



Original Article

## The effect of walking sticks on balance in geriatric subjects

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**Abstract.** [Purpose] Guidelines and clarity regarding the information for deciding the need for walking sticks and the suitability of these sticks is insufficient. This study aimed to evaluate the suitability of walking stick and its effects on the balance in the elderly. [Subjects and Methods] A total of 39 elderly subjects aged between 65–95 years (mean age,  $76.15 \pm 8.35$  years) and living in the Residential Aged Care and Rehabilitation Center were included. Sociodemographic data of the individuals, the material of the walking stick, who made the decision of usage and length of walking sticks were questioned. The Berg Balance Scale (BBS) scores were used to evaluate balance. [Results] Subjects' BBS scores while using the walking stick were higher than that without the walking stick. A significant difference was observed in BBS scores obtained with the stick and without the stick, according to body mass index parameters. Majority of the subjects also started to use walking sticks by themselves. No significant difference was observed between the ideal length and actual length of the walking stick was used. [Conclusion] Our study demonstrated that the elderly generally decide to use walking stick by themselves and chose the appropriate materials; which improves their balance.

**Key words:** Walking stick, Balance, Geriatric

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### INTRODUCTION

Balance is the result of control of the center of gravity on the boundaries of stabilization<sup>1)</sup>. In literature, the concepts of balance reactions, posture, postural reactions, and postural control are used to describe balance<sup>2)</sup>. Balance is required for the locomotor system to exhibit its optimal function, to perform activities of daily living, to protect the stability position while passing from one position to another and to live independently in the community<sup>3–5)</sup>. To maintain balance and body posture, there has to be a continuous flow of information about position and movement from every part of the body, including the head and eyes. Meanwhile, balance involves complex interactions of various systems, particularly the musculoskeletal and neuronal systems<sup>3)</sup>. Additionally, postural balance is achieved through the collaborative work of the muscle, bone, ligament, physiological system, and the nervous system. Motor and sensory loss with aging, observed in these systems, affects postural balance negatively.

In recent years, the elderly population is growing both numerically and proportionally<sup>6)</sup>. With ageing and modernization, the incidence of many diseases has been increasing<sup>2)</sup>. In addition, the cost incurred because of the disease affect the least developed countries<sup>1)</sup>. In 2025, it is estimated that 70% of all elderly people will be living in the least developed countries<sup>7)</sup>.

External support is needed to increase the sensory input and psychological support in physical disabilities while walking. The elderly start using a walking stick because of balance and postural disorders and to prevent falling because of these

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disorders. A walking stick is the most preferred walking aid, because it is easy to use and is accepted by the society<sup>8</sup>). In literature, it has been indicated that the walking stick is used to improve postural stability and to decrease the load on the weak side of the lower extremities<sup>9</sup>). These sticks are usually held by the stronger side of the body. Therefore, it has been discussed that it may have negative effects on the balance of the elderly since they usually fall on their weak side<sup>10</sup>).

In addition, it has been stated that walking symmetry of the walking stick users worsens and causes decreased walking cadence and stride length.

In literature, the guidelines and clarity regarding information for deciding the need for walking sticks and the suitability, advantage, and disadvantage of these sticks are insufficient. This study aimed to evaluate the suitability of the walking stick for the elderly using it. For this reason, the effects of using traditional walking sticks for balance was investigated.

## SUBJECTS AND METHODS

In our study, 39 elders aged between 65–95 years (mean age=76.15 ± 8.35 years) and living in the Residential Aged Care and Rehabilitation Center were included. The ethics committee of Mustafa Kemal University approved the study. Each subject was informed about the study and gave their written informed consent to participate. The purpose and test procedures were explained to all subjects who were included in the study prior to enrollment.

Sociodemographic data of individuals, the material of the walking stick, person who made the decision of usage, length of walking sticks and advantages and disadvantages of using walking sticks were questioned. The length of the walking sticks used was measured using a tape measure. The ideal length of a walking stick was determined when the elbow was in 20–30° flexion and the bottom part of the walking stick was 15 cm from the feet<sup>8</sup>).

Standardized Mini-Mental State Examination (MMSE) was also used to evaluate the cognitive level of the individuals, and Berg Balance Scale (BBS) was used to measure the effects of the walking stick on balance.

The MMSE is a popular test used in clinical practice to identify cognitive impairments and to monitor dementia syndromes and response to treatment, and has been used in the field for epidemiological studies. The MMSE is a short, convenient, and standard application that can be used to assess the cognitive functions of the elderly.

MMSE consists of 11 items and is evaluated over 30 points. It has five main domains namely: orientation, memory, attention and calculation, recall and language<sup>11</sup>).

The Berg Balance Scale (BBS) is used to evaluate balance disorders and risk of falling<sup>10</sup>). The scale consists of 14 items. Balance from sit to stand, unsupported standing, unsupported sitting, stand to sit, transfers, eyes closed standing, standing with feet together, leaning forward while standing, picking an object from the ground, looking back, turning 360°, tandem and single leg standing activities have been evaluated. High scores indicate good balance, and the maximum score that can be achieved is 56. Scores between 0 and 20 show 100% risk of falling, while scores between 21 and 40 indicated that support was needed while walking due to the increased risk of falling, and finally, scores between 41 and 56 showed that there was no need for support while walking since the risk of falling is very little<sup>5, 12</sup>).

All analyses were conducted using the IBM SPSS Statistics program with version 20.0 software. An alpha p value<0.05 was considered statistically significant. All data were evaluated for normality using the Shapiro-Wilk test. Descriptive statistics were used to show the characteristics of the participants and their mean scores with SD. Wilcoxon Test was used for dependent measurement; Kruskal-Wallis and Mann-Whitney U Test were used for independent measurements.

## RESULTS

The age of subjects ranged from 63 to 95 years and their average age was 76.15 ± 8.35 years. Demographic characteristics of subjects are shown in Table 1.

It was found that 92.1% of subjects' dominant extremity was right and 76.9% were using the walking stick with the right extremity, while only 7.9% of subjects' dominant extremity was the left and 23.1% were using the walking stick with the left extremity.

The materials of the walking sticks were plastic, wood, or metal. There was no significant difference between the materials of the walking stick and the BBS scores that were evaluated while the subjects were using the walking stick ( $p>0.05$ ). The patients were asked "how they started to use the walking stick", and it was found that most (79.5%) of them started by self-decision. The person that decided about using the walking stick did not affect the BBS scores ( $p>0.05$ ). There was no significant difference between the length of ideal walking sticks and the length of walking sticks used by the subjects ( $p>0.05$ ), (Table 2).

The BBS scores obtained while using the walking stick were significantly higher than that obtained without the walking stick ( $p<0.05$ ). Subjects were found to be mostly overweight (20.5%) and obese (25.6%). The elderly were categorized into 4 groups according to their BMI scores. It was found that there were significant differences between the scores of the BBS while using and while not using the walking sticks in all groups according to BMI scores ( $p<0.05$ , Table 3).

There was also a significant difference in the BBS scores between the evaluation scores of those with and without walking sticks depending on the body mass index parameters (Table 3), ( $p<0.05$ ).

## DISCUSSION

In the present study, the effects of using walking sticks for balance in the elderly were investigated. According to the average results of the BBS, the risk of falling was very low while they were using a walking stick, and the risk increased to a moderate level when they were not using a walking stick. There was a significant difference between balance scores while using and when not using a walking stick. It was recorded that they preferred to use a walking stick to support their balance and independence while walking, by self-decision (79.5%). Since there was no significant difference between the ideal and preferred length of the walking sticks length, it was thought that the elderly could make the best decision and could choose an appropriate walking stick for themselves.

In a study conducted by Gerev et al., it has been determined that the body mass index may affect the balance and it becomes more difficult to maintain postural stability as the BMI increases<sup>13</sup>. It was found that there was a significant difference in BBS scores between those with and without walking sticks according to BMI in our study.

Maintaining the balance during walking is quite different from the posture in standing. While standing, the purpose is to keep the center of gravity within the support surface. However, walking disturbs the stability of the body and adaptation is required according to alterations in the gravity line<sup>14</sup>. Gait disturbances generally start from the age of 60 years, but more significant changes are observed in the 75–80 years age group.

Civi et al. reported that gait disorders increase in the older age group according to their physical disability measurement. The dependence on daily living activities increases and additional physical disabilities accumulate<sup>15</sup>. There is a folded

**Table 1.** Demographic characteristics of the elderly subjects

	n (n=39)	%
Gender		
Male	29	74.4
Female	10	25.6
Clinical condition		
No disease	21	53.8
Hypertension	6	15.4
Diabetes mellitus	3	7.7
Others	9	23.07
Cognitive dysfunction (mmse)		
Normal	9	23.04
Mild	19	48.64
Moderate	7	17.92
Severe	4	10.24
Body mass index		
Underweight	1	2.6
Normal	20	51.3
Overweight	8	20.5
Obese	10	25.6

**Table 2.** The materials used in walking sticks, the decisions of the individuals about using and the length of the walking stick

Material of walking sticks	n	%
Plastic	2	5.1
Wood	27	69.2
Metal	10	25.6
Decisions of individuals about using a walking stick		
Consultation with the health professionals	8	20.5
Self-decision	31	79.5
Length of walking stick	X ± SD	
Ideal	86.23 ± 9.96	
Preferred	88.13 ± 6.97	

**Table 3.** BBS scores of all subjects and BBS scores according to BMI, with and without walking sticks

	Without walking stick X ± SD	With walking stick X ± SD
BBS scores	36.1 ± 17.0*	47.3 ± 13.1*
BMI		
Underweight	48.0 ± 0.0	56.0 ± 0.0*
Normal	35.3 ± 18.3	50.0 ± 11.3*
Overweight	40.0 ± 17.9	50.0 ± 11.4*
Obese	33.2 ± 15.1	49.9 ± 11.7*

Wilcoxon signed ranks test \*p<0.05.

BBS: Berg Balance Scale, BMI: body mass index, SD: standard deviation

accumulation in physical disabilities in older ages.

According to the results of Tinetti et al.'s study on the elderly living in the community, the risk of falling increased by 8% in 1 year in those who had no risk at that moment and the risk of those who had at least 4% at that moment increased up to 78% in 1 year<sup>16</sup>). It has been observed that the elderly individuals begin to use a walking stick due to the decrease in the ability to maintain balance and increase in the rate of falling and need of psychological and physical support<sup>17</sup>). In general, walking aid sticks are preferred more than any other walking aids because they have supportive features and carry approximately 15–29% of the weight other walking aids have. In Gunduz's study, it was stated that various aids such as walking sticks, crutches, and walkers are used to support walking activity and balance, while tripods or quadripods increase the stability<sup>18</sup>). According to literature, it was found that the elderly who participated in the study preferred to use a walking stick as an aid. Moreover, a consideration may be that sociocultural sights limit them to use tripods or quadripods, despite having been given more stability.

Beauchamp et al. investigated the effect of walking sticks on walking symmetry. It was found that the use of walking sticks improved walking symmetry<sup>19</sup>). Similarly, Bateni et al. analyzed the possible effects of a supportive tool on walking and balance, they obtained that such tools increased balance and mobility<sup>20</sup>). In our study, similar results were obtained. It was observed that the use of a walking stick improved the balance and the independence level while reducing the risk of fall. Therefore, it has been concluded that using a walking stick should be recommended to the elderly individuals who have balance disorders and the risk of falling.

Another important issue related to the using a walking stick in the elderly individuals was using them in an appropriate and correct manner. It was also stated that when the elderly individuals are trained for using walking sticks, they use them correctly.

Laufer et al. stated that the type of walking stick affects the stability<sup>9</sup>). In our study, although most of the participants were using wooden sticks (69.2%), it was recorded that the material of the walking aid did not affect the balance; although when deciding on one, the type, its lightness, and appropriateness must be considered. It has been concluded that the material has no effect on the balance; however, it is important to use a light and suitable walking stick.

In an aging society, the number of people is continuously increasing, and the need for methods to prevent falls from the elderly and enhance their balance has been made clear<sup>21</sup>). Walking sticks should be considered when a person is unable to maintain his balance such trying to hold on to objects and, even for doing certain activities and losing independence. A person who experiences repeated falls also needs to be considered as a person who should use a walking stick. In spite of these, walking stick shouldn't be deemed as a necessity for an elder without balance problems. Additionally, neither should it be seen as an accessory. If the elder is in need of a walking aid, a health professional should suggest it for independence and confidence. However, many elders decide by themselves on when they want to start using walking sticks, but there has been little research on this perspective<sup>22</sup>).

Because of this need, our study fulfills this incomplete area despite the study's limitations. One of which was the limited number of participants preventing a comparison according to the participant age and the walking aid material. In future studies, the duration of usage of the walking stick could also be questioned and its effect on balance could be analyzed with more participants.

In our study, it was observed that the elderly generally decided to use walking stick by themselves and chose the appropriate material. In doing so, their balance improved.

In light of these results, to help our elderly community members while making a decision on the usage of walking aid, health staff must take consider their sociocultural and economic levels and preferences. In addition, community-based rehabilitation perspectives, seminars, conferences, or any type of education about balance, self-confidence, walking aids, and their usage should be provided beginning from the adult age.

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