



Original Article

The effects of Tai Chi on waist circumference and blood pressure in the elderly

YOUNG MEE LEE, RN, PhD¹⁾

¹⁾ Department of Nursing, Kangwon National University: 346 Hwangjo-gil, Dogye-eup, Samcheok-si, Gangwon-do 25949, Republic of Korea

Abstract. [Purpose] The purpose of this study was to investigate the effects of Tai Chi on waist circumference and blood pressure in the elderly. The present study used a nonequivalent control group pretest-posttest design. [Subjects and Methods] Sixty-eight elderly individuals residing in J city were divided into 2 groups: 34 in the experimental group, who received Tai Chi training for 6 weeks, and 34 in the control group, who did not receive Tai Chi training. Simplified Yang style 24-form Tai Chi was used as the intervention, which was conducted for 60 minutes per session, 5 sessions per week, for a total of 6 weeks. In each session, subjects in the experimental group conducted 10 minutes of warm-up exercises, 45 minutes of Tai Chi, and 5 minutes of cool-down exercises. Waist circumference and blood pressure were measured before and after the 6-week intervention. [Results] Waist circumference and blood pressure decreased significantly after the 6-week intervention in the experimental group compared with the control group. [Conclusion] Tai Chi can be used as an effective intervention to improve waist circumference and blood pressure in the elderly.

Key words: Blood pressure, Tai Chi, Waist circumference

(This article was submitted Aug. 29, 2016, and was accepted Nov. 2, 2016)

INTRODUCTION

Average life expectancy has increased owing to continued economic growth and advancements in medical science and technology, and, as such, the elderly population is increasing rapidly. According to a recent report, elderly individuals are less likely to receive medical treatment as they age, when their income is lower, and if they are female¹⁾, and the burden of medical costs is increasing accordingly.

In particular, because prevalence of metabolic syndrome is higher in those aged over 60 than in other age groups, it has been of clinical interest. In those with metabolic syndrome, risk of cardiovascular disease is increased by more than 2-fold, while risk of diabetes is increased by more than 10-fold^{2, 3)}.

Increasing prevalence of metabolic syndrome in older individuals has been reported to be closely related to low physical activity in the elderly⁴⁾. Among various risk factors for metabolic syndrome, high blood pressure has been found to be most significant, followed by abdominal obesity. Thus, in order to decrease prevalence of metabolic syndrome, factors that can decrease blood pressure and abdominal obesity should be investigated⁵⁾.

Exercise—a factor influencing metabolic syndrome that can be regulated—is essential for maintaining health, recovering health from chronic disease, and maintaining independence in the elderly, and is reported to have positive physical, psychologic, and social influences⁶⁾. In a previous study regarding Tai Chi in middle-aged women, risk factors for metabolic syndrome decreased while health-related quality of life improved⁷⁾. Similarly, in a pilot study investigating Tai Chi in 11 middle-aged subjects with metabolic syndrome, waist circumference and blood pressure showed significant improvement compared with baseline values⁸⁾.

Corresponding author. Young Mee Lee (E-mail: ymlee@kangwon.ac.kr)

©2017 The Society of Physical Therapy Science. Published by IPEC Inc.

This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives (by-nc-nd) License <<http://creativecommons.org/licenses/by-nc-nd/4.0/>>.

Therefore, the present study aimed to determine the effects of Tai Chi in the elderly, who show high prevalence of metabolic syndrome, and to investigate whether Tai Chi can be used actively in a clinical setting.

SUBJECTS AND METHODS

This study used a nonequivalent control group pretest-posttest quasi-experimental design. The sample size necessary for t-tests was calculated as 36 subjects in each group according to G* power analysis conducted with an effect size of 0.67, significance level of 0.05, and power of 0.80, based on the results of a previous study⁹).

In the present study, 68 elderly individuals residing in J city were divided into 2 groups: 36 in the experimental group, who received Tai Chi training for 6 weeks, and 36 in the control group, who did not receive Tai Chi training. However, 2 subjects in each group withdrew, resulting in 34 subjects in each group. Subjects were assigned to groups using a coin-flip strategy. Subjects were aged over 65, had not exercised regularly during the last 6 months, had no health problems preventing them from exercising, and could perform physical activities independently. Subjects received an explanation regarding the purpose and methods of the study prior to participation and provided written informed consent according to the principles of the Declaration of Helsinki.

The intervention used in this study was Yang style 24-form Tai-Chi, which was conducted for 60 minutes per session, 5 sessions per week, for a total of 6 weeks. In each session, subjects in the experimental group conducted 10 minutes of warm-up exercises, 45 minutes of Tai Chi, and 5 minutes of cool-down exercises. Similar to the experimental group, the control group performed 10 minutes of warm-up exercises and 5 minutes of cool-down exercises in each session, 5 times per week, for a total of 6 weeks. The content validity of the program was verified by a medical specialist, nursing professor with experience conducting exercise-related research, and exercise therapist. The intervention was conducted at our organization's auditorium from 14:00 pm to 15:00 pm.

Waist circumference and blood pressure were measured before and after the 6-week intervention. Mean waist circumference was determined after measuring twice using a tape (Dritz), while blood pressure was measured using an automated sphygmomanometer (model BPBIO330, Meditec) on the subject's right arm after relaxing for 20 minutes. Data were collected between December 2, 2013, and February 24, 2014. After collecting data from the control group for 6 weeks, data from the experimental group were collected for 6 weeks.

Data were analyzed using SPSS version 19.0 for Windows (IBM Corporation). Homogeneity between the experimental and control groups was tested using χ^2 and t-tests. T and paired t-tests were performed to determine differences in waist circumference and blood pressure between groups. Statistical significance was set at $p < 0.05$.

RESULTS

Subjects' mean age was 72.4 ± 3.8 years and 71.2 ± 5.1 years in the experimental and control groups, respectively.

Because there were no significant differences between groups in age, gender, marital status, educational level, religion, income, or exercise status, the groups were found to be homogeneous (Table 1).

Moreover, before the intervention, there were no significant differences between groups in waist circumference, systolic blood pressure (SBP), or diastolic blood pressure (DBP) (Table 2). After the intervention, waist circumference decreased by 1.8 cm in the experimental group and increased by 0.2 cm in the control group; change in waist circumference showed a significant difference between groups ($p = 0.001$) (Table 3).

SBP decreased by 16.6 mmHg in the experimental group and increased by 0.8 mmHg in the control group; change in SBP showed a significant difference between groups ($p = 0.001$) (Table 3).

DBP decreased by 10.1 mmHg in the experimental group and increased by 0.9 mmHg in the control group; change in DBP showed a significant difference between groups ($p = 0.001$) (Table 3).

DISCUSSION

Tai Chi conducted in elderly individuals decreased the risk factors for metabolic syndrome, thus, showing positive effects. Change in waist circumference before and after the intervention showed a significant difference between the experimental and control groups. This finding is consistent with a previous study¹⁰ reporting a significant difference in waist circumference after 24 weeks of exercise, and with another study⁹ reporting an increase in oxygen consumption of 16.1% in the Tai Chi exercise group and a decrease of 1.8% in the control group after 1 year of Yang style Tai Chi exercise.

Regarding BP in the experimental group, before the Tai Chi intervention, values for SBP and DBP were higher than normal. After the intervention, however, SBP and DBP measured within normal ranges. On the contrary, in the control group, values for SBP and DBP were higher than normal both before and after the intervention. These results are similar to a previous study⁵ showing that high BP contributed to prevalence of metabolic syndrome in middle-aged and elderly individuals living in one region. Our findings also agree with another study⁷ in which 12 weeks of Tai Chi exercise conducted in middle-aged women with metabolic syndrome exerted significant effects on decreasing certain risk factors for metabolic syndrome (DBP, waist circumference) in the experimental group compared with the control group.

Table 1. Subjects' general characteristics

| Characteristic | | Experimental group (n = 34) | Control group (n = 34) |
|--------------------|-------------------|--------------------------------|---------------------------|
| Age (yrs) | | 72.4 ± 3.8 | 71.2 ± 5.1 |
| Gender | Male | 11 (32.4) | 10 (29.4) |
| | Female | 23 (67.6) | 24 (70.5) |
| Marital status | Married | 23 (67.6) | 26 (76.5) |
| | Other | 11 (32.4) | 8 (23.5) |
| Educational level | No school | 5 (14.7) | 4 (11.8) |
| | Elementary school | 20 (58.8) | 20 (58.8) |
| | Middle school | 5 (14.7) | 5 (14.7) |
| | High school | 4 (11.8) | 4 (11.8) |
| | College | 0 (0) | 1 (2.9) |
| Religion | Buddhist | 13 (38.2) | 11 (32.4) |
| | Christian | 6 (17.6) | 6 (17.6) |
| | Catholic | 8 (23.5) | 5 (14.7) |
| | Other | 1 (2.9) | 2 (5.9) |
| | No religion | 6 (17.6) | 10 (29.4) |
| Income, 10,000 won | ≤50 | 4 (11.8) | 9 (26.5) |
| | >50 | 15 (44.1) | 14 (41.2) |
| | ≥100 | 15 (44.1) | 10 (29.4) |
| | ≥200 | 0 (0) | 1 (2.9) |
| Exercise | Yes | 11 (32.4) | 9 (26.5) |
| | No | 23 (67.6) | 25 (73.5) |

Data are presented as mean ± SD or n (%), as appropriate.

Table 2. Dependent variables between groups

| Variable | Experimental group (n = 34) | Control group (n = 34) |
|---------------------------------|--------------------------------|---------------------------|
| Waist circumference (cm) | 82.6 ± 6.1 | 83.2 ± 6.6 |
| Systolic blood pressure (mmHg) | 149.3 ± 19.6 | 143.8 ± 22.8 |
| Diastolic blood pressure (mmHg) | 88.1 ± 16.6 | 86.6 ± 17.1 |

Data are presented as mean ± SD.

Table 3. Dependent variables before and after the intervention between groups

| Variable | | Before | After |
|---------------------------------|--------------------|--------------|----------------|
| Waist circumference (cm) | Experimental group | 82.6 ± 6.1 | 80.8 ± 6.0** |
| | Control group | 83.2 ± 6.6 | 83.4 ± 6.6 |
| Systolic blood pressure (mmHg) | Experimental group | 149.3 ± 19.6 | 132.7 ± 15.6** |
| | Control group | 143.8 ± 22.8 | 144.7 ± 20.5 |
| Diastolic blood pressure (mmHg) | Experimental group | 88.1 ± 16.6 | 78.0 ± 11.4** |
| | Control group | 86.6 ± 17.1 | 87.5 ± 13.9 |

Data are presented as mean ± SD, **p<0.01

In the present study in which the intervention was conducted for a relatively short period of time (6 weeks), significant differences in dependent variables, including waist circumference and BP, may have occurred because the exercise was conducted frequently (5 times per week). We applied Tai Chi exercise 5 times per week for a total of 6 weeks in elderly men and women and observed significant decreases in waist circumference and BP in the experimental group.

Thus, regular Tai Chi training has a positive impact on decreasing the risk factors for metabolic syndrome in the elderly.

The findings of this study suggest the need for further research to identify the effects on body mass index and blood-related indicators in the elderly.

REFERENCES

- 1) Ministry of Health, Welfare and Family Affairs: 2013 Korean National Health and Nutrition Examination Survey, 2014.
- 2) Park HS: Epidemiology of metabolic syndrome in Korea. *J Korean Soc Stud Obes*, 2002, 11: 203–211.
- 3) Ministry of Health, Welfare and Family Affairs: 2010 Korean National Health and Nutrition Examination Survey, 2011.
- 4) Berra K: Treatment options for patients with the metabolic syndrome. *J Am Acad Nurse Pract*, 2003, 15: 361–370. [[Medline](#)] [[CrossRef](#)]
- 5) Lee HS, Kwon CS: Prevalence of metabolic syndrome and related risk factors of elderly residents in Andong rural area. 1. Based on the anthropometric measurements and health behaviors. *J Korean Soc Food Sci Nutr*, 2010, 39: 511–517. [[CrossRef](#)]
- 6) Jeong YM, Kim JH: An effect of health promotion program on health behavior, perceived health status and life satisfaction in the elderly. *J Korean Acad Adult Nurs*, 2002, 14: 327–336.
- 7) Eom AY: The effects of the Tai Chi exercise on metabolic syndrome and health-related quality of life in middle-aged women. *J Muscle Jt Health*, 2012, 19: 152–160. [[CrossRef](#)]
- 8) Liu X, Miller YD, Burton NW, et al.: A preliminary study of the effects of Tai Chi and Qigong medical exercise on indicators of metabolic syndrome, glycaemic control, health-related quality of life, and psychological health in adults with elevated blood glucose. *Br J Sports Med*, 2010, 44: 704–709. [[Medline](#)] [[Cross-Ref](#)]
- 9) Taylor-Piliae RE, Haskell WL, Froelicher ES: Hemodynamic responses to a community-based Tai Chi exercise intervention in ethnic Chinese adults with cardiovascular disease risk factors. *Eur J Cardiovasc Nurs*, 2006, 5: 165–174. [[Medline](#)] [[CrossRef](#)]
- 10) Kim JS, Kim SY: The effect of Qigong-based combined exercise program for rural elderly people. *J Korea Soc Wellness*, 2012, 7: 39–51.