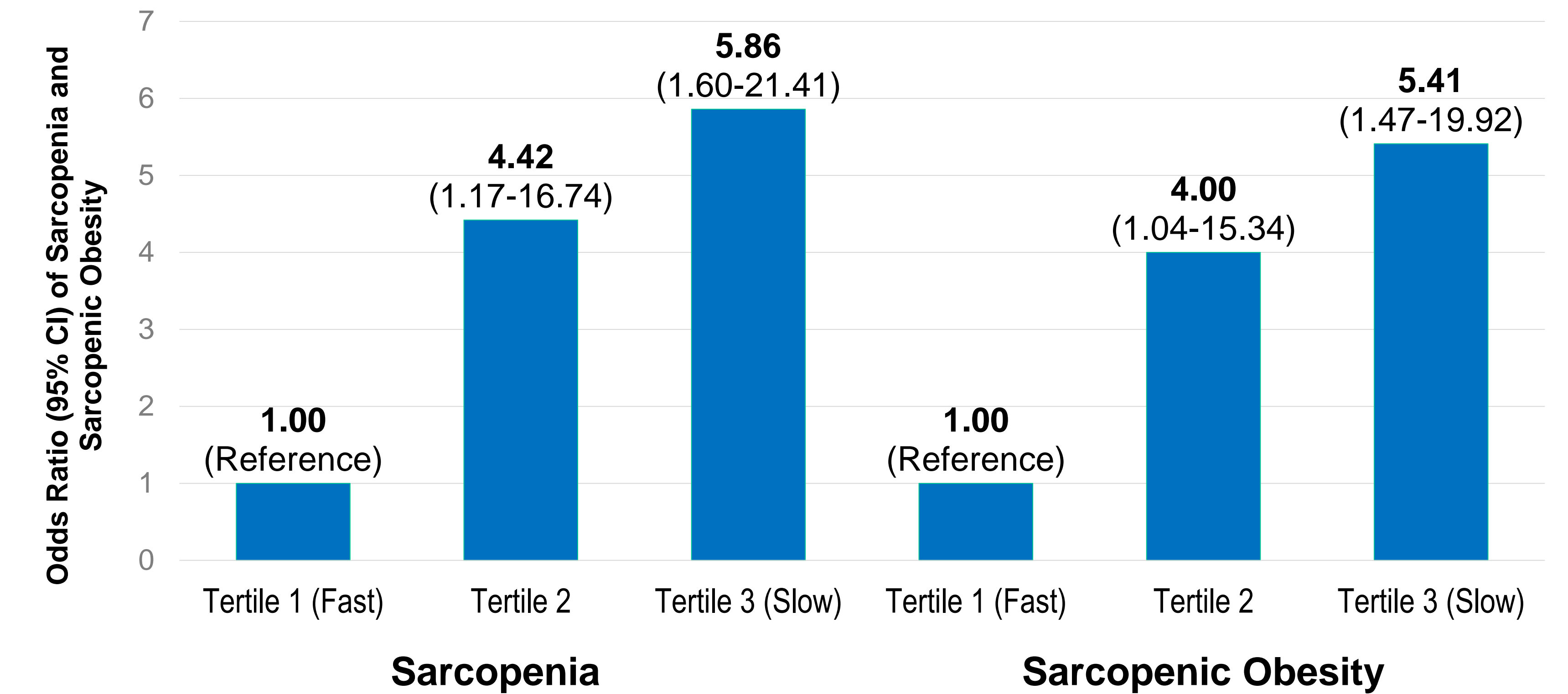
Values are means (SD) for continuous variables or % for categorical variables. ALM: appendicular lean mass, DBP: diastolic blood pressure, SBP: systolic blood pressure.

**Table 2. Sarcopenia and Sarcopenic Obesity Indices and CVD Risk Factors per Second of Get-Up Speed\***

	Coefficient	SE	P
<b>Sarcopenia &amp; Sarcopenic Obesity Variables</b>			
Gait speed (m/s)	-0.020	0.003	<0.001
Handgrip strength (kg)	-0.668	0.130	<0.001
ALM (kg)	0.103	0.068	0.130
ALM index (AML/height <sup>2</sup> , kg/m <sup>2</sup> )	0.037	0.021	0.084
% body fat (%)	0.869	0.112	<0.001
<b>Cardiovascular Disease Risk Factors</b>			
Peripheral SBP (mmHg)	-0.052	0.359	0.884
Peripheral DBP (mmHg)	0.176	0.151	0.247
Central SBP (mmHg)	-0.125	0.331	0.707
Central DBP (mmHg)	0.073	0.156	0.642
Fasting glucose (mg/dl)	0.637	0.313	0.043
Total cholesterol (mg/dl)	-0.725	0.682	0.289
Body mass index (kg/m <sup>2</sup> )	0.707	0.083	<0.001

\*Adjusted for age (years), sex, smoking status (ever smoking, yes or no), and heavy alcohol drinking (yes or no) using multivariable linear regression. ALM: appendicular lean mass, DBP: diastolic blood pressure, SBP: systolic blood pressure

**Figure 1. Odds Ratios of Sarcopenia and Sarcopenic Obesity by Get-Up Speed\***



\*Adjusted for age (years), sex, smoking status (ever smoking, yes or no), and heavy alcohol drinking (yes or no) using multivariable logistic regression. Number of participants (case) were 89 (3), 90 (11), and 90 (15) for sarcopenia, and 89 (3), 90 (10), and 90 (14) for sarcopenic obesity. CI=confidence interval.

**Table 3. Odds Ratio of Cardiovascular Disease Risk Factors by Get-Up Speed\***

	No.	No. of cases	Adjusted Odds ratio (95% CI)*
<b>Hypertension</b>			
Tertile 1 (Fast)	89	35	1.00
Tertile 2	90	44	1.45 (0.79-2.66)
Tertile 3 (Slow)	90	45	1.52 (0.83-2.79)
<b>Diabetes</b>			
Tertile 1 (Fast)	89	5	1.00
Tertile 2	90	9	1.88 (0.59-5.95)
Tertile 3 (Slow)	90	10	2.12 (0.68-6.54)
<b>Hypercholesterolemia</b>			
Tertile 1 (Fast)	89	43	1.00
Tertile 2	90	47	1.18 (0.65-2.13)
Tertile 3 (Slow)	90	42	0.93 (0.52-1.69)
<b>Obesity</b>			
Tertile 1 (Fast)	89	6	1.00
Tertile 2	90	13	2.47 (0.87-7.03)
Tertile 3 (Slow)	90	36	11.40 (4.31-30.19)

\*Adjusted for age (years), sex, smoking status (ever smoking, yes or no), and heavy alcohol drinking (yes or no) using multivariable logistic regression.

## CONCLUSIONS

- Faster get-up physical performance in older adults is associated with lower prevalence of sarcopenia, sarcopenic obesity, and cardiovascular disease risk factors.**
- Get-up test speed can be used as an indicator of sarcopenia, sarcopenic obesity, and cardiovascular disease risk factors in older adults.**

\* **Limitation:** This is a cross-sectional study, thus prospective studies are needed.

## ACKNOWLEDGMENT

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