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Regional Differences in Fall-Related Physical Fitness of the Elderly between Seoul, Korea and Gifu, Japan

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Falling is a leading cause of severe injuries among the elderly, such as hip fracture. This study examined the regional and sex differences in fall-related physical fitness of the elderly between Seoul, Korea and Gifu, Japan. The study included 87 elderly residents of Seoul (mean age 75.4 years; 21 males and 66 females) and 91 elderly residents of Gifu (mean age 71.9 years; 17 males and 74 females). The participants underwent various physical tests, and two-way ANCOVA (region × sex) with age as a covariate was used for statistical analysis. Significant interaction was shown by the one-legged stance (OLS) with eyes open test, which was higher in elderly females from Gifu than in those from Seoul. Significant main effects for the region were shown by the 30-s chair stand (CS-30) and reaction time tests, wherein the Gifu group performed better than the Seoul group. Significant main effects for sex were shown by the sit and reach, handgrip strength, and knee extension strength tests, which were higher for females in the sit and reach test and lower for females in the handgrip and knee extension strength tests compared to the corresponding males in both the cases. Lastly, elderly from Gifu performed better than those from Seoul in the reaction time, CS-30, and OLS tests. Since the ability to move quickly and maintain balance to avoid falling are factors necessary for reducing fall risk, fall prevention classes and exercise programs are required to improve these abilities in the elderly.

Keywords: fall; Japanese; Korean; older adults; physical fitness
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Introduction

Although the Korean aging rate in 2015 was 13.1% and is still low in comparison to the Japanese aging rate (26.0%) (Statistics Korea 2015; Cabinet office, Government of Japan 2015), it is rapidly growing. It is predicted that the aging rate of Korea will exceed 20% in 2025, 30% in 2037, and reach 37.4% in 2050 (Statistics Korea 2014). Korea will become a super-aged society similar to Japan at 38.8% (Kim 2014). The rapid graying of society is expected to begin in the 2020s, when the baby boom generation, born between 1955 and 1963, begins to reach the age of 65 years and its members become senior citizens. The Japanese population has the highest levels of both life expectancy (79.9 years for men and 86.4 years for women in 2012) and proportion of people above the age of 65 years (24.1% in 2012) worldwide. The number of people who require long-term care insurance because of disability, further requiring support for their activities of daily living (ADL), has increased approximately 2.5-times over the past 10 years (Statistics and Information Department 2013). The main reasons for long-term care insurance use amongst elderly Japanese are falls and fall-related fractures.

Falls are a common event among the elderly and falling is a leading cause of severe injuries, such as hip fracture in this population (Edwards et al. 2013). A study of 2,299 residents in Hertfordshire, UK, showed that a history of any type of fall after the age of 45 resulted in an unadjusted fracture hazard ratio of 7.31 (95% CI: 3.78-14.14) and 8.56 (95% CI: 4.85-15.13) in men and women, respectively. For elderly community residents, effective fall prevention may potentially reduce serious fall-related injuries. According to research concerning actual falling conditions in community-dwelling elderly populations, fall incidence rates over a one year period in elderly individuals aged 65 years and above was approximately 20% in Japan (Suzuki 2001; Demura et al. 2012) and 15%-32% in Korea (Kim 2008), although there were some regional differences. Because

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fall incidence increases with age, the possibility that an elderly individual will sustain a fracture and become bedridden may also increase. A decline in physical fitness strictly limits daily life activities in elderly populations and increases the possibility of a fall (Shin et al. 2013).

In Japan, awareness of health issues and fall prevention is extremely high among elderly individuals; welfare institutions for elderly individuals and social welfare systems, such as the nursing-care insurance system and fall prevention classes are well developed. On entering the 21st century in Korea, the average life expectancy has increased gradually with the rise in the standard of living and with advances in medical techniques. However, awareness of the necessity for physical fitness improvement is low in elderly populations. So is the rate of elderly individuals who had exercise habits before becoming part of the aged society (Kim et al. 2011; Jang et al. 2015; Ahn et al. 2015).

Recently, in Korea, exercise programs and lectures aimed at promoting the health and improving the physical fitness of elderly individuals have been initiated in response to the challenges of an aging society (Jang et al. 2015). However, interventions related to fall prevention and fall-related physical fitness remain insufficient. Although Korea and Japan are similar East Asian countries, their ratio of elderly individuals, life expectancy, and level of health consciousness differ (Kim et al. 2005). Therefore, comparing the fall risk characteristics and fall-related physical fitness of elderly individuals in these different environments is important for full understanding of the social welfare systems of both countries and for comparing their approaches.

To date, many studies have been conducted to investigate fall-related physical fitness and fall prevention in both Japan and Korea. However, direct comparisons of physical fitness between the two countries have been difficult because of different measurement methods. In this study, the characteristics of fall-related physical fitness were examined in elderly individuals of both sexes from Gifu, Japan and Seoul, Korea, using the same measuring methods and rating parameters known to be effective for the evaluation of fall-related physical fitness.

Methods

Participants

The study included 91 elderly Gifu residents (17 males and 74 females) and 87 elderly Seoul residents (21 males and 66 females). Physical characteristics (height and weight) in the two regions were similar to the national averages of citizens 65 years of age and above in Japan and Korea; therefore, it is inferred that participants in this study represented the physical characteristics (physique) of Japanese and Korean elderly. The proportions of elderly 65 years of age or above in Gifu and Seoul are 27.3% (330 million people) and 12.0% (66 million people), respectively (Table 1).

During the past year, 29.4% and 25.7% of elderly males and females, respectively, in Gifu, and 33.3% and 28.8% of elderly males and females, respectively, in Seoul experienced falls. Women (Gifu 63% and Seoul 57.6%) in both countries were more likely than men (Gifu 41.2%, Seoul 38.1%) to participate in exercise classes (Table 1). Fall risk scores (cut-off score: five points or above) for the elderly, measured by the Tokyo Metropolitan Institute of Gerontology (Suzuki 2000) (males 3.3, females 3.9 points), were higher in elderly from Seoul than those for elderly from Gifu (males 3.2, females 2.7 points). ADL scores (Ministry of Education, Culture, Sports and Technology 2000; cut-off score: < 24 points) were higher in elderly from Gifu (males 28.9, females 27.8 points) than those for elderly from Seoul (males 25.4, females 24.1 points) (Table 2).

A fall risk assessment for Korea has not been developed. The above fall risk and ADL assessments are considered appropriate for use in Korea because they consist of items related to general physical activity levels, and direct comparisons of fall risk as well as ADL scores between the two countries are valid since identical questionnaire items were used. The purpose and procedures of our study were explained to the participants in detail and written informed consent was obtained. The present study was approved by the institutional review board of the Gifu University School of Medicine (reference number: 24-310).

Physical fitness test

Blood pressure readings were taken prior to testing and participants with systolic or diastolic blood pressures higher than 160 mmHg or 100 mmHg, respectively, were excluded from further testing. Participants underwent a number of physical fitness tests known to effectively evaluate fall-related physical fitness: 30-s chair stand (CS-30), one-legged stance (OLS) with eyes open, timed up and go (TUG), reaction time, handgrip strength, sit and reach, 10-m gait time, and knee extension strength tests. These will be detailed in the

Table 1. Participants' characteristics.

	Gifu in Japan (n = 91)		Seoul in Korea (n = 87)	
	Male (n = 17)	Female (n = 74)	Male (n = 21)	Female (n = 66)
Proportion of elderly 65 years of age or above	27.3% (26.0% in Japan)		12.0% (13.1% in Korea)	
Faller in the previous year	5 (29%)	19 (26%)	7 (33%)	19 (29%)
Participants in exercise classes	7 (41%)	47 (64%)	8 (38%)	38 (58%)

The %value in each parenthesis indicates as a percentage of each sample size. There was no significant difference in the ratio test of the individual who fell in the previous year by sex and region.
(Differences between males and females: Gifu $\chi^2 = 0.10$ p = 0.75, Seoul $\chi^2 = 0.16$ p = 0.70, Differences between Gifu and Seoul: Male $\chi^2 = 0.07$ p = 0.80, Female $\chi^2 = 0.18$ p = 0.68).

Table 2. The two-way ANOVA (region × sex) results for age, physique, fall risk score and ADL score.

			Two-way ANOVA			
Age (years)	Mean	SD		F-value	p-value	Tukey's HSD
Gifu (M)	74.1	6.2	Bet. Reg.	9.22*	0.00	regions: G < S
Gifu (F)	72.1	6.2	Bet. Sex	0.01	0.94	
Seoul (M)	75.9	6.4	Interaction	0.38	0.54	
Seoul (F)	75.2	5.6				
Height (cm)						
Gifu (M)	161.7	4.8	Bet. Reg.	6.67*	0.01	
Gifu (F)	149.8	5.0	Bet. Sex	155.05*	0.00	sex: F < M
Seoul (M)	164.8	6.5	Interaction	0.31	0.58	
Seoul (F)	151.8	5.5				
Weight (kg)						
Gifu (M)	61.4	8.8	Bet. Reg.	4.64*	0.03	regions: G < S
Gifu (F)	50.7	6.8	Bet. Sex	39.97*	0.00	sex: F < M
Seoul (M)	62.4	8.2	Interaction	2.18	0.14	
Seoul (F)	55.7	7.3				
Body fat (%)						
Gifu (M)	19.8	6.3	Bet. Reg.	37.98*	0.00	regions: G < S
Gifu (F)	27.0	5.8	Bet. Sex	46.58*	0.00	sex: M < F
Seoul (M)	26.3	6.6	Interaction	0.13	0.72	
Seoul (F)	34.3	5.6				
Fall risk score						
Gifu (M)	2.8	2.5	Bet. Reg.	4.49*	0.04	regions: G < S
Gifu (F)	2.7	1.5	Bet. Sex	0.68	0.41	
Seoul (M)	3.3	2.3	Interaction	0.83	0.36	
Seoul (F)	3.9	2.2				
ADL score						
Gifu (M)	29.4	6.0	Bet. Reg.	10.81 *	0.00	regions: S < G
Gifu (F)	27.8	3.9	Bet. Sex	3.32	0.07	
Seoul (M)	25.4	8.2	Interaction	0.05	0.83	
Seoul (F)	24.1	5.1				

Cut-off score of fall risk: ≥ 5 points, Cut-off scores of ADL: < 24 points.
M, male; F, female, G, Gifu; S, Seoul; Bet. Sex, Between sexes, Bet. Reg., Between regions.
*p < 0.05.

following sections.

CS-30 test

The CS-30 test consists of getting up from and sitting down on a chair as many times as possible within 30 s (Millor et al. 2013). A standard chair (with a seat height of 40 cm) without a backrest was used. Initially, participants were seated on the chair with their back in an upright position. They were instructed to look straight and rise after the "go" command at their fastest speed with their arms folded across their chest.

OLS with eyes open test

The OLS with eyes open test was assessed using participant's preferred leg (Seino et al. 2014). Participants were asked to place their hands at their waists while staring at a mark on the wall, raise one leg and stand for as long as possible. They were timed until they lost their balance or reached a maximum of 120 s. Participants performed two trials, and the longer time (to the nearest 0.1 s) was used.

TUG test

Participants were asked to perform the TUG test, as fast as was safely possible, by getting up from a standard chair (40-cm high seat),

walking 3 m, turning at a designated spot, returning to the seat, and sitting down (Greene et al. 2014). The time was measured from the moment the clinician says "go" to the moment the participant sits back on the chair. Participants performed two trials, and the shorter time (to the nearest 0.1 s) was used.

Reaction time test

Reaction time test was performed, as reported (Tsunoda et al. 2013). Participants stood at the center of a cross-shaped mat switch in front of a light stimulator with reaction measuring equipment (TKK 1264b, Niigata, Japan). At the light signal, they jumped up as quickly as possible. Participants performed five trials, and the mean (to the nearest 0.1 s) of the five trials was used.

Handgrip strength test

Handgrip strength was assessed using common Smedley-type hand dynamometers (TKK 5401, Niigata, Japan). Participants stood with their arms hanging naturally at their sides holding the dynamometer with the grip size adjusted to a comfortable level (Seino et al. 2014). They were instructed and verbally encouraged to squeeze the handgrip as hard as possible. Participants performed two trials with each hand, and the best result (to the nearest 0.1 kg) was used.

Sit and reach test

Participants sat on the floor with their backs against the wall and their legs straight (Tsunoda et al. 2013). With their hands placed on a scale box (TKK 5112, Niigata, Japan), they slowly pushed the scale box forward with their hands as far as possible. Participants performed two trials, and the longer value (to the nearest 0.1 s) was used.

The 10-m gait test

The 10-m gait test was performed on a flat ground along a 10-m long line of a 10-cm wide tape (Shin and Demura 2009a). Each participant was requested to walk as fast as possible on the line. Using a stopwatch, a tester measured the time required for participants to walk from the beginning to the end of a line. Participants performed two trials, and the shorter time was used.

Knee extension strength test

Knee extension strength test was performed, as reported (Shin and Demura 2009b). TKK 5715 (Takei, Niigata, Japan) and TKK 5710e (Takei, Niigata, Japan) were used to measure the knee extension strength. Participants sat on the chair (TKK 5715) with their feet off the floor. A belt of tension meter was attached to the front of one ankle, and the length of the fixed belt was adjusted so that the knee bending angle reached 90° when the knee was extended and was connected to the support of the back of the lower leg. A tester measured the maximal knee extension strength of the participant. Participants performed two trials with both legs, and the best result (to the nearest 0.1 kg) was used.

Statistical analyses

To examine differences between groups, two-way ANCOVA (region × sex) with age as a covariate was used. Multiple post-hoc comparisons were performed using the Bonferroni method if a significant main effect or interaction was identified. A probability level of $p < 0.05$ was considered statistically significant. STATISTICA 10 (StatSoftInc, Tulsa, USA) was used for all statistical analyses.

Results

Table 2 shows the results of two-way ANOVA for age and physique. Height, weight, and body fat percentage showed significant sex- and region-based differences, and age showed a significant region-based difference. All the parameters were higher for the Seoul group than for the Gifu group. Height and weight were higher in males than females, and body fat percentage was higher in females than males. The average height and weight of elderly males 65 years of age and above, as reported by the Korea Seoul Olympic Sports Promotion Foundation, are 165.0 ± 6.1 cm and 64.9 ± 9.2 kg, respectively, whereas those for females are 151.1 ± 5.8 cm and 56.1 ± 8.4 kg, respectively (Shin et al. 2015). The average height and weight of elderly males over 65 years of age, as reported by the Ministry of Health, Labour and Welfare (2014) in Japan, are 162.5 ± 6.2 cm and 61.9 ± 9.1 kg, respectively, whereas those for females are 149.1 ± 5.8 cm and 50.8 ± 8.3 kg, respectively. Therefore, the participants of our study had similar physical characteristics as the general elderly populations in Japan and Korea.

Table 3 shows the results of two-way ANCOVA with age as a covariate. A significant interaction was shown by the OLS test, with the female Gifu group performing better than the female Seoul group. A significant main effect according to sex was observed in the knee extension strength and handgrip strength tests, with higher scores for males than females. A significant main effect according to the region was observed in CS-30, sit and reach, and reaction time tests, with the Gifu group performing better than the Seoul group.

Discussion

In this study, items known to effectively evaluate fall-related physical fitness were measured and the characteristics of fall-related physical fitness were examined in the elderly from Gifu, Japan and Seoul, Korea. Although Korea and Japan are geographically close and share many cultural similarities, it has been reported that there are differences between them in terms of quality of life, economic level, social environment, welfare facilities and policies for elderly individuals (Lee 2004). Korea is currently undergoing a rapid increase in its elderly population, with insufficient consideration to the necessary improvements in and maintenance of social welfare. Because of the extension of the average life expectancy, elderly individuals and communities recognize the importance of good health, making efforts to improve eating habits and increasing the physical activity for healthy aging. On the other hand, Japan, with the highest longevity in the world, is generally well prepared for its super-aged society. For example, prevention classes for long-term care, including fall prevention, are conducted systematically across the country (Lee et al. 2008).

In this study, there were no differences between elderly

Table 3. The results of two-way ANCOVA (region × sex) with age as a covariate in the physical fitness items.

						Two-way ANCOVA		
OLS (sec)	Mean	SD	Effect size			F-value	p-value	Tukey's HSD
Gifu (M)	44.8	42.5	Bet. Sex (G)	0.55	Bet. Reg.	24.28*	0.00	region (F: S < G)
Gifu (F)	70.5	48.6	Bet. Sex (S)	0.21	Bet. Sex	2.53	0.11	
Seoul (M)	19.9	22.4	Bet. Reg. (F)	1.46	Interaction	5.75*	0.02	
Seoul (F)	15.7	19.3	Bet. Reg. (M)	0.78				
Hand grip strength (kg)								
Gifu (M)	33.4	7.4	Bet. Sex (G)	2.26	Bet. Reg.	0.73	0.40	
Gifu (F)	23.0	3.8	Bet. Sex (S)	1.92	Bet. Sex	123.64*	0.00	sex (F < M)
Seoul (M)	31.4	6.4	Bet. Reg. (F)	0.25	Interaction	0.10	0.75	
Seoul (F)	22.0	4.4	Bet. Reg. (M)	0.30				
Knee extension strength (kg)								
Gifu (M)	41.8	13.1	Bet. Sex (G)	1.77	Bet. Reg.	0.01	0.93	
Gifu (F)	27.2	6.9	Bet. Sex (S)	1.45	Bet. Sex	76.61*	0.00	sex (F < M)
Seoul (M)	39.4	11.0	Bet. Reg. (F)	0.05	Interaction	0.23	0.63	
Seoul (F)	26.8	8.0	Bet. Reg. (M)	0.21				
10 m gait (sec)								
Gifu (M)	5.6	1.7	Bet. Sex (G)	0.25	Bet. Reg.	1.21	0.27	
Gifu (F)	5.3	1.1	Bet. Sex (S)	0.14	Bet. Sex	0.19	0.66	
Seoul (M)	5.8	1.6	Bet. Reg. (F)	0.56	Interaction	1.39	0.24	
Seoul (F)	6.0	1.4	Bet. Reg. (M)	0.12				
TUG (sec)								
Gifu (M)	6.0	1.9	Bet. Sex (G)	0.52	Bet. Reg.	0.00	0.99	
Gifu (F)	5.3	1.2	Bet. Sex (S)	0.00	Bet. Sex	0.66	0.42	
Seoul (M)	5.9	1.6	Bet. Reg. (F)	0.45	Interaction	1.33	0.25	
Seoul (F)	5.9	1.5	Bet. Reg. (M)	0.06				
CS-30 (times)								
Gifu (M)	22.6	5.8	Bet. Sex (G)	0.13	Bet. Reg.	21.10*	0.00	region (S < G)
Gifu (F)	22.0	4.2	Bet. Sex (S)	0.26	Bet. Sex	0.05	0.82	
Seoul (M)	16.2	5.1	Bet. Reg. (F)	0.84	Interaction	1.35	0.25	
Seoul (F)	17.7	6.1	Bet. Reg. (M)	1.21				
Sit and reach (cm)								
Gifu (M)	33.3	11.8	Bet. Sex (G)	0.54	Bet. Reg.	4.76*	0.03	region : n.s
Gifu (F)	38.5	9.2	Bet. Sex (S)	0.02	Bet. Sex	2.4	10.12	
Seoul (M)	39.3	11.8	Bet. Reg. (F)	0.12	Interaction	2.10	0.15	
Seoul (F)	39.5	8.0	Bet. Reg. (M)	0.52				
Reaction time (sec)								
Gifu (M)	0.442	0.207	Bet. Sex (G)	0.31	Bet. Reg.	24.70*	0.00	region (G < S)
Gifu (F)	0.410	0.061	Bet. Sex (S)	0.11	Bet. Sex	0.95	0.33	
Seoul (M)	0.576	0.145	Bet. Reg. (F)	1.24	Interaction	0.16	0.69	
Seoul (F)	0.558	0.163	Bet. Reg. (M)	0.79				

The results of two-way ANCOVA with age as a covariate.
M, male; F, female; G, Gifu; S, Seoul; Bet. Sex, between sexes; Bet. Reg., between regions.
*$p < 0.05$.

from Gifu and Seoul in handgrip strength, knee extension strength, 10-m gait time, and TUG time tests. Strength of the upper and lower limbs as well as walking ability are essential for performing daily living activities and preventing falls. These generally decrease with increasing age, but it is possible to improve with regular exercise (Kimura et al. 2012). Kim et al. (2005) compared the physical activity of elderly populations in Korea and Japan and reported that Korean elderly were less physically active than Japanese. Japanese elderly also performed better in most physical fitness parameters.

In previous studies (Kim et al. 2005 ; Kang 2007), significant differences in physical fitness between Korean and Japanese elderly individuals were reported, with the Koreans being less fit compared to Japanese. These differences were reported to be associated with life expectancy, life style, and environmental influences, such as the social welfare system. However, our study showed different results than in previous studies. This may be related to an increase in physical activity and active participation in exercise classes by elderly individuals in Seoul who participated in our study. The exercise class participation rate of elderly in Seoul was 57.6% and 38.1% for females and males, respectively, a higher proportion than reported in previous studies (Kim et al. 2005; Lee et al. 2008). Korea has been emphasizing the importance of health-related physical fitness and physical activity in preparation for its aging society since 2000. The implementation of health-promoting exercise programs for the elderly was included in a basic law passed in 2005, addressing low birthrates and an aging society. The Ministry of Culture, Sports and Tourism and the Ministry of Health and Welfare of Korea have focused on developing exercise programs, providing support facilities and the training of exercise instructors for the elderly. Various programs for health and physical fitness improvement, such as yoga and dance sports, are included in the exercise classes of Korean Senior Welfare Centers. The Korean subjects in our study actively participated in these programs. Therefore, it is possible that participation in these exercise programs may have increased the awareness of health and physical fitness, and the increase in physical activity may have led to physical performance improvements in areas such as, muscle strength and ability to move.

Conversely, the OLS time, CS-30, and reaction time tests showed differences between the two regions, with the Gifu group performing better than the Seoul group. The OLS time, reaction time, and CS-30 tests are primarily used when evaluating balance, agility, and lower limb strength. To perform these physical activities, a body needs weight shift and body support. In addition, these are important physical factors in fall avoidance movements to prevent falls and near falls. We presume that the difference between the regions in terms of body weight and body fat percentage is the main reason for the regional differences in the three physical fitness parameters detailed previously.

Kim et al. (2005) reported that body mass index and body fat percentage were higher in Korean than Japanese; this may not only increase fall risk but also lead to orthopedic and circulatory diseases. The average height and weight of elderly Koreans over 65 years of age is 165.0 ± 6.1 cm and 64.9 ± 9.2 kg, respectively, for males and 151.1 ± 5.8 cm and 56.1 ± 8.4 kg, respectively, for females (Shin et al. 2015). In Japan these are 162.5 ± 6.2 cm and 61.9 ± 9.1 kg, respectively, for males, and 149.1 ± 5.8 cm and 50.8 ± 8.3 kg, respectively, for females (Ministry of Health, Labour and Welfare 2014). The physique parameters for Koreans were higher than those for Japanese, and the physiques of the participants of this study were comparable with data from the statistical offices in both countries. Therefore, it may be that the higher weight and proportion of body fat in the Seoul group affected their ability to move their center of gravity and maintain body balance.

The presence or absence of programs related to falls and long-term prevention may be another reason for the regional differences in the three physical fitness parameters detailed previously. Welfare policies and facilities for elderly populations are properly maintained in the super-aged society of Japan, where individuals and society in general are more conscious of physical health promotion and preventative care is high (Lee et al. 2008). The fall prevention classes conducted in Gifu explain the importance of fall prevention and propose exercise programs to improve fall-related physical fitness (e.g., step, balance, and muscle strengthening exercises). The introduction of welfare policies, such as fall prevention and long-term care prevention in Gifu, and the participation of elderly in fall prevention classes in Gifu are likely to have influenced their improvement in aspects of fall-related physical fitness such as agility, lower limb strength, and balance.

Although there was no significant difference between Gifu and Seoul in fall experience, the fall risk scores were higher in the elderly of Seoul compared to those in Gifu. A lack of awareness about fall prevention is considered one of the reasons. However, more studies on the regional differences in the fall risk scores are needed.

Exercise programs for increasing physical activity are mainly conducted in welfare centers for the elderly in Seoul and more generally, across Korea. These exercises have a positive effect on movement ability and leg muscle strength. However, various professional programs and policies are required to enhance fall-related physical fitness in balance, agility, among others, in addition to leg muscle strength and walking ability, influencing fall prevention in a more comprehensive way (Kimura et al. 2012).

This study was regionally limited by targeting the elderly populations in Gifu, Japan and Seoul, Korea. Further studies of elderly populations in more diverse areas are needed. In addition, the fall risk scores were higher in the elderly population of Seoul than in Gifu. Reviewing the cause of this result from various perspectives is necessary in addition to fall-related physical fitness comparisons.

In conclusion, there were no significant differences between the participants in the 10-m gait time, TUG, sit and reach, handgrip strength, and knee extension strength tests. However, elderly individuals from Gifu had better in reaction time, CS-30 and OLS tests than those from Seoul. Because the abilities to move quickly and maintain body balance in order to avoid falls are necessary to reduce fall risk and fall prevention, fall prevention classes and exercise programs for the improvement of these abilities are necessary.

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Conflict of Interest

The authors declare no conflict of interest.

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