

Gait Characteristics, Balance, and Hip Joint Mobility in the elderly

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Introduction

◆Sarcopenia, characterized by progressive muscle mass and function loss, is a challenge to aging individuals. This study aims to compare gait characteristics, balance, and hip joint mobility between elderly individuals with sarcopenia and the general elderly population.

Methods

◆Forty-four elderly individuals without specific diseases were enrolled, and after obtaining consent, all biosignals and walking data were collected and analyzed.

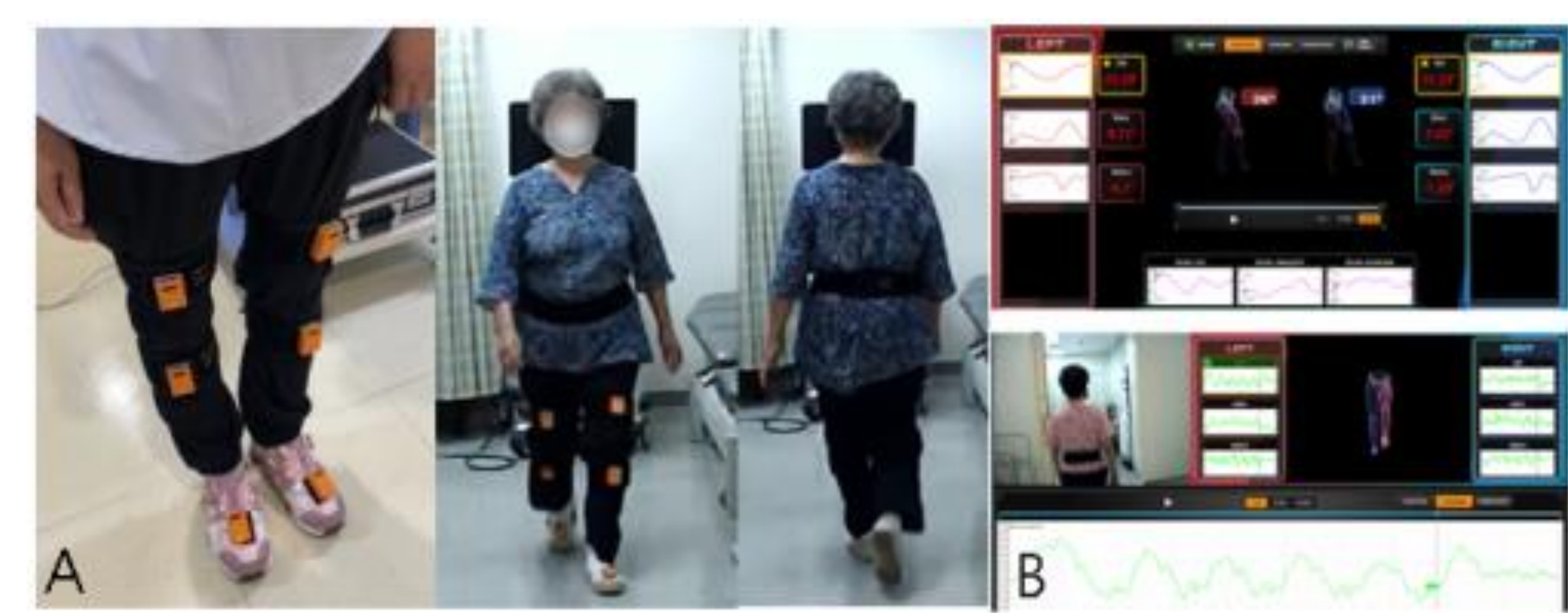


FIGURE 1. Walking Analysis Using Gait Analysis Equipment, A: Walking with Sensors Attached / B: Screen Display During Walking Analysis Examination

Results

◆The average age of subjects was 71.4 years, with an average BMI of 24.1 cm/kg²dp, and 17 met sarcopenia criteria based on Asian Working Group for Sarcopenia (AWGS) guidelines. While no significant differences were observed between the sarcopenia and general subject groups overall, the general elderly group performed significantly better on the Berg Balance Scale. Gait analysis revealed higher initial bilateral weight-bearing ratios in the sarcopenia group, indicating less stable gait, while the general elderly group exhibited higher unilateral weight-bearing ratios. Moreover, sarcopenia patients showed increased hip joint angles during walking, along with higher gait rates, suggesting potentially less efficient gait despite covering the same distance, and a linear association between gait rate and skeletal muscle index (SMI) was observed.

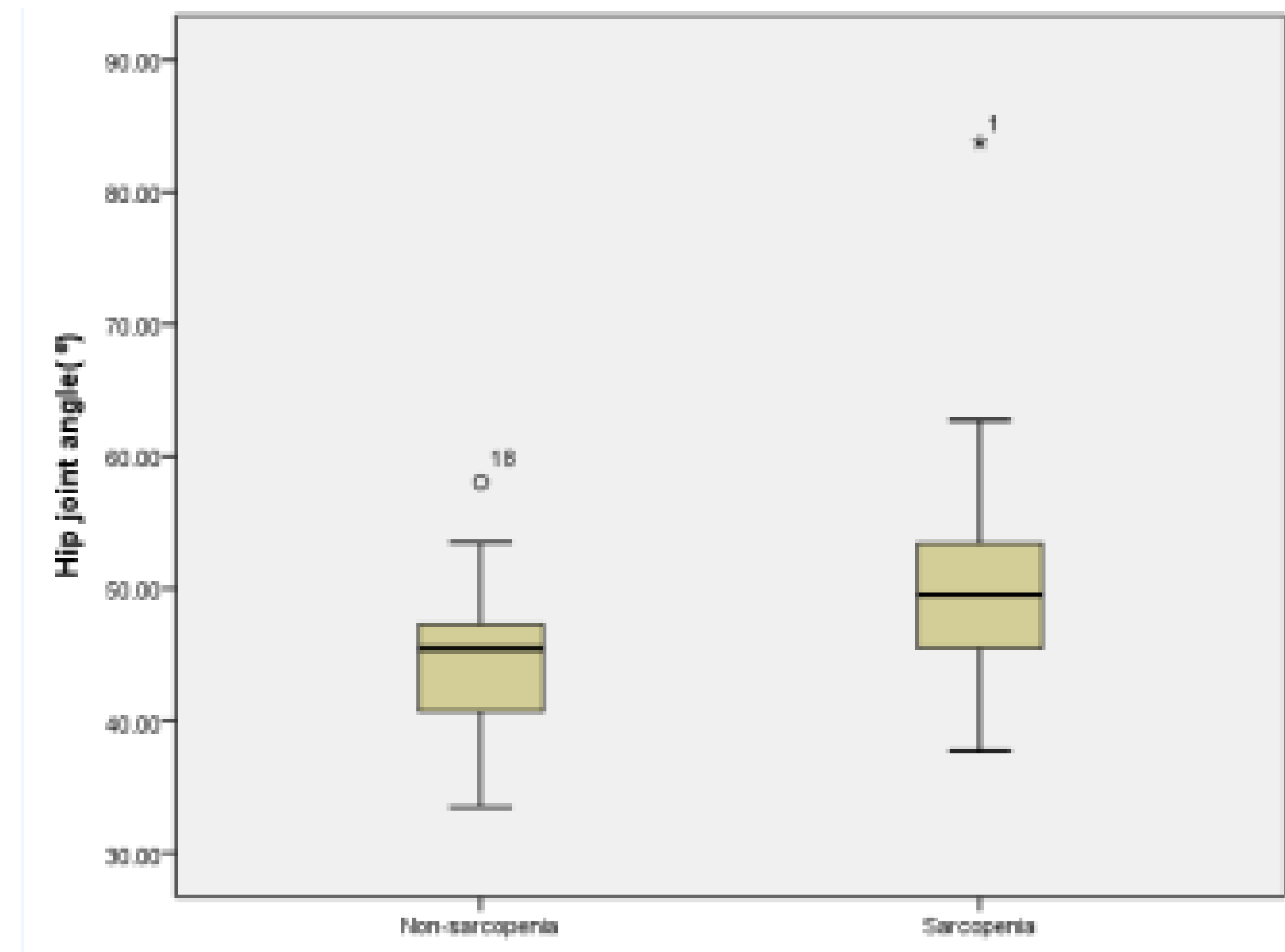


FIGURE 2. Comparison of Hip Joint Angles During Walking Left: General Elderly / Right: Sarcopenia Elderly

TABLE 1. Biometric Indices and Gait Analysis Test Results in Elderly Subjects

Characteristics	Total (n=44)	Sarcopenia (n=17)	non-sarcopenia (n=27)	P-value
General profile				
Age	71.4±4.3	70.2±4.04	72.2±4.4	0.147
Sex(Male,n)	12	5	7	0.80
Height(cm)	157.0±8.1	159.8±7.1	155.3±8.3	0.059
Body weight(kg)	59.6±10.1	58.2±10.1	60.4±10.1	0.495
BMI(cm/kg ²)	24.1±3.0	22.7±2.8	24.9±2.9	0.012*
Blood Pressure (DBP/SBP)	72.1±9.3 /126.0±11.1	73.2±10.6 /127.1±12.8	71.5±8.5 /125.3±9.9	0.592 /0.625
Heart rate	75.1±9.6	74.8±11.9	75.3±7.9	0.886
Laboratory study				
Hemoglobin	13.5±1.2	13.5±1.2	13.5±1.3	0.968
Albumin	4.2±0.2	4.2±0.2	4.2±0.2	0.249
Glucose	99.2±15.6	95.2±9.4	101.8±18.2	0.121
Triglyceride	100.1±47.8	96.5±57.4	102.3±41.8	0.720
HDL	55.5±12.4	58.5±14.1	56.6±11.1	0.232
LDL	106.0±31.9	115.4±28.3	100.1±33.2	0.110
Physical examination				
Thigh Circumference	38.4	38.4±3.3	39.5±2.6	0.273
Gait speed	0.8	0.7±0.1	0.8±0.1	‘
BBS	55.6±0.9	56	55.4±1.1	0.030*
MMSE	28.3±1.5	28.6±1.1	28.0±1.7	0.333
BDI	7.2±4.3	5.5±3.0	8.2±4.7	0.025*
DXA results				
Total %fat	38.2±5.8	37.2±5.2	38.9±6.2	0.144
A/G ratio	1.1±0.2	1.0±0.2	1.1±0.1	0.071
LBM/Height ²	16.2±6.1	13.2±1.9	18.0±2.4	0.230
LABM/Height ²	6.6±0.3	5.4±0.9	7.3±0.1	0.233
Gait analysis				
Cadence(steps/min)	104.8±7.7	106.4±7.2	103.3.8±8.1	0.027*
Stance phase (%)	63.6±2.8	63.4±3.4	63.7±2.4	0.681
Swing phase (%)	36.4±2.8	36.7±3.4	36.2±2.4	0.615
Initial double support (%)	14.8±5.3	17.2±7.7	13.3±1.6	0.014*
Single support (%)	36.4±2.8	35.7±7.3	37.3±2.5	0.149
Hip joint angle	46.8±8.4	50.9±10.4	44.1±5.5	0.020*
Knee joint angle	56.2±5.8	56.5±4.8	56.0±6.4	0.762
Ankle joint angle	32.2±13.6	35.1±20.4	30.4±6.3	0.370

BBS, Berg balance scale; BMI, Body Mass Index; DBP, Diastolic blood pressure; SBP, Systolic blood pressure, HDL, High-density lipoprotein; LDL, Low-density lipoprotein; A/G ratio, Android/Gynoid ratio; LBM, Lean body mass; LABM, Lean appendicular body mass. (*p-value<0.05)

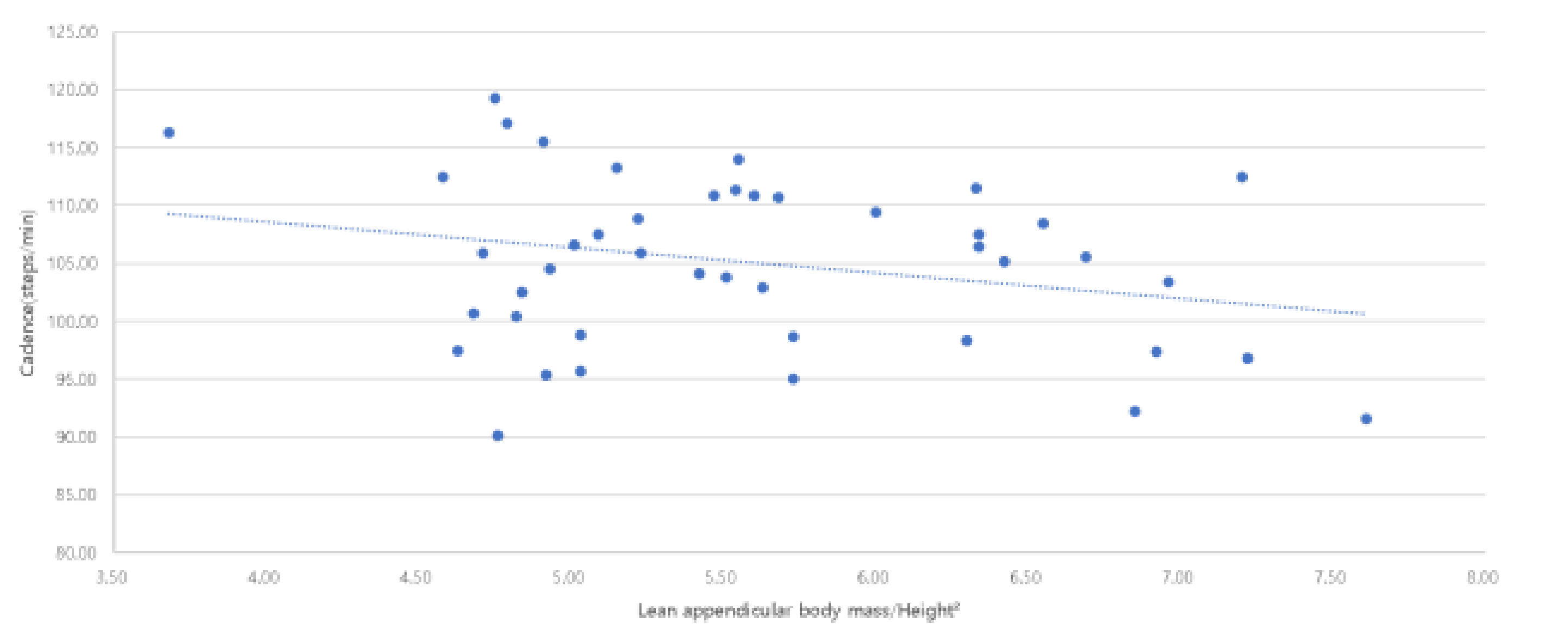


FIGURE 3. Correlation between gait rate and skeletal muscle index (SMI)

Conclusions

◆Distinct variations in gait, balance, and hip joint mobility were observed between elderly individuals with sarcopenia and the general elderly population. These findings suggest potential interventions to enhance gait stability among sarcopenia patients.