

Department of Sports and Health Sciences

Key words

Weight bearing index , Speed of sound , Gait speed , Physical function



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Education

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Consultations, Lectures, and Collaborative Research Themes

Consultation about a lifestyle and the health, Experience of the Nordic walking, Measurement of the walking speed.

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Main research themes and their characteristics

「Association between gait speed and bone strength in community-dwelling postmenopausal Japanese women」

Gait speed is the most frequently used physical performance measurement, and an association between gait speed and survival in older adults has been reported . Likewise, slow walking speed in older people has been shown to be strongly associated with an increased risk of cardiovascular mortality.

It is unclear whether gait speed can be used to predict bone status or to diagnose osteopenia or osteoporosis. Bone mineral density (BMD) is currently used to diagnose osteoporosis, and its decrease is the major risk factor for bone fracture. We measured heel bone density by ultrasound, as this measurement has been shown to predict the risk of hip fracture as efficiently as BMD measurement.

We measured speed of sound (SOS), weight bearing index (WBI), maximum or usual gait speed, step length of each gait, single leg balance time with or without eyes closed, and grip strength among 1,061 postmenopausal women (mean age \pm standard deviation 68 ± 8 years).

After adjustments for age and body mass index, SOS was associated with maximum or usual gait speed and with step length during maximum speed gait, but not with WBI, grip strength, single-leg balance time with or without eyes closed, or step-length time during usual gait speed (Table 1). When subjects were divided into quartile groups based on WBI (a marker of lower extremity strength), significant associations between usual or maximum gait speed and SOS were found only in the lowest and second lowest groups (first and second quartiles). Finally, analysis of sensitivity and specificity at various cut-off points of maximum gait speed to predict decreased SOS showed relatively high specificity compared with the corresponding sensitivity among those with low gait speed.

Receiver operating characteristic (ROC) curves for detecting persons with an SOS value of less than 1,501 or 1,479 m/s revealed better test performance using maximum gait speed (Fig. 1). Since the SOS of most of the subjects aged 85 years and older is less than 1,479 m/s, this group of subjects was excluded from this analysis. The sensitivity and specificity of predicting individuals with a SOS of less than 1,501 or 1,479 m/s showed a relatively high specificity among those with a low maximum gait speed (Fig. 2).

In conclusion, the combination of WBI and gait speed is a specific method by which to screen subjects with low SOS values and, therefore, at high risk of bone fracture. It is currently not easy to clinically discriminate those individuals at high risk for critical fractures; therefore, gait speed and physical examination may become useful tools in clinical practice.

Tab.1 Correlation of SOS with variables in physical performance test

Variable	Value
Weight bearing index	0.038
Grip strength (kg)	0.055
Single leg balance with eyes closed (sec)	0.039
Single leg balance without eyes closed (sec)	0.035
Maximum gait speed (m/min)	0.111**
Step length (maximum-speed gait)(cm)	0.072*
Usual gait speed (m/min)	0.067*
Step length (usual-speed gait)(cm)	0.029

Values are partial correlation coefficients adjusted for age and BMI

**p<0.01, *p<0.05

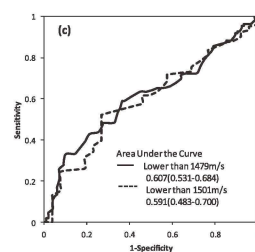


Fig.1 Receiver operating characteristic analysis of maximum gait speed to detect a speed of sound (SOS) lower than 1,479 or 1,501 m/s in different age groups. c 75–84 years

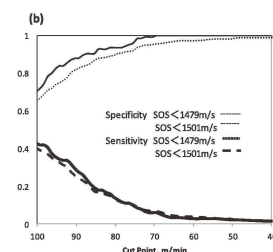


Fig.2 Sensitivity and specificity for detecting a SOS lower than 1,479 or 1,501 m/s by maximum gait speed measurement in different age groups. b 65–74 years

Major academic publications

Takahiko Sakazaki, Teruhiko Koike, Yuji Yanagimoto & Yoshiharu Oshida
“Association between gait speed and bone strength in community-dwelling postmenopausal Japanese women”
Environmental Health and Preventive Medicine, 17 (2012) 394–400.

Takahiko Sakazaki, Gaishi Iguchi, Shunya Hata, Daisuke Sarubo, Hideki Yoshimura, Tatsuya Funakoshi & Yuji Yanagimoto
“Conducting a Nordic walking event that combines body temperature measurement, hand disinfection, and handwashing during the COVID-19 pandemic(in Japanese)” Walking Research, 25 (2022) 27–33.

Takahiko Sakazaki, Matoi Nakamura , Yuji Yanagimoto
“Awareness survey on Nordic walking among town hall employees(in Japanese)”
Walking Research, 26 (2023) 105–109.