

A Plantar Perceptual Learning Exercise to Improve the Standing Balance of Elderly People

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It is well known that decreased standing balance increases the risk of falling, and it has also been reported to reduce everyday activity and be linked to disuse syndrome [1]. A previous study had shown that even among elderly people, the standing balance stability of a group who had a fall was significantly lower than that in a non-fall group [2]. Thus, an elderly person's ability to maintain a standing posture is an important factor in ensuring safety during the activities of daily life.

We have conducted several studies, including randomized controlled trials (RCT) and incorporated the results in developing an exercise to improve standing balance. Here, we introduce a portion of this research [3]. The study participants were 24 elderly people aged 61–71 years who were living in the community. The study design was an RCT based on a parallel comparison of 2 groups. The plantar perceptual learning exercise performed by the intervention group used pieces of sponge rubber with varying levels of hardness. The exercise, which was performed for 2 weeks, involved standing on the sponge rubber and discriminating its hardness level by using the soles of the feet. Five types of sponge rubber made of the same material and size (30 cm length and width), but with different hardness levels were used.

The order of the intervention was as follows. (1) Pre-task procedure: The physical therapist asked the participants to feel/remember the hardness levels of the 5 pieces of sponge rubber (performed in both ascending and descending order) while providing oral feedback. (2) Task: Ten trials were performed (2 times for each of the 5 hardness levels of sponge rubber) based on a randomized table, with the physical therapist counting the number of wrong answers. In contrast, the control group subjects stood on the pieces of sponge rubber, but were not asked to discriminate levels of hardness.

Examining the answers from 2 weeks of the hardness-discrimination task showed that the number of error answers declined significantly as the participants performed more trials, indicating that a learning effect had occurred. A comparison of the average movement and anterior movement of the center of gravity in the functional reach tests (FRT)

before and after the intervention showed a significant reduction in the total closed-eye trajectory and an increase in the open-eye forward movement of the center of gravity in the intervention group; no significant changes were observed in the control group.

Similar effects as those above, albeit with significant differences in some parameters, were obtained in the RCT on healthy young adults [4], stroke hemiplegic patients [5], and frail elderly people who were aged 75 years or older and living in institutions [6], showing that the plantar perceptual learning exercise is effective in several subjects. Further, the authors recently showed that in elderly people, such perceptual learning training has a positive effect on postural sway during walking [7]. For further details on this intervention, please refer to the original articles [3-7].

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