Department of Sports and Health Sciences

Key words | Elderly, Balance ability, Fall, Walking ability, Lifestyle disease, Recreation

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Professional Background

KOBE YMCA Wellness Center SANNOMIYA, Director
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Main research themes and their characteristics

「Development of screening tests to determine active and high fall risks in the elderly using unexpected stimuli」

Fig.1 Balance board test

Locomotive syndrome, which is characterized by a reduced mobility capacity due to sarcopenia associated with aging or dysfunction of motor organs, has been acknowledged as a problem commonly found in the elderly. It increases the risk for falls, posing an even more serious problem. To maintain independent living for elderly individuals, attenuating deterioration in muscle and balance function is essential. Many recent studies have reported causes of falls in the elderly, and they mostly attributed falls to reduced motor abilities, such as the strength of trunk and leg muscles and balance ability. In contrast, falls in the community-dwelling elderly have been reported to be attributable to the high activity, which makes them encounter more chances of falls, rather than to the reduced motor abilities and other causes of falls described above. To avoid falls, it is important to maintain a posture instantaneously, and the dynamic balance ability makes a critical contribution. Recently, a test (balance board test) has been developed to assess dynamic balance ability; this test involves maintaining a stable posture on an unstable board. Because the supporting base always fluctuates due to an unstable board, subjects need maintain a stable posture under unstable conditions. Hence, there exist persons who cannot achieve it even among the elderly with high independence in daily activities. It is assumed that they are inferior for various physical functions, including dynamic balance ability, and have higher fall risk.

This study aims to develop screening tests to determine active and high fall risks in the elderly and includes the balance board test on an unstable stool. The ability for achievement of the elderly with fall experience was inferior. In addition, the characteristics of the elderly who failed a previous test with aging were considered. As a result, the factors affecting the ability of the elderly to perform the test after 1 year included initial performance on the test, decreased motor abilities for the tasks that require balance ability, and reduced height. However, the fall incidence in elderly did not change. Therefore, future longitudinal investigation is necessary to examine the fall experience of the elderly.

「Examining the balance ability using the rate of “limits of stability” based on “base of support”」

Humans maintain a center of pressure (COP) that is virtually united in a vertical direction of center of gravity (COG) to maintain an upright standing posture in the base of support (BOS) (Fig.2). However, the COP cannot move until there is an edge of BOS. Actually, it can move only until there is an edge of the inside functional BOS [limits of stability (LOS)] (Fig.2). We examine a rate of LOS per BOS (LPB). A pressure sensitive mat (BodiTrak BT6526; Vista Medical Ltd., Canada) was used to measure the BOS, and a force platform (T.K.K.5810; Takei Scientific Instruments Co., Ltd., Japan) was used to measure the LOS. The former was placed on the latter. The subjects were 11 healthy male students. After measuring the BOS, they measured the LOS, which moved the COP to form a circle without changing the foot breadth (0 cm and 10 cm). The above measurements were performed for duration of 5 straight days. Two-way ANOVA (foot breadth × day) showed no significant difference in the interaction; however, there was a significant difference in the main effect of the breadth factor. A multiple comparison test demonstrated that the LPB was lower in 0 cm (about 41%) than in 10 cm (about 46%) throughout the duration of the study. In addition, the intraclass correlation coefficients were >0.67 for both foot breadths. Our outcomes demonstrated that not only BOS and LOS but also LPB increased the foot breadth and differed little from the interday variation.

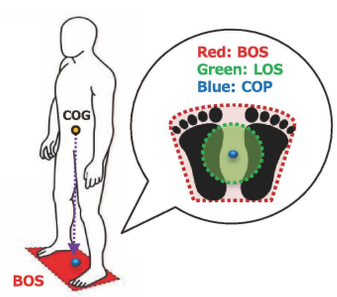

Fig.2 Definition of each parameter

Major academic publications

Sugiura, H. et al. (2022) Changes in the exercise time of elementary and junior high school students due to the emergency school closure to prevent COVID-19: Affiliation to athletic organizations and frequency of exercise with parents. The Journal of Education and Health Science. 68(2): 117-125. (in Japanese)

Sugiura, H. (2022) The difference between the foot breadth in a rate of “limits of stability” based on the “base of support” and day-to-day reliability. Japan Journal of Test and Measurement of Physical Education and Sports. 21: 19-24. (in Japanese)

Sugiura, H. et al. (2021) Effect of successful performance of a balance board test of the right and left directions on motor abilities and fall experience in elderly females. Gazzetta Medica Italiana. 180(9): 425-428.

Sugiura, H. et al. (2019) Changes in performance on the balance board test and motor fitness over time in elderly women. Journal of Physical Activity Research. 4(1): 47 – 50.