

Analysis of Association between Sarcopenia and Lifestyle Patterns in Adults

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Abstract

Background/Objectives: This study was conducted to provide data for the management of sarcopenia and development of physical therapy evaluation tools by investigating the body function and lifestyle patterns of sarcopenia.

Methods/Statistical analysis: The subjects were evaluated according to the diagnostic criteria proposed by the Asia Working Group for Sarcopenia 2014, and were divided sarcopenia group and normal group. Then, the timed up and go test and the lifestyle pattern survey were investigated. The data collected in this study is the statistical program SPSS ver. 25.0 was used and independent t-test and chi-squared test were performed ($p < 0.05$).

Findings: Both groups conducted a timed up and go test and a lifestyle pattern survey. First, Timed up and go tests were performed to determine differences in functional motility between groups. As a result of the evaluation, there was a statistically significant difference of 17.07 seconds in the sarcopenia group and 15.02 seconds in the normal group, indicating that sarcopenia was accompanied by a decrease in body function. And the subject's lifestyle patterns were surveyed. Lifestyle patterns included work, movement, exercise and leisure activities, sleep, sitting and lying. There were no significant differences in high-intensity work, medium-intensity work, walking or biking on the move, high-intensity exercise and leisure activities, and sleep time. However, it was confirmed that the sarcopenia group was less than the normal group in the performance ratio and the average daily performance time of moderate-intensity exercise and leisure activities. In addition, it was confirmed that the sarcopenia group was more than the normal group in the average daily performance time of sitting and lying. These results were statistically significant.

Improvements/Applications: For the management and development of interventions of sarcopenia, a focus should be placed on increasing functional motility, promoting of medium-intensity activities and controlling sitting and lying time.

Keywords: Sarcopenia, Lifestyle pattern, Survey research, Timed up and go test, Medium-intensity exercise and leisure activity

1. Introduction

Sarcopenia is common in the elderly population and is an important risk factors for the health and life of the elderly. In 1989, Erwin Rosenverg proposed the word Sarcopenia, which includes a decline of muscle strength, muscle mass and/or reduced physical performance [1]. Sarcopenia induces restriction of physical activity, increasing the risk of falls, fractures, weakness, and death, which leads to impaired performance in daily life [2]. As of 2000, more than 50 million of adults around the world have sarcopenia, and it is estimated that after 2040, there will be more than 200 million people with sarcopenia [3]. As the life expectancy increases, the prevalence of sarcopenia associated with senile diseases will gradually increase, and the

importance of prevention, diagnosis, and management of sarcopenia. The cause of sarcopenia has not been elucidated yet. However, age, hormones, malnutrition and lifestyle are considered as related factors [4]. In particular, it has been reported that the decrease in physical activity and exercise amount among lifestyle habits is closely related to sarcopenia [5]. However, most domestic studies mainly analyze the relationship with individual diseases such as obesity and diabetes, and verify therapeutic intervention methods through exercise, and studies that investigate the lifestyle of sarcopenia were insufficient. Therefore, this study aims to prepare basic data for the management of sarcopenia and development of physical therapy evaluation tools by identifying the problems of the physical function of sarcopenia in Korean adults over 50 years of age and by investigating the lifestyle patterns.

2. Materials and Methods

In this study, we evaluated the diagnosis of sarcopenia in adults over the age of 50 and classified it into the sarcopenia group and the normal group. Then, a Timed up and go test for functional motility evaluation was conducted, and lifestyle patterns were investigated and compared. This study was initiated after approval by the institutional review committee of Eulji University, and the subjects were recruited with the cooperation of the Seongnam Senior Experience Complex.

2.1. Subjects

Research subjects were selected as those who understand the contents of the study and questionnaire, can communicate, voluntarily participate in clinical research, and do not take drugs that affect balance. And those who wore prosthetic feet or were unable to walk independently and had cardiovascular disease or mental illness were excluded. For the diagnosis of sarcopenia, the diagnostic criteria suggested by the Asia Working Group for Sarcopenia 2014 (AWGS 2014) were used [6]. Diagnostic criteria are decreased muscle strength (measure the grip strength) and decreased of skeletal muscle mass (using bioimpedance analysis) and/or reduction of walking speed. Subjects who met this diagnostic criterion were identified as 'sarcopenia group (SG)' and subjects who did not meet the criteria were identified as 'normal group (NG)' [Table 1].

Table 1: General characteristics of subjects

				Count (%)
Characteristics	Categories	SG(n=24)	NG(n=24)	
Sex	Male	1 (7.14)	13 (92.86)	
	Female	23 (27.71)	60 (72.29)	
Age	50s	3 (9.38)	29 (90.62)	
	60s	13 (30.95)	29 (69.05)	
	70s and over	8 (34.78)	15 (65.22)	

SG; sarcopenia group, NG; normal group

2.1.1. Sarcopenia Diagnosis Method

For the diagnosis and evaluation of sarcopenia, the evaluation tool presented by AWGS 2014 were used. To measure muscle strength, a digital grip dynamometer (my-5410, TAKEI, japan) was used to measure the dominant hand. Subjects were measured while holding the grip dynamometer with their dominant hand in an upright standing position with their arms extended downwards, encouraging them to apply maximum force for 4 to 5 seconds. The values measured twice at intervals of 60 seconds rest were calculated and used on average. The walking speed measurement was applied by modifying the method suggested by Kim in 2014 [7] to suit the space and distance of the measurement location. The skeletal muscle mass was measured using a bioimpedance analyzer (Inbody 570, Biospace, Seoul, Korea) and adjusted by dividing the skeletal muscle mass of the limb by the square of the height. A Comparison of diagnostic indicators for sarcopenia between groups is shown in table 2.

Table 2: Comparison of diagnostic indicators of sarcopenia between groups

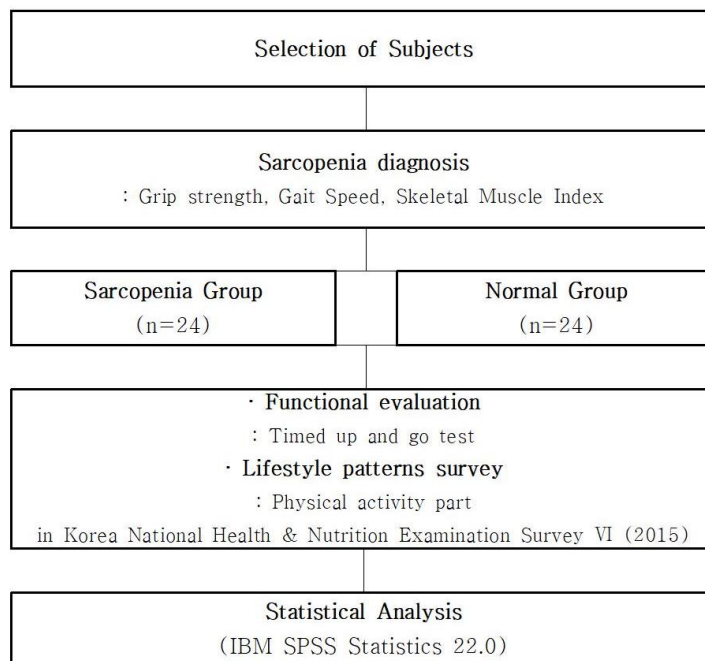
Categories	SG(n=24)	NG(n=24)	t	p
Grip strength (kg)	15.83 ± 1.45	25.92 ± 5.81	-8.252	0.000*
Gait speed (m/s)	0.49 ± 0.01	0.56 ± 0.08	-2.603	0.012*
Skeletal muscle index (kg)	14.39 ± 1.79	16.51 ± 2.65	-3.253	0.002*

(*p<0.05)

2.2. Experimental Method

Subjects conducted the Timed up and go test to evaluated functional mobility and completed a lifestyle patterns survey. In order to unify the physical condition of the experimenters, an empty stomach was maintained on the morning of the evaluation day, and the experiment was conducted after sufficiently explaining the measurement procedure. The study design is as follows

[Figure 1].

**Figure 1. Experimental design**

2.2.1. Timed Up and Go test

Timed Up and Go test were used to measure the subject's functional mobility and balance. The evaluation begins with the subject sitting down with the back and buttocks attached to the chair back. The evaluator measured the time until the subject stood up from the chair, walked straight for 3m, returned, and then sat down on the chair again.

2.2.2. Lifestyle patterns survey

The survey was conducted through a questionnaire to measure the subject's lifestyle patterns. The questionnaire was surveyed using the 'Physical activity part' of the 'Korea National Health & Nutrition Examination Survey (KNHANES) 6 (2015) - Health Interview'. The questionnaire was divided into four areas: work (occupation), movement, exercise and leisure activities, and sleep and rest, and the general lifestyle patterns were investigated. In the work and exercise and leisure activities, activities with very fast heartbeat or shortness of breath were classified as high-intensity activities, and activities with a slight shortness of breath or rapid heartbeat were classified as medium-intensity activities. The work (occupation) corresponds to occupation, study, housework, school life/education, office work, agriculture, fishing, cattle farming, service industry, and volunteer activities, etc. And the exercise and leisure activities corresponds to running, jumping rope, strength training, dancing, basketball, swimming, badminton, fast walking, jogging, golf, pilates, mountaineering, etc. For work and exercise and leisure activities, subjects responded with yes if they performed for at least 10 minutes, and no if not. For movement, Subjects responded with yes if they walked or ride a bicycle more than 10 minutes, and no if not. For sleep and rest time, we investigated the sleeping time of the day and the sitting and lying time of the day. All responses were based on activity over the past week or month.

2.3. Analysis Method

The data collected in this study is the statistical program SPSS ver. 25.0 was used and different analysis techniques were applied depending on the purpose. Independent T-test and chi-squared test were carried out to confirm the difference in functional mobility and lifestyle patterns between groups, and the statistical significance level(p-value) was set to less than 0.05.

3. Results and Discussion

Through the independent sample t-test, the difference in measurement time of the timed up and go test between the groups was confirmed. It was higher in the sarcopenia group than in the normal group ($p < 0.05$) [Table 3].

Table 3: Comparison of measurement time of the timed up and go test between groups

Categories	SG(n=24)	NG(n=24)	t	p
Timed up and go test (sec)	17.07 ± 4.03	15.02 ± 2.45	2.136	0.038*

(* $p < 0.05$)

Through a chi-squared test, the differences in the rate of performance of lifestyle patterns between the groups were confirmed. There was no statistically significant difference between the groups in the proportion of subjects who responded 'yes' to high-intensity work, medium-intensity work, walking or biking while moving, high-intensity exercise and leisure activities ($p>0.05$). However, in the proportion of subjects who responded 'yes' to medium-intensity exercise and leisure activities, sarcopenia group was statistically significantly lower ($\chi^2=8.084$, $p<0.05$). [Table 4]

Table 4: Comparison of lifestyle patterns between groups: Rate of performance

Categories		SG(n=24)	NG(n=24)	χ^2 (p)	Count (%)
High-intensity work	Yes	6 (25.00)	6 (25.00)	0.000	
	No	18 (75.00)	16 (75.00)	(1.000)	
Medium-intensity work	Yes	9 (37.50)	13 (54.17)	1.343	
	No	1 (62.50)	11 (45.83)	(0.247)	
Walking or biking while moving	Yes	21 (87.50)	20 (83.3)	0.167	
	No	3 (12.50)	4 (16.67)	(0.683)	
High-intensity exercise and leisure activities	Yes	13 (54.17)	15 (62.5)	0.343	
	No	11 (45.84)	9 (37.5)	(0.558)	
Medium-intensity exercise and leisure activities	Yes	15 (62.50)	23 (95.83)	8.084	
	No	9 (37.50)	1 (4.17)	(0.004)*	

(* $p<0.05$)

Through an independent t-test, the differences in average daily performance time of lifestyle patterns between the groups were confirmed. There was no statistically significant difference between groups in the average daily performance time of high-intensity work, medium-intensity work, walking or biking while moving, high-intensity exercise and leisure activities, sleep ($p>0.05$). However, in average daily performance time of medium-intensity exercise and leisure activities, the sarcopenia group was statistically significantly lower. And in the average daily performance time of sitting and lying, the sarcopenia group was statistically significantly higher ($p<0.05$) [Table 5].

Table 5: Comparison of lifestyle patterns between groups: Performance time

Categories	SG(n=24)	NG(n=24)	t	p
High-intensity work	0.30 ± 0.60	0.27 ± 0.61	0.171	0.865
Medium-intensity work	0.86 ± 1.53	0.74 ± 1.01	0.302	0.764
Walking or biking while moving	0.93 ± 0.83	1.06 ± 1.64	-0.333	0.741
High-intensity exercise and leisure activities	0.34 ± 0.50	0.52 ± 0.72	-0.990	0.327
Medium-intensity exercise and leisure activities	0.43 ± 0.45	0.93 ± 0.77	-2.765	0.008*
Sleep	6.63 ± 1.35	6.88 ± 0.90	-0.757	0.453
Sitting and lying	4.00 ± 2.13	2.50 ± 1.50	2.822	0.007*

(* $p<0.05$)

Timed up and go tests(TUG test) were performed to identify differences in functional mobility between groups. As shown in Table 3, the sarcopenia group took a longer time to perform the TUG test than the normal group. From these results, it has been shown that sarcopenia is accompanied by a decline in body functions such as functional mobility and balance. In a 2015 study of elderly hospitalized patients in Brazil, it was reported that TUG test could be used as a predictor of sarcopenia [8]. In future studies, a study on the TUG test criteria can be used to diagnose of sarcopenia in Koreans is necessary, and a study on functional mobility and balance of sarcopenia is necessary.

According to an announcement by the World Health Organization (WHO), physical inactivity ranks fourth as a risk factor for death, accounting for 6% of the causes of death worldwide. In addition, previous studies reported that loss of habitual and regular exercise during daily life weakens muscles and bones, leading to sarcopenia [9]. This study examined work, movement, exercise and leisure activities, sleep, sitting and lying as lifestyle patterns. As shown in Tables 4 and 5, it was confirmed that the sarcopenia group was less than the normal group in the rate of performance and the average daily

performance time of the medium-intensity exercise and leisure activities. In addition, it was confirmed that the sarcopenia group was higher than the normal group in the average daily performance time of sitting and lying. The results of this study are consistent with previous studies that elderly adults who are less physical activity have a higher risk of sarcopenia [10]. In addition, sedentary lifestyle patterns are consistent with previous studies showing that they are major risk factors for chronic disease, weakness and sarcopenia [11]. As a result, physical activity through medium-intensity exercise and leisure activities is closely related to sarcopenia.

This study was difficult to have representative because it was only targeting people living in Seongnam, Gyeonggi-do, and the number of samples is small. Also, since this study is a cross-sectional study, it has a limitation that it is difficult to know the predecessor relationship between sarcopenia and each variable. Nevertheless, this study is meaningful in that it directly applied the sarcopenia diagnostic criteria to conduct face-to-face evaluation with Korean adults, and also provided basic data by investigating the lifestyle patterns of sarcopenia adults using a verified questionnaire. In future studies, it is necessary to investigate the causal relationship between sarcopenia and lifestyle patterns in a large number of subjects in various environments.

4. Conclusion

This study was conducted to prepare basic data for the management and prevention of sarcopenia by investigating the problems of physical function and lifestyle patterns of adults with sarcopenia. The subjects were Korean adults over the age of 50, and were classified into sarcopenia group and normal group through the evaluation of sarcopenia. As a result of timed up and go test, it was found that the sarcopenia group had lower functional motility than the normal group. In addition, as a result of conducting a lifestyle survey, it was found that the sarcopenia group had less medium-intensity exercise and leisure activities compared to the normal group, and that there was more time sitting and lying. In conclusion, it was confirmed that sarcopenia has an effect on the decrease in functional motility and is closely related to medium-exercise and leisure activities and sitting and lying time among lifestyle patterns. For the prevention and management of sarcopenia, the focus should be on enhancing functional mobility and promotion of medium-intensity exercise and leisure activities and control of sitting and lying time among lifestyle patterns are recommended.

5. Acknowledgment

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