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Comparison of Physical Function among Elderly Women in Japan and China

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Abstract

[Purpose] To compare the physical function of elderly people who belong to senior citizens' clubs in Japan with that of elderly women who belong to Tai Chi clubs in China. [Method] Grip strength was measured using a Smedley grip strength meter (SPR_651, manufactured by Matsumiya Medical Instruments) once on each side, and the higher of the two values was taken as the measured value. When standing on one leg with eyes closed, the time to maintain the position was measured using a digital stopwatch. The measurement position was a standing position. The measurement was discontinued when the opposite foot touched the floor. Measurement was taken once on each side, and the higher of the two values was taken as the measured value. Walking time was measured as the time (in seconds) spent walking at maximum effort over a 10 m straight section with 3 m walkways on both ends. [Results] The grip strength of the Chinese elderly group was significantly greater than that of the Japanese elderly group ($p = 0.01$). [Conclusion] The differences in the nature of activities between the senior citizens' club and the tai chi group suggest that the grip strength of the Chinese elderly group was significantly greater than that of the Japanese elderly group.

Keywords

Senior Women, Senior Club, Tai Chi Users

1. Introduction

China's population exceeds 1.4 billion, accounting for one-fifth of the world's population. Of this, the elderly population aged 65 and over is 216.76 million, accounting for 15.4% of the total population [1]. Meanwhile, Japan's population is

123.8 million, and the elderly population aged 65 and over is 36.24 million, accounting for 29.3% of the total population [2]. Maintaining and improving motor function in old age is an important factor in preventing physical deterioration associated with aging and maintaining an active social life. In recent years, the importance of preventing the need for nursing care has increased, and comprehensive geriatric training [3] and the practical methods and effects of preventive exercise [4] aimed at promoting health and preventing falls have become widely known. Furthermore, cross-sectional and longitudinal studies [5] [6] have reported that regular physical activity can maintain and improve the physical fitness of older people. However, there are few studies directly comparing the physical function of Japanese senior citizens' club members and Chinese tai chi club members. Therefore, in this study, we report a comparison of the motor function of older women who belong to senior citizens' clubs in Japan and those who belong to Tai Chi clubs in China.

2. Subject and Methods

2.1. Participantsu

The subjects were 34 elderly women aged 60 years or older who belonged to a senior citizens' club in City A, Kagoshima Prefecture, Japan (68.7 ± 3.3 years old). The subjects were 30 elderly women aged 60 years or older who belonged to a Tai Chi club in City K, Sichuan Province, China (66.7 ± 4.8 years old) (**Table 1**). The daytime subjects were verbally informed of the purpose of the study, that participation in the study was not mandatory, that the data obtained from the study would not be used for purposes other than research, and that the data would be anonymized before use, and informed consent was obtained from the subjects.

Table 1. General information of participants.

variables	Chinese elder (n = 30)	Japanese elder (n = 34)
age	66.7 ± 4.8	68.7 ± 3.3
range	60 - 73	62 - 73

2.2. Methods

Grip strength was measured using a Smedley grip strength meter (Matsumiya Medical Instruments SPR_651) once on each side, and the higher of the two values was taken as the measured value.

When standing on one leg with eyes closed, the time to maintain the position was measured using a digital stopwatch. The measurement position was a standing position. The measurement was discontinued until the contralateral foot touched the floor. Measurement was performed once on each side, and the higher of the two values was taken as the measured value.

Walking time was measured as the time (in seconds) spent walking at maximum effort over a 10-m straight section with 3-m walkways on both ends.

2.3. Sratistics

An unpaired t-test was used to compare the Chinese Tai Chi club elderly group (Chinese elderly group) and the Japanese senior citizens club elderly group (Japanese elderly group). Statistical analysis was performed using SPSS 28.0, with a statistical significance level of less than 5%.

3. Results

The age and grip strength of the Chinese elderly group was significantly greater than those of the Japanese elderly group ($p = 0.01$) (Table 2).

Table 2. T-test was used for variables.

variables	Chinese elder (n = 30)	Japanese elder (n = 34)	p-value
age	66.7 ± 4.8	68.7 ± 3.3	0.01
Grip strength (kg)	22.3 ± 4.9	19.3 ± 4.7	0.01
close-eyed one legged stand (sec)	5.0 ± 2.3	4.8 ± 3.9	0.82
10 m gait time (sec)	5.4 ± 0.5	5.3 ± 1.2	0.65

Notes: *$p < 0.05$ by unpaired student's t -tests.

4. Discussion

A comparison of the motor function of a group of elderly Japanese and Chinese people revealed that grip strength was 19.3 kg for the Japanese elderly group and 22.3 kg for the Chinese elderly group. Walking time was 5.3 seconds for the Japanese elderly group and 5.4 seconds for the Chinese elderly group. Ishizaki *et al.* [7] reported that because weak grip strength is a risk factor for decreased independence in basic and instrumental ADLs, measuring grip strength is useful as an indicator of health status, and Shinkai *et al.* [8] proposed a target level of physical fitness for elderly people to prevent a decline in basic ADLs. They pointed out that a grip strength of 15 kg or more and a maximum time of 6.5 seconds or less for women are sufficient to lead an independent life.

Participants in this study included Japanese elderly individuals who belonged to senior clubs and engaged in exercises and community cleanup activities at community centers. Meanwhile, Chinese elderly participants belonged to Tai Chi clubs and practiced Tai Chi in parks. Basic Tai Chi movements include pushing hands, pulling hands, turning, and footwork. These movements involve pairs of people maintaining contact with one or both hands, rotating the point of contact in a circular motion or pushing against each other. Therefore, it is effective as training for strengthening the forearm muscles located between the wrist and elbow [9]. Rather than the Japanese elderly group being significantly 2 years older than the Chinese elderly group, the difference in the nature of these group activities likely explains why the Chinese elderly group had significantly greater grip strength than the Japanese elderly group. Liu *et al.* [10] reported significant im-

provements in grip strength and forward bend flexibility after three months of tai chi instruction for healthy elderly individuals. Lan *et al.* [11] reported that after 12 months of Tai Chi exercise for 20 elderly individuals, significant differences were observed between the Tai Chi group and the control group (18 individuals) in knee flexor muscle strength and thoracolumbar flexion flexibility. These prior studies also support the finding that the Chinese elderly group in this study had significantly greater grip strength.

Health promotion programs for the elderly are actively being implemented to understand, maintain, and improve physical function. In these programs, muscle strength, flexibility, and balance function are used to evaluate physical function. Among these, balance function is an indicator that reflects important elements of daily living functions such as standing and walking. Balance function has also been reported to be associated with falls in the elderly.

In this study, the balance function of standing on one leg with eyes closed was measured in both the Japanese and Chinese elderly groups and was lower than the national average (10 seconds for 68-year-old women) [12]. In general, elderly people experience a decline in postural adjustment function due to degeneration of the musculoskeletal system, nervous system, and sensory receptors, and balance function is a physical ability achieved through appropriate postural adjustment [13]. Normal balance function involves many elements related to physical movement, such as perception of the external world via sensory receptors and the sensory nervous system, integration of sensation and movement by the central nervous system, and expression of movement via the motor nervous system and musculoskeletal system [14]. Tanida *et al.* [15] conducted a 12-week exercise program in 22 community-dwelling elderly people and compared LNG with eyes open and closed before and after exercise. Results showed a significant decrease in LNG with eyes open, but no significant change in LNG with eyes closed.

Tai Chi is inherently considered effective for improving balance function [16]. The Chinese elderly group in this study did not demonstrate superior results in the one-legged stance with eyes closed. The one-legged stance in this study was performed with eyes closed, not open. It has been reported that the vestibular system plays a major role in postural adjustment function in the elderly and affects balance functions requiring attention [17] [18]. Furthermore, decreased plantar sensitivity affects standing maintenance and balance function. Women, in particular, tend to have lower body temperatures than men, resulting in higher sensory receptor thresholds [19]. These factors may explain why the Chinese elderly group in this study performed poorly in the closed-eye single-leg stance test.

In the future, we plan to conduct follow-up surveys to explore the relationship between the degree of independence and medical expenses in old age.

5. Conclusion

The differences in the nature of activities between the senior citizens' club and the tai chi group suggest that the grip strength of the Chinese elderly group was sig-

nificantly greater than that of the Japanese elderly group.

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Conflicts of Interests

The authors declare no conflicts of interest regarding the publication of this paper.

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