

**Martin Šporin**<sup>1</sup>  
**Dorjana Zerbo Šporin**<sup>2,\*</sup>

## **SHORT PHYSICAL PERFORMANCE BATTERY FOR THE SCREENING OF SARCOPENIA IN OLDER SLOVENIAN NURSING HOME RESIDENTS**

## **KRATEK TEST TELESNIH SPOSOBNOSTI ZA PREPOZNAVANJE SARKOPENIJE PRI STAREJŠIH UPORABNIKIH DOMOV ZA STAREJŠE V SLOVENIJI**

### **ABSTRACT**

Sarcopenia is a common skeletal muscle disease in older adults that is associated with numerous negative consequences and represents a real public health concern. Due to the lack of appropriate measurement tools, sarcopenia is difficult to diagnose in residential care. The aim of this study was to find out whether the Short Physical Performance Battery (SPPB) score can be used as a diagnostic tool for screening older adults in nursing homes for sarcopenia in order to take targeted measures for those at risk of the disease. In the cross-sectional study, the prevalence of sarcopenia was determined using the European Working Group on Sarcopenia in Older People 2 (EWGSOP2) guidelines in 121 participants (69% women) of median age of 86 years. Physical performance was assessed using the SPPB test and the cut-off score  $\leq 6$ , which is associated with increased all-cause mortality, was used to distinguish the exposed from the non-exposed group for which the odds ratio (OR) for sarcopenia cases was calculated. The median SPPB score was lower and the prevalence of sarcopenia higher in the exposed group than in the non-exposed group (3/12 and 8/12 for SPPB score and 27.5% and 20.0% for sarcopenia prevalence, respectively), but the odds of developing sarcopenia were similar for both groups (OR=1.51; 95% CI 0.55 – 4.14;  $p=0.418$ ). The SPPB showed a lack of diagnostic ability for sarcopenia in nursing home residents when a discriminatory cut-off score of 6 was used. The SPPB score remains a valuable indicator of physical performance and thus reflects the health status of older people.

*Keywords:* physical performance, elderly, sarcopenia

<sup>1</sup>*Zg. Škofije 52c, Škofije, Slovenia*

<sup>2</sup>*Faculty of Health Science, University of Primorska, Izola, Slovenia*

### **IZVLEČEK**

Sarkopenija je pogosta bolezen skeletnih mišic pri starejših odraslih, ki je povezana s številnimi zdravstvenimi posledicami in izgubo samostojnosti. Zaradi pomanjkanja ustreznih merilnih instrumentov, je bolezen v domovih za starejše težko diagnosticirati. Namen te raziskave je bil ugotoviti, ali rezultate Kratkga testa telesnih zmogljivosti (SPPB) lahko uporabimo za prepoznavanje sarkopenije pri uporabnikih domov za starostnike v Sloveniji. V prečno presečni raziskavi, je bila s pomočjo European Working Group on Sarcopenia in Older People 2 (EWGSOP2) algoritma, razširjenost sarkopenije določena na vzorcu 121 preiskovancev (69 % žensk) povprečne starosti 86 let. Telesna zmogljivost je bila ovrednotena s testom SPPB in mejna vrednost  $\leq 6$ , ki je povezana s povečano umrljivostjo starejših, je bila uporabljena kot ločnica med rizično in manj rizično skupino, med katerima je bilo izračunano razmerje obetov (OR) za pojav sarkopenije. Srednja vrednost rezultatov SPPB testa je bila v rizični skupini nižja, razširjenost sarkopenije pa večja, v primerjavi z manj rizično skupino (3/12 in 8/12 za SPPB ter 27,5 % in 20,0 % za razširjenost sarkopenije). Verjetnost pojava sarkopenije je bila v obeh skupinah podobna (OR=1,51; 95 % CI 0,55 – 4,14;  $p=0,418$ ). V primeru uporabljene vrednosti  $\leq 6$  za opredelitev oseb s povečanim tveganjem za s starostjo povezane bolezni, je SPPB pokazal šibko sposobnost prepoznavanja sarkopenije. Rezultat SPPB testa ostaja dragocen pokazatelj telesne zmogljivosti in kot tak odraža zdravstveno stanje starejših.

*Ključne besede:* sarkopenija, telesna zmogljivost, starostniki

*Corresponding author\*:* Dorjana Zerbo Šporin

Faculty of Health Sciences, University of Primorska, Polje 42, SI-6310 Izola, Slovenia.

E-mail: dorjana.zerbosporin@fvz.upr.si

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## INTRODUCTION

Sarcopenia is a progressive and common skeletal muscle disease that occurs frequently in older adults and is associated with adverse outcomes such as physical disability, falls, fractures and mortality (Cruz-Jentoft et al., 2010). The population in the EU28 over the age of 65 is increasing and it is estimated that cases of sarcopenia will increase by 63.8 % between 2016 and 2045. This trend points to a sarcopenia epidemic if this problem is not given the necessary attention immediately (Ethgen, Beaudart, Buckinx, Bruyère & Reginster, 2017). The reported prevalence of sarcopenia in residential facilities varies between 17.7 % and 87.0 %, depending on the diagnostic criteria and the characteristics of the study population (Rodríguez-Rejón, Ruiz-López, Wander-Berghe & Artacho, 2019). The diagnosis of sarcopenia is based on the analysis of strength, functionality and muscle mass. A widely used method for determining sarcopenia is the European Working Group on Sarcopenia in Older People 2 (EWGSOP2) testing protocol, which uses muscle strength as the primary parameter of sarcopenia (Cruz-Jentoft et al., 2019). The assessment of sarcopenia, particularly the assessment of muscle mass, can be challenging as the measurement tools are rarely available in general practise (Avgerinou, 2020). The Short Physical Performance Battery (SPPB) is an easy-to-use and inexpensive test for evaluating physical performance of older adults (de Fátima Ribeiro Silva, Ohara, Matos, Pinto & Pegorari, 2020), which measures balance, strength and gait without the need for specialised instruments (Guralnik et al., 1994). Lower performance scores are highly predictive of later disability (Guralnik, Ferrucci, Simonsick, Salive & Wallace, 1995) and all-cause mortality (Pavasini et al., 2016), identifying older people who would benefit most from preventive interventions (Vasunilashorn et al., 2009). Some studies have shown promising diagnostic capabilities and provide normative SPPB values for the discrimination of sarcopenia in community-dwelling older people (Lee et al., 2021; Phu et al., 2020; Ramírez-Vélez, López Sáez de Asteasu, Morley, Cano-Gutierrez & Izquierdo, 2021), but very little is known about the relationship between SPPB values and sarcopenia in institutionalised older people.

The aim of the present study was to determine whether SPPB can identify a sarcopenic phenotype in older adults from nursing homes. First, the prevalence of sarcopenia is determined using EWGSOP2, then the diagnostic ability of SPPB in sarcopenic individuals is assessed. We hypothesise that people with lower SPPB values are more likely to have sarcopenia.

## **METHODS**

### **Sample**

Older adults from six nursing homes in western Slovenia were invited to take part in a study on the prevalence of sarcopenia. To participate in the study, residents had to be 65 years or older, able to stand and walk (including with walking aids) and score above 18 on the Mini-Mental State Examination (Granda, Mlakar & Vodušek, 2003). Participation in the study was free of charge and we received written informed consent from 128 participants. After excluding those who could not undergo the EWGSOP2 testing protocol, 121 participants were recruited. All measurements were performed in nursing homes by trained staff. We have followed the ethical guidelines of the Declaration of Helsinki and obtained approval from the National Medical Ethics Committee of the Republic of Slovenia (No. 0120-321/2017-4).

### **Study protocol**

In the cross-sectional study, the prevalence of sarcopenia was determined according to the EWGSOP2 guidelines. Possible sarcopenia was determined by low hand grip strength, which was defined by thresholds of  $< 27$  kg in men and  $< 16$  kg in women. Later, sarcopenia was confirmed by low muscle mass, defined as a Skeletal Muscle Index below  $7.0 \text{ kg/m}^2$  in men and  $5.5 \text{ kg/m}^2$  in women (Cruz-Jentoft et al., 2019).

Physical performance was assessed using the Short Physical Performance Battery. The SPPB is an objective assessment tool for evaluating the functional capacity of the lower extremities in older people. The SPPB is a composite test that includes a standing balance test (tandem, semi-tandem and side-by-side stands), a gait speed test and the ability to stand up and sit down from a chair five times as quickly as possible. A numerical value was assigned for each test: 0 – inability to perform the test, a score from 1 to 4 for completed test, 1 for worst performance, and 4 for best performance. The summarised performance score was calculated by adding the scores for the individual tests, with a maximum score of 12 (Guralnik et al., 1994).

An SPPB threshold of 6 points was used to discriminate nursing home residents for increased risk of sarcopenia, as the association between SPPB and all-cause mortality was more pronounced at lower scores (Pavasini et al., 2016). Participants with scores  $\leq 6$  points were included in an exposed group for the development of sarcopenia, participants with scores  $> 6$  points were included in a non-exposed group.

### **Data analysis**

Baseline statistics are presented as median (Mdn) and interquartile range (IQR) or frequency (%). To determine whether  $\text{SPPB} \leq 6$  points is a risk factor for sarcopenia, odds ratio (OR) and

odds ratio 95 % confidence interval (95 % CI) were calculated (Szumilas, 2010). Using a two-way table with the number of sarcopenic and non-sarcopenic individuals in the exposed and non-exposed groups, the probability of sarcopenia in one group compared to the other was assessed. The larger the OR, the more likely the occurrence of sarcopenia with decreasing SPPB. 95 % CI indicates a range of values within which we can find the true odds ratio of the total population with 95 % confidence. IBM SPSS Statistics 29.0.0.0 (SPSS inc., Chicago, IL) software was used to analyse the data.

## RESULTS

A total of 121 participants (69 % women) with a median age of 86 years (IQR 79, 89) were included in the data analysis. The median SPPB score was lower and the prevalence of sarcopenia was higher in the exposed group than in the non-exposed group (3 (IQR 1, 5) and 8 (IQR 7, 9) for SPPB and 27.5 %, 20.0 % for sarcopenia, respectively) (Table 1, Table 2).

Table 1: Baseline characteristics of participants.

Gender (women) n (%)	83 (69 %)
	Median (IQR)
Age (years)	86 (79, 89)
SPPB ≤ 6	3 (1, 5)
SPPB > 6	8 (7, 9)

Notes: SPPB= Short Physical Performance Battery total score; n= numerus

### Diagnostic value of the SPPB

The use of SPPB showed a lack of diagnostic ability for sarcopenia in nursing home residents, while the odds for sarcopenia in the exposed group were not significantly different from the non-exposed group (OR=1.51; 95% CI 0.55 – 4.14; p=0.418) (Table 2).

Table 2: The distribution of sarcopenia cases in the exposed and non-exposed group with regard to the SPPB score.

		Sarcopenia		Total (%)
		yes	no	
SPPB ≤ 6	yes n (%)	25 (27.5 %)	66 (72.5 %)	91 (75.2 %)
	no n (%)	6 (20.0 %)	24 (80.0 %)	30 (24.8 %)
		31 (25.6 %)	90 (74.4 %)	121

Notes: SPPB = Short Physical Performance Battery total score, exposed group = SPPB ≤ 6; non-exposed group = SPPB > 6; n= numerus

## DISCUSSION

Sarcopenia is a progressive and prevalent skeletal muscle disease in older adults (Cruz-Jentoft et al., 2010) that is associated with numerous adverse outcomes and represents a real public health and economic burden (Beaudart, Zaaria, Pasleau, Reginster & Bruyère, 2017).

The aim of this study was to evaluate the predictive value of the SPPB test for identifying older adults from nursing homes with sarcopenia. It was therefore hypothesised that participants with SPPB total scores  $\leq 6$  would be more likely to have sarcopenia.

Using the EWGSOP2 diagnostic tool, 25.6 % of participants in our sample were sarcopenic, which is consistent with published literature for residential facilities (Rodríguez-Rejón, Ruiz-López, Wander-Berghe & Artacho, 2019).

Regarding the predictive value of the SPPB, we compared our results with studies conducted in community-dwelling older adults, as we found no comparable studies for nursing homes. In agreement with the study by Marcos-Pardo, González-Gálvez, Carbonell-Baeza, Jiménez-Pavón & Vaquero-Cristóbal (2023), we found a lack of diagnostic ability of the SPPB for sarcopenia (OR=1.51; 95% CI 0.55 - 4.14;  $p=0.418$ ) when a score  $\leq 6$  was used as a discriminator, which is indeed a cut-of-point for increased all-cause mortality (Pavasini et al, 2016). Phu et al. (2020) also found that the SPPB is of moderate value for the diagnosis of sarcopenia in community-dwelling older persons when used alone without measuring muscle mass. Marcos-Pardo, González-Gálvez, Carbonell-Baeza, Jiménez-Pavón & Vaquero-Cristóbal (2023) reported several issues that could be a reason for the low diagnostic potential of the SPPB, as the test battery was not developed for the assessment of sarcopenia and the "ceiling effect" manifests itself in SPPB tests. This is demonstrated by the high SPPB score cut-offs of 8/12 or 11/12, which are useful for the diagnosis of older adults with severe sarcopenia (Phu, et al., 2020, Lee et al, 2021). However, if we look at the median SPPB of our sample for the exposed group (3) and the non-exposed group (8) (Table 1), we see that they are below the thresholds for severe sarcopenia mentioned above, which could mean that in our sample there is a considerable number of sarcopenic participants in both groups. It is therefore not surprising that we found a similar sarcopenic pattern in nursing home residents from groups with a total SPPB score of less than 6 or more than 6. Regardless of this, it may be important to carry out the SPPB test regularly and recognise a rapid decline in physical performance in nursing home residents, as this indicates an increased risk of death (Charles, Detilleux, Buckinx, Reginster, Gruslin & Bruyère (2020). Although the median energy expenditure of the elderly residents of

the Slovenian nursing home exceeded the limits for low physical activity (Šporin & Zerbo-Šporin, 2021), an appropriate resistance training programme should be implemented to prevent and treat sarcopenia (Beckwée et al., 2019).

## CONCLUSION

Studies reporting an association between total SPPB score and sarcopenia in nursing home residents are scarce. In our sample, we did not find sufficient predictability of sarcopenia using a total SPPB score  $\leq 6$  to distinguish those at risk for the disease. SPPB can be used to assess physical performance as a health indicator in older nursing home residents.

## Study limitations

This study has potential limitations. The results obtained may not reflect the physical performance and sarcopenic status of older Slovenian adults living in all nursing homes. The use of different SPPB cut-off values could lead to a different association between SPPB and sarcopenia. In addition, we only included participants who met certain inclusion criteria.

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## Conflict of interest

The authors declare no potential conflicts of interest.

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