Original Article

Change in static standing balance ability of community-residing elderly females after the onset of COVID-19 pandemic in Japan

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Abstract. [Purpose] This study aimed to examine the changes in the balance ability of community-residing elderly females between 2017 and 2020. [Participants and Methods] The participants included 202 females with ≥65 years of age (average age, 78.3 ± 5.88 years), living independently in the community and attending the salon. The balance ability was measured through a one-legged standing test by keeping the participants’ eyes open. The measurement duration was a maximum of 120 s while standing still. Each participant underwent the measurement twice, and the best attempt was recorded. The survey period was from 2017 to 2020, and the measurements were conducted once a year. [Results] The 2020 records showed a statistically significant difference compared to those of the other 3 years. The degree of decline was higher in the old-old than that in the young-old. [Conclusion] The balance ability of the elderly females was found to reduce significantly during the COVID-19 pandemic. Specifically, supporting physical activities in the old-old females is necessary to improve their balance ability.

Key words: Young-old, Old-old, COVID-19

INTRODUCTION

In general, it is a well-known fact that physical fitness decreases in older age due to aging1, 2). As people grow older, they face diminishing daily life function and mobility3). Regular physical activity improves long-term health outcomes4). In adults above 65 years, regular exercise can delay disabling health outcomes and they can remain independent for longer periods of time5, 6). Before the outbreak of coronavirus disease 2019 (COVID-19), this researcher measured one-legged standing test with eyes open once a year from 2017–2020 for the purpose of confirming physical function in community-residing older adults who lived independently and participated in the Matsuyama Fureai-ikiiki salons. However, as the World Health Organization (WHO) declared COVID-19 a pandemic on March 11, 2020, many people experienced restriction in social activities7). People worldwide are forced to refrain from regular activities and Japan is no exception. We are witnessing less activity among people in consequence to long-term restrictions regarding daily social activities. In community-residing older adults (65 to 84 years old) in Japan, changes in physical activity between January (before the COVID-19 pandemic) and April (during the COVID-19 pandemic) 2020 showed that the total physical activity time in April 2020 was significantly lower than that from January 20208). During the strict lockdown in Spain between March–May 2020, 98 community-residing older adults in Barcelona reported lockdown related frailty symptoms and social relationships were consistently associated with both physical activity levels during-lockdown and pre-post change9). Marjolein used logistic regression analysis to examine the relationship between the characteristics evaluated before the COVID-19 pandemic and the effects of the pandemics on physical activity in 1,119 (62–98 years old) independent adults in Amsterdam10). The study reported that about half of the participants had reduced physical activity and exercise due to the pandemic. The COVID-19
pandemic has been shown to have a negative impact on physical activity behavior in many older adults and may increase the risk of frailty, sarcopenia and disability. In Japan, “older adults” are defined as individuals aged 65+ years, with the young-old are aged 65–74 years, and the old-old are 75+ years in age\textsuperscript{11}. In Japan, there is concern that the amount of physical activity of the older adults will decrease and the percentage requiring long-term care will consequently increase. Additionally, older adults become frailer when positive for COVID-19\textsuperscript{12}. Therefore, they should be prioritized in infection prevention. As social interaction is restricted, there are fewer opportunities for group exercise for this population, which causes a decline in their health and can complicate long-term care. Few reports have longitudinally examined changes in the physical strength of older adults during the COVID-19 pandemic. One-legged standing test with eyes open is an indicator of physical fitness of the older adults done by evaluating balance ability\textsuperscript{13}. In older adults, diminished balance is associated with reduced physical functioning and an increased risk of falling\textsuperscript{14}. Falls are one of the major health problems affecting the quality of life in older adults\textsuperscript{15}. BJ Vellas followed a healthy, community-residing volunteer group over the age of 60 for 3 years on the relationship between one leg balance and falls in the older adults (N=316; mean age 73 years)\textsuperscript{16}. As a result, it was reported that one-leg is the strongest individual predictor of fall injuries. Older adults need to maintain one-leg balance ability in order to live independently. The purpose of this study was to capture the changes in the one-legged standing test with eyes open in the older community-residing adults to verify if there was a difference pre and post onset of the COVID-19 pandemic, and to observe longitudinal changes in physical fitness. Following the global spread of COVID-19 after the first case was reported in Wuhan, China in December 2019\textsuperscript{17}, many gathering public places have been closed in Japan to prevent the spread of infection. Consequently, the older adults had less opportunity to go out for physical or social activities. This study hypothesized that the physical fitness of the older adults in Japan during 2020 was significantly lower than before the onset of the pandemic.

**PARTICIPANTS AND METHODS**

This was a retrospective cohort study using a non-probability consecutive sampling technique for selection of the older adults\textsuperscript{18, 19}. Inclusion criteria for participation in the study was older adult females who belonged to 38 Matsuyama Fureai-ikkiki salons and lived independently in the community. Matsuyama city opened salons for the elderly in order to maintain and improve the mental and physical functions of the older adults and prevent long-term care. This study classified participants by age based on the Japanese classification of older adults\textsuperscript{11}. The measurement of one-leg standing test with eyes open was carried out as part of the activities of Fureai-ikkiki Salons in Matsuyama City. The staff of Matsuyama Social Welfare Council explained this research to participants at each salon. All qualifying participants provided written informed consent before participating in the study, and the study protocol was designed according to the Declaration of Helsinki and was approved by the Tokaiakuen University Ethics Committee (2021-8).

The study was conducted from October 2017 to November 2020. One-leg standing with eyes open was measured once a year for each participant from all 186 salons in Matsuyama City. During the test, the participants were barefoot and both upper limbs were kept to the sides of their torso. The maximum time that participants were to hold the one-legged standing with their eyes open was 120 s. The measurements were recorded by a staff member of the Council of Social Welfare who was trained in measuring one-legged standing. A stopwatch was used to measure the time. The criteria for discontinuing the measurement were: when the upper limbs were separated from the trunk, the position of the supporting legs were moved on the floor, or the contralateral foot was in contact with the floor. The measurement was performed twice on each side, and the longest (best) time was adopted as a representative value.

The continuous data are presented as mean ± SD (standard deviation). To find the association between the variables, analysis, one-way ANOVA was performed to test the difference between the average values of one-legged standing for each year. For subsequent tests, Tamhane’s T2 test was performed. Statistical analyses were performed using IBM SPSS Statistics for Windows, version 26 (IBM, Armonk, NY, USA). Statistical significance was set at p-value <0.05.

**RESULTS**

The mean length of stay of the participants in the salon was 6.9 ± 4.4 years. In 2017, among these participants, 52 were young-old (71.7 ± 1.9 years old) and 150 were old-old (80.7 ± 4.97 years old). A total of 202 older older adults (aged 78.3 ± 5.88 years) participated in this study. As of 2017, the averages height and weight of the participants were 150.8 ± 6.1 cm and 52.1 ± 6.9 kg respectively. The results of the one-legged standing test are shown in Table 1. The time recorded in 2020 was significantly different when compared to the last three years. The old-old 2020 records showed a statistically significant difference from 2018 and 2019 (p<0.05, p<0.01). No statistically significant difference was found in the young-old records.

**DISCUSSION**

The time recorded for one-legged standing test with eyes open showed a significant decline in 2020 for all participants. The findings from this study support the hypothesis that the physical fitness of the older adults in Japan during 2020 was significantly lower than before the onset of the pandemic. Another study which explored the frailty caused by COVID-19 in healthy older adults also support these findings\textsuperscript{20}. At the time of measurement in 2020, approximately half of the salons, to
which the participants belonged, had to suspend activities to prevent increasing COVID-19 cases. About 6,000 older adults belonged to Matsuyama Fureai-ikiiki Salons. Measurements of one-legged standing test with eyes open was performed in more than 2,000 older females aged 65 years and above from 2017 to 2019 on. However, the number of female people who underwent the test in 2020 was 558. Additionally, it is thought that the number of people participating in the salon has decreased due to the COVID-19 pandemic. There was no statistically significant difference in the one leg standing test results between 2017–2020 in the young-old participants. However, the old-old participants’ record fell significantly in 2020. The number of old-old participants is much larger than the number of young-old participants, which may have affected the total results. Participants were active community-residing older adults who regularly attended Fureai-ikiiki salons before the COVID-19 pandemic. However, the physical strength of old-old participants was speculated to be more impacted by the COVID-19 pandemic. The ability to balance is an important physical fitness factor for fall prevention in older adults. Older adults with higher levels of physical activity have higher static balance ability. Fractures from falls are a major obstacle to an independent life for older adults. Decreased physical activity of older adults during this pandemic is expected to be a vicious cycle of decreased balance ability and increased risk of falling. Older adults can increase their level of physical activity by exercising at home, either in an independent program or in combination with group-based classes. From the results of this study, it is evident that the pandemic has had a debilitating and deteriorating impact on the old-old adults of Japan with regard to their physical fitness. It is a challenge to maintain the balance ability of old-old females with the complications of the COVID-19 pandemic. It is expected that the COVID-19 pandemic will continue, and it is suggested that support such as health education for older adults’ home exercise is required.

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**Table 1. Result of one-legged standing with eyes open (sec)**

|           | 2017   | 2018   | 2019   | 2020   |
|-----------|--------|--------|--------|--------|
| Total n=202 | 53.9 ± 41.6 | 57.5 ± 42.9 | 56.6 ± 43.9 | 43.0 ± 41.8 |
| Young-old n=52 | 77.3 ± 44.7 | 76.5 ± 41.6 | 82.1 ± 40.9 | 64.1 ± 44.8 |
| Old-old n=150 | 45.8 ± 37.4 | 50.9 ± 41.7 | 47.7 ± 41.6 | 35.6 ± 38.3 |

Values are expressed as mean ± SD. *p<0.05, **p<0.01.
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