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Effectiveness of Thai Wand Exercise training on health-related quality of life in sedentary older adults

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Background : *Older people with physical inactivity and overweight have high risks of cardiovascular disease. Regular exercise is known to improve quality of life (QOL) and obesity leading to a reduction of cardiovascular risks. Therefore, Thai Wand Exercise training is believed to reduce the cardiovascular risks. Consequence is that Thai Wand Exercise is more accessible and suitable for Thai elderly than modern exercise program.*

Objective : *This study was aimed to examine the effect of Thai Wand Exercise on the improvement of health-related QOL and other cardiovascular risk factors in sedentary older adults.*

Setting : *Srinagarind Hospital, Faculty of Medicine, Khon Kaen University*

Design : *A single blind randomized controlled trial*

Methods : *Sedentary healthy subjects aged 55-70 years old in Khon Kaen were studied. All subjects were randomized into 2 groups: a control group (n = 71) and Thai Wand Exercise group (n = 71). Thai Wand Exercise training consisted of 40 min/day, 3-5 days/week, for 15 weeks. Anthropometry, body composition, body flexibility, 6-minute walk distance (6MWD) and QOL were measured before and after 15-week period.*

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Result : *Thai Wand Exercise significantly reduced body mass, total fat mass, waist and hip circumferences and increased flexibility, 6MWD, physical health dimension and vitality of mental health dimension of the QOL.*

Conclusion : *This study shows that Thai Wand Exercise training improved physical health status, vitality and decreased obdominal. Therefore, this easy and low impact exercise program is a good approach to reduce cardiovascular risks in sedentary elderly, to whom the common exercise programs are not applicable.*

Keywords : *Thai Wand Exercise Training, Elderly, Physical health status, Flexibility, Obesity.*

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พรรณี ปึงสุวรรณ, กล้วยไม้ พรหมดี, วิภา ศรัทธาบุญ, รัตนวดี ณ นคร, นฤมล ลีลายุวัฒน์. ประสิทธิผลของการรำไม้พลองต่อการเพิ่มคุณภาพชีวิตด้านสุขภาพในผู้สูงอายุ ที่ไม่ได้ออกกำลังกายเป็นประจำ. จุฬาลงกรณ์เวชสาร 2551 มี.ค. – เม.ย; 52(2): 107 – 121

บทนำ : *ผู้สูงอายุที่ไม่ได้ออกกำลังกายเป็นประจำและมีน้ำหนักเกินกว่าปกติ มักมีโอกาสเสี่ยงสูงต่อการเป็นโรคหัวใจและหลอดเลือด การออกกำลังกายเป็นประจำได้รับการยอมรับว่า มีผลเพิ่มคุณภาพชีวิตและลดความอ้วน ทำให้ลดโอกาสเสี่ยงต่อการเป็นโรคหัวใจและหลอดเลือด ดังนั้นการออกกำลังกายแบบรำไม้พลองเป็นประจำ จึงน่าจะลดโอกาสเสี่ยงต่อการเป็นโรคหัวใจและหลอดเลือดได้ ที่สำคัญคือ การรำไม้พลองเป็นรูปแบบการออกกำลังกายที่ทำได้ง่ายและเหมาะสมสำหรับผู้สูงอายุชาวไทย มากกว่าโปรแกรมการออกกำลังกายแบบตะวันตก*

วัตถุประสงค์ : *งานวิจัยนี้มุ่งหวังศึกษาผลของการรำไม้พลองต่อการเพิ่มคุณภาพชีวิตด้านสุขภาพและปัจจัยเสี่ยงอื่น ๆ ต่อการเกิดโรคหัวใจและหลอดเลือด ในผู้สูงอายุสุขภาพปกติที่ไม่ได้ออกกำลังกายเป็นประจำ*

สถานที่ที่ทำการศึกษา : *โรงพยาบาลศรีนครินทร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น จังหวัดขอนแก่น*

รูปแบบการวิจัย : *A single blind randomized controlled trial*

วิธีการศึกษา : *เป็นการศึกษาในอาสาสมัครที่มีสุขภาพปกติที่ไม่ได้ออกกำลังกายอายุ 55-70 ปี ในจังหวัดขอนแก่น ซึ่งถูกสุ่มแบ่งเป็น 2 กลุ่ม คือ กลุ่มควบคุม (71 คน) และกลุ่มที่ออกกำลังกายแบบรำไม้พลอง (71 คน) เป็นประจำ วันละ 40 นาที 3-5 วัน/สัปดาห์ เป็นเวลา 15 สัปดาห์ และ ทุกคนได้รับการตรวจวัดโครงสร้างและส่วนประกอบของร่างกาย ความยืดหยุ่นของร่างกาย ระยะทางที่เดินได้ใน 6 นาที และคุณภาพชีวิตด้านสุขภาพ ก่อนและหลัง 15 สัปดาห์*

ผลการศึกษา : *การออกกำลังกายแบบรำไม้พลองมีผลลดน้ำหนักตัว ลดมวลไขมันในร่างกาย ลดเส้นรอบวงของเอวและสะโพก เพิ่มความยืดหยุ่นของร่างกาย ระยะทางที่เดินได้ใน 6 นาที และคุณภาพชีวิตด้านสุขภาพกายทั้งหมด และคุณภาพชีวิตด้านสุขภาพจิตใจในส่วนของความมีพลัง อย่างมีนัยสำคัญทางสถิติ*

วิจารณ์และสรุป : *งานวิจัยนี้แสดงให้เห็นว่าการออกกำลังกายแบบรำไม้พลอง ทำให้คุณภาพชีวิตด้านสุขภาพกายทั้งหมด และคุณภาพชีวิตด้านสุขภาพจิตใจในส่วนของความมีพลังเพิ่มขึ้น และลดความอ้วน ดังนั้นการออกกำลังกายแบบรำไม้พลองซึ่งเป็นการออกกำลังกายรูปแบบที่ง่ายและทำให้เกิดแรงกระแทกน้อย จึงเป็นวิธีการลดโอกาสเสี่ยงต่อการเกิดโรคหัวใจและหลอดเลือด ที่เหมาะสมสำหรับผู้สูงอายุสุขภาพปกติ ที่ไม่ได้ออกกำลังกายเป็นประจำ และไม่สามารถออกกำลังกายในรูปแบบตะวันตกที่เป็นที่นิยม*

คำสำคัญ : *การฝึกออกกำลังกายแบบรำไม้พลอง, ผู้สูงอายุ, สุขภาพทางกาย, ความยืดหยุ่น, โรคอ้วน.*

Many studies have shown that sedentary older people who are physically inactive have a higher cardiovascular disease risk factors, e.g., decreased capacity to fulfill the activities of daily living, [1] physical inactivity [2] and increased abdominal obesity. [3-6] More physical activity [7,8] and less fat intake [9] have been shown to reduce cardiovascular risks in the older people. Therefore, increase in aerobic fitness, physical activity and maintaining proper body weight are recommended for preserving the wellness during aging. [8-11] An important outcome that determines the overall health status is health-related quality of life (HRQL). [12]

Exercise program which is a combination of flexibility, balance, strengthening and endurance has been recommended to promote the quality of older individuals' lives. [11] It has been supported by a study in older individuals that endurance exercise training increases physical functioning, body flexibility and self-perception of general health (by SF-36 questionnaire). [13] It is noteworthy that even small amounts of routine physical activity within a normal lifestyle can increase health-related QOL. [14] Moreover, the endurance exercise training has been shown to reduce body fat [3,15,16] which is associated with a better health-related quality of life. [14]

A problem is that normal fitness training in a gym is not accessible for the elderly since it is too heavy and inconvenient. Thus, the present study offers a new approach implementing an old technique. The training called Thai Wand Exercise or Ram-plong in Thai consists of a series of exercises all of which use a three feet long stick called the wand. Thai Wand Exercises are executed in two stages with 5 separate exercises in each stage in standing position. It is a combination of flexibility, balance, and endurance which has been recommended to promote the quality of older individuals' lives. [11] Consequence is that all movements which are simple, slow, smooth with full range of motion of shoulders and waist without high impact on any joint of lower limb can be performed at home. Therefore, it is a kind of exercise that is applicable and suitable for older people in improving their health status. To-date, however, no study has investigated the beneficial effects of Thai Wand Exercise on health-related QOL and other cardiovascular risk factors. Therefore, the present study is aimed to examine the effects of the new form of exercise that will overcome the problem of physical inactivity in the elderly on health-related QOL and other cardiovascular risk factors.

Methods

Design and Setting

This study was a single blind randomized controlled trial. Participants were randomly allocated to one of the two interventions by a computer-generated randomization list. They were divided into the control and Thai Wand Exercise groups with 71 participants in each group (Figure 1). Throughout 15 weeks participants in the exercise group performed Thai Wand Exercise and in the control group did not perform any exercise; they simply maintained their usual level of physical activity. All variables were measured before and after the intervention at 15 weeks.

Participants

A total of 142 participants (55-70 years old) who had given their informed consent were recruited from the urban area of Khon Kaen, Thailand. The study

was approved by the Ethics Committee of Khon Kaen University and was performed in accordance with the 1964 Declaration of Helsinki. Participants with hyperglycaemia, hypertension, dyslipidemia, impaired mobility, hepatic and renal functions were excluded, as were those who regularly exercised. Participants were evaluated by a routine medical examination: a health-risk questionnaire, vital signs, blood chemistry assessment, and a 12-lead electrocardiograph (ECG). A flow diagram of the study as outlined in the Consolidated Standards of Report Trials (CONSORT) statement is shown in Figure 1.

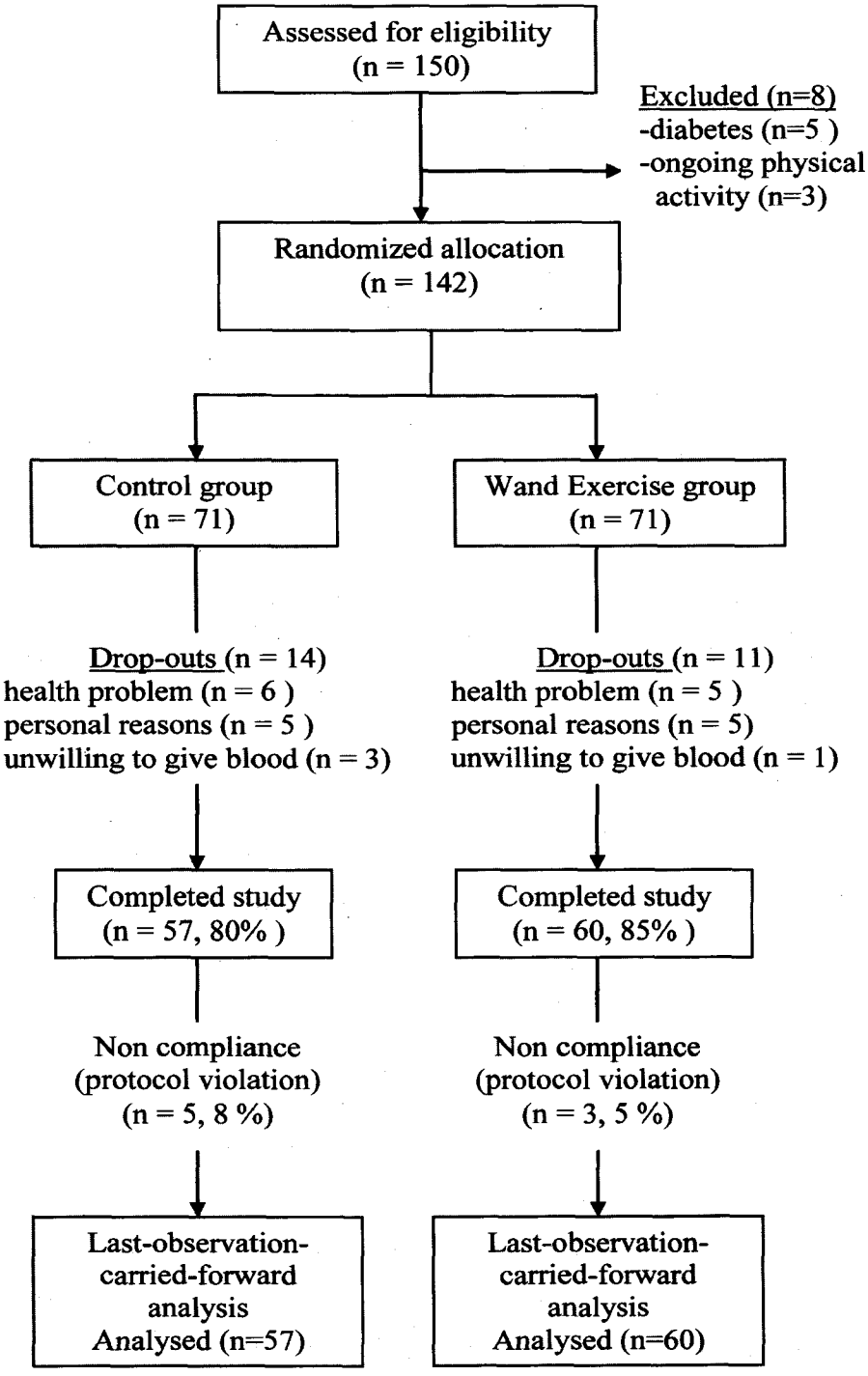

Figure 1. Flow diagram of describing subject enrollment, intervention allocation, follow-up and data analysis.

Wand Exercise Program

Thai Wand Exercise training consists of a series of exercises in standing position with a three-feet long stick, called the wand. The exercises were grouped in 2 stages with 5 separate exercises in each stage. The first stage consists of movements of waist and the upper part of body. The second stage emphasizes on the lower part of body. Moreover, Thai Wand Exercise in this study uses similar equipment as the Chinese Wand Exercise [17] but it is different in movement pattern. The movements of the Thai Wand Exercise in this study were slower and easier than those of the Chinese Wand Exercise.

Baseline and 15-Week Measurements

Anthropometry and Body Composition

Total fat mass (FM) was measured indirectly by skinfold measurement. Skin-fold thickness was determined at the triceps, biceps, subscapular and suprailiac by a caliper. The sum of skinfolds taken at the four sites was used to evaluate body fat (BF) by using the equations of Durnin and Womersley (1974) which have been assumed to be valid in Thai people. Fat free mass (FFM) was then calculated from the BF. Waist (W) and hip (H) circumferences were measured midway between the costal margin and the iliac crest and greatest value over the buttocks, respectively.

Body Flexibility

Body flexibility was measured by sit and reach box. The subjects were asked to sit (long sitting) with knee straight in front of the box, to cross both hands (right on the top), and stretch their fingers. They reached out along the ruler as far possible for 3 times and the maximal distance was then recorded.

Functional Capacity

Functional capacity was measured by 6-minute walk test (6 MWT). [19] The subjects were asked to walk as quickly as they can for six minutes on a flat and hard surface of 100 feet hallway. They performed 2 times of 6MWT with 30 minutes rest and the maximal distance was then recorded as 6-minute walk distance (6 MWD).

Health-related Quality of Life (HRQOL)

The SF-36, a self-perceived health status questionnaire, is a promising instrument for measuring HRQOL in a general population. It is easy to use, acceptable to patients, and fulfils stringent criteria of reliability and validity. [12] The SF-36 includes one multi-item scale that covers a range of mental and physical component scales and assesses eight health domains: physical functioning, physical role, bodily pain, general health perception, vitality, social functioning, emotional role and mental health.

Exercise Intervention

Wand Exercise Program

Each participant in the Thai Wand Exercise group learned to perform Thai Wand Exercise on the first day of the experiment. For the following 15 weeks they performed the training at home according to a video show one session per day (20 minutes), 3 days/ week for the first 3 weeks, and two sessions per day (40 minutes), 3-5 days/week for the next 12 weeks. After the first 3 weeks, all participants in the Thai Wand Exercise group were asked to come back to the laboratory again for reassessment of the program and adjustment. Each participant was telephoned every month to check their compliance to the program.

Diet and Physical Activity

All participants were asked to record all dietary intake and physical activities for 3 days, 2 weekdays and 1 weekend day. The dietary intake record was analyzed by using a computerized food composition database, the INMUCAL program (INMUCAL software, Mahidol University, Thailand). A questionnaire of the physical activity included duration and frequency of the activities including occupational work, household activity, sports and leisure activities and sleeping etc. Each month, every participant was contacted by telephone to check up on completing their daily dietary intake and physical activities record.

Statistical Analysis

Data analysis was performed with the STATA statistical package (version 10). The data of normally distributed parameters were expressed as means ± SD, and mean differences. Skewed data were logarithmically transformed and expressed as mean with 95 % confidence intervals. Paired *t*-tests were used to test for the differences of variables within group. Analysis of covariance (ANCOVA) test was performed for comparison of post-test values between two groups. P value < 0.05 was used as the criterion of statistical significance.

Results

One hundred and seventeen (57 control, 60 Thai Wand Exercise groups) sedentary older adults completed the study. The mean age and gender distribution of both groups were similar. There were no differences between the groups in baseline physical characteristics of any participants, suggesting a successful randomization (Table 1).

Table 1. Baseline characteristics of subjects.

	Control group (n = 57)	**Thai Wand Exercise group (n = 60)**
Age, yr	61 ± 4 (55-70)	62 ± 4 (55-70)
Gender	F = 46, M = 11	F = 50, M = 10
BM, kg	59.0 ± 9.4 (38.5-89.0)	60.7 ± 9.2 (41.0-81.5)
Height, cm	155.9 ± 6.4 (142-168)	156.2 ± 6.3 (144-170)
BMI, kg/m^2	25.6 ± 3.8 (18.3-33.1)	25.6 ± 3.1 (18.6-33.7)
BF, %	31.1 ± 8.0 (11.8-44.5)	33.1 ± 6.9 (13.8-43.9)
FM, kg	18.7 ± 6.4 (6.8-32.9)	20.1 ± 5.5 (7.2-33.7)
FFM, kg	40.4 ± 6.4 (31.3-62.8)	40.6 ± 7.3 (28.9-60.8)
Circumference, cm		
W	81.1 ± 9.5 (58.0-104.5)	82.9 ± 9.0 (56.5-105.0)
H	96.5 ± 7.4 (79.0-116.6)	97.7 ± 6.9 (78.5-115.6)
W/H ratio	0.84 ± 0.06 (0.71-1.00)	0.85 ± 0.07 (0.67-1.04)

Data are expressed as means ± SD (range: minimum and maximum values) F = female, M = male; BM, body mass; BMI, body mass index; BF, body fat; FM, total fat mass; FFM, fat free mass; W, waist circumference; H, hip circumference; W/H ratio, waist to hip circumference ratio.

The characteristics of the dropouts were not different from the completers. Twenty-five participants in the control and Thai Wand Exercise groups withdrew from participation because of personal reasons, unwilling to give blood and health problems unrelated to the exercise training program (Figure 1). The analysis included the non-compliance data.

Changes in Habitual Daily Physical Activity and Diet

Baseline daily dietary intake and energy expenditure were similar in both groups (Table 2). After 15 weeks, energy expenditure was significantly increased in Thai Wand Exercise group when compared with the control group.

Participants' Compliance to the Program

There were 5 and 3 non-compliant participants in the control and Thai Wand Exercise groups, respectively (Figure 1).

Between-group analysis

After 15 weeks, Thai Wand Exercise training statistically reduced anthropometry and body composition: BM = -0.73 kg (95 % CI: -1.3 to -0.16 kg, P = 0.01), BMI = -0.26 kg/m^2 (95 % CI: -0.5 to -0.02 kg/m^2, P = 0.03, Table 3), % BF = -1.14 % (95 % CI: -2.2 to -0.06 %, P = 0.04, Table 3), FM = -0.94 kg (95 % CI: -1.7 to -0.18 kg, P = 0.02, Table 3), W = -2.29 cm (95 % CI: -3.2 to -1.3 cm, P < 0.001, Table 3) and WHR = -0.01 (95 % CI: -0.02 to -0.001, P = 0.03, Table 3) when compared between groups. Thai Wand Exercise significantly increased body flexibility (2.96 cm, 95 % CI: 1.7 to 4.2 cm, p < 0.001, Figure 2A), 6MWD (17.34 m, 95 % CI: 5 to 29 m, p = 0.006, Figure 2B). However, FFM was not significantly different between groups. Moreover, Thai Wand Exercise training improved physical role (10.82, 95 % CI: 1.3 to 20, p = 0.03, Table 4), bodily pain (6.97, 95 % CI: 0.5 to 13.5, p = 0.04, Table 4), general health perception (5.20, 95 % CI: 0.04 to 10, p = 0.04, Table 4) and vitality (4.65, 95 % CI: 0.12 to 9.2, p = 0.04, Table 4) when compared between groups.

Table 2. Daily dietary intake and energy expenditure of the control and Thai Wand Exercise groups during 15 weeks.

Daily dietary intake and energy expenditure	Control group (n = 57)		Thai Wand Exercise group (n = 60)	
	before	after	before	after
Carbohydrate, (g)	287 ± 75	268 ± 91	244 ± 70	230 ± 92
Fat, (g)	51 ± 22	53 ± 30	50 ± 23	46 ± 23
Protein, (g)	78 ± 45	82 ± 30	73 ± 39	75 ± 31
Dietary intake, kcal/day	1712 ± 430	1691 ± 415	1664 ± 457	1629 ± 496
Energy expenditure, kcal/day	1625 ± 347	1633 ± 287	1648 ± 395	1884 ± 380**

Data are expressed as means ± SD.

** Significant difference from the control group, p-value<0.001.

Table 3. Changes in anthropometry and body composition before and after 15 weeks in the control and Thai Wand Exercise groups.

Variables	Control group (n = 57)			Thai Wand Exercise group (n = 60)			Mean difference	p-value [b]
	before	after	p-value [a]	before	after	p-value [a]	(95 % CI)	
BM, kg	59.05 ± 9.41	58.85 ± 9.24	0.37	60.66 ± 9.23	59.71 ± 9.30	<0.001***	-0.73 (-1.3 to-0.16)	0.01*
BMI, kg/m^2	25.59 ± 3.75	25.51 ± 3.70	0.36	25.57 ± 3.10	25.22 ± 3.15	<0.001***	-0.26 (-0.5 to-0.02)	0.03*
BF, %	31.07 ± 8.00	30.76 ± 7.57	0.58	33.07 ± 6.91	31.37 ± 6.71	<0.001***	-1.14 (-2.2 to-0.06)	0.04*
FM, kg	18.67 ± 6.43	18.41 ± 6.15	0.51	20.13 ± 5.49	18.81 ± 5.42	<0.001***	-0.94 (-1.7 to-0.18)	0.02*
FFM, kg	40.43 ± 6.40	40.40 ± 5.88	0.90	40.55 ± 7.32	40.85 ± 7.20	0.004**	0.34 (-0.18 to 0.8)	0.20
W, cm	81.14 ± 9.51	81.49 ± 9.46	0.33	82.90 ± 8.96	80.89 ± 8.94	<0.001***	-2.29 (-3.2 to-1.3)	<0.001***
H, cm	96.46 ± 7.42	95.88 ± 7.26	0.08	97.73 ± 6.89	95.71 ± 6.94	<0.001***	-0.01 (-0.02 to-0.001)	0.03*
WHR	0.84 ± 0.06	0.85 ± 0.07	0.03*	0.85 ± 0.07	0.84 ± 0.07	0.37	-0.01 (-0.02 to-0.001)	0.03*

Data are expressed as means ± SD and mean differences (95 % CI: confidence interval).

BM, body mass; BMI, body mass index; BF, body fat; FM, fat mass; FFM, fat free mass; W, waist circumference; H, hip circumference; WHR, W/H ratio

[a] Test for significant differences within group, [b] Test for significant differences between groups; * p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001

Table 4. Changes in SF-36 score before and after 15 weeks in the control and Thai Wand Exercise groups.

Variables	Control group (n = 57)			Thai Wand Exercise group (n = 60)			Mean difference	p-value [b]
	before	after	p-value [a]	before	after	p-value [a]	(95 % CI)	
Physical component scale								
PF	78.58 ± 14.82	77.83 ± 17.64	0.67	76.83 ± 13.24	80.58 ± 13.78	0.03*	3.99 (-0.6 to 8.6)	0.09
PR	74.53 ± 35.52	78.30 ± 33.98	0.46	79.17 ± 31.27	90.83 ± 21.57	0.002**	10.82 (1.3 to 20)	0.03*
BP	67.30 ± 20.88	67.94 ± 22.25	0.82	65.53 ± 16.73	74.03 ± 17.26	<0.001***	6.97 (0.5 to 13.5)	0.04*
GHP	56.89 ± 17.76	60.13 ± 17.40	0.13	60.39 ± 15.75	67.27 ± 15.70	0.002**	5.20 (0.04 to 10)	0.04*
Mental component scale								
Vitality	64.72 ± 16.00	66.20 ± 15.17	0.50	68.98 ± 13.73	72.80 ± 12.29	0.03*	4.65 (0.12 to 9.2)	0.04*
SF	82.41 ± 15.46	83.10 ± 18.36	0.78	86.45 ± 16.16	86.25 ± 15.21	0.91	0.94 (-4.5 to 6.4)	0.73
ER	66.67 ± 42.95	77.16 ± 37.10	0.09	70.00 ± 41.49	79.44 ± 33.67	0.06	1.06 (-10.8 to 12)	0.86
MH	73.69 ± 15.41	75.46 ± 11.88	0.34	77.67 ± 13.49	78.33 ± 12.57	0.64	3.99 (-0.6 to 8.6)	0.09

Data are expressed as means ± SD and mean differences (95% CI: confidence interval).

PF, physical functioning; PR, physical role; BP, bodily pain; GHP, general health perception; SF, social functioning; ER, emotional role; MH, mental health; [a] Test for significant differences within group, [b] Test for significant differences between groups; * p-value < 0.05, ** p-value < 0.01, *** p-value < 0.001

Within-group analysis

After Thai Wand Exercise training, physical functioning ($p = 0.03$), physical role ($p = 0.002$), bodily pain ($p < 0.001$), general health perception ($p = 0.002$), and vitality ($p = 0.03$) of SF-36 scores (Table 4) were increased. In addition, FFM was increased in the Thai Wand Exercise group (Table 3). In the control group, however, WHR ($P = 0.03$ Table 3) was increased and body flexibility ($p = 0.05$, Figure 2A) was decreased from baseline. There were no significantly changes in 6MWD (Figure 2B) and the SF-36 scores, in the control group (Table 4).

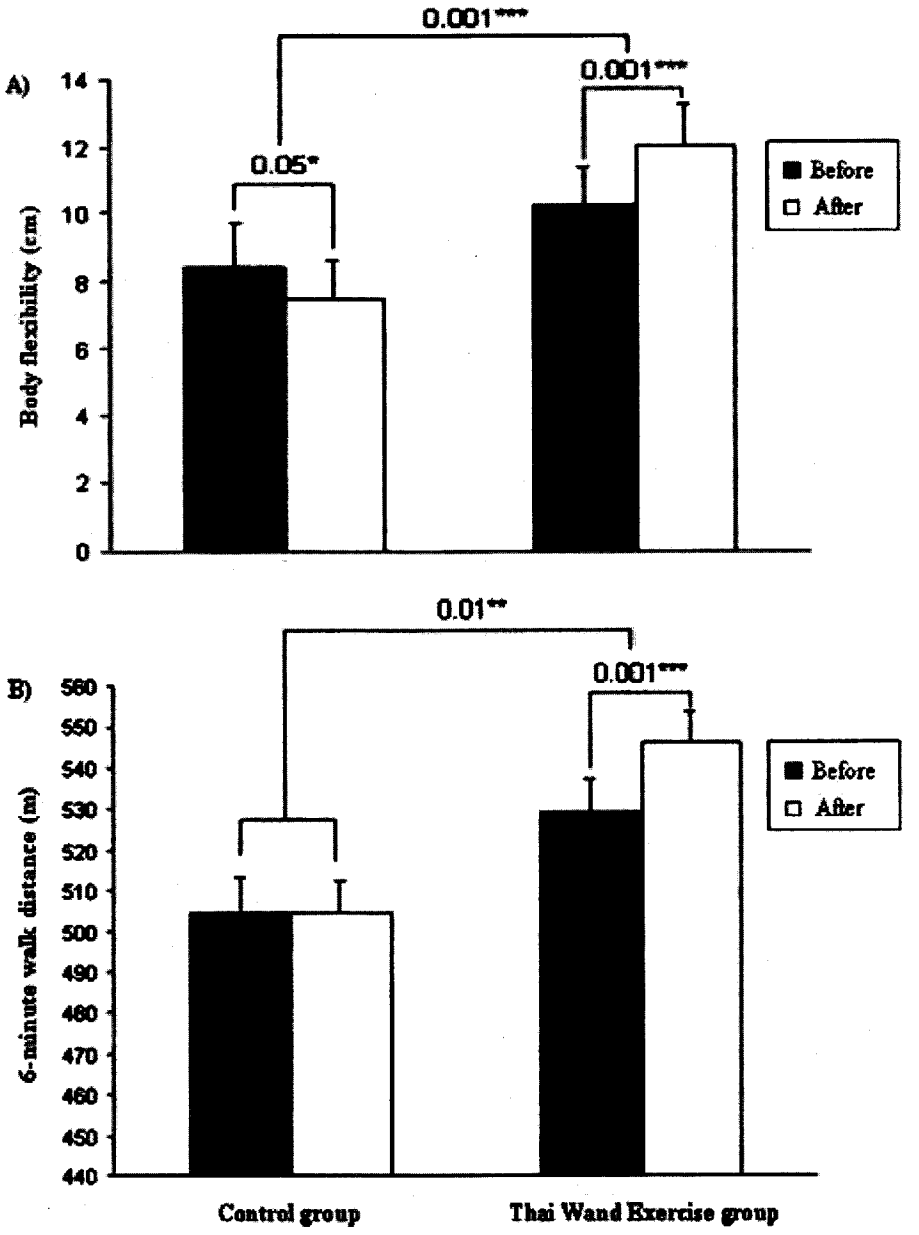

Figure 2A-B. Changes of body flexibility (Figure 2A-B) and 6-minute walk test (Figure 2B) before (black) and after (white) 15 weeks in the control group (n = 57) and Thai Wand Exercise group (n = 60).

Discussion

This is the first study which has shown that a group of older subjects who participated in 40-min Thai Wand Exercise program per day, 3-5 days per week over 15 weeks exhibited significant improvement in HRQOL both from physical component scale of the SF-36 health score and from direct measurement of body flexibility functional capacity and abdominal obesity.

However, physical component summary scale of the SF-36 health form showed poor discriminant validity in cardiac patients. [20] Cardiac patients with hypertension had lower physical component scale than those without hypertension but those with hyperlipidaemia had higher physical component scale than those without hyperlipidaemia. An explanation for this difference is still unclear. Moreover, at a subscale level of the SF-36 health score, a discriminant validity seems to depend on health status. McHorney and college (1993) suggested that subscales of SF-36 health score which are physical functioning and physical role show good discriminant validity of severity of chronic medical physical conditions. It was demonstrated by previous study that, general health perception subscale was able to differentiate coronary heart disease patients with various levels of physical disabilities and discriminate healthy participants from participants with dyslipidaemia and/ or hypertension. [22] The participants in this study are healthy elder adults. Therefore, the general health perception subscale should be a good parameter that is used to interpret the beneficial effect of Thai Wand Exercise training on the improvement of HRQOL.

The improved general health perception subscale may be due to the increase in the body flexibility and functional capacity directly measured in the present study. Six minutes walk test used to measure the functional capacity has been reported to be correlated with maximal oxygen consumption [23] which determines aerobic fitness. [14] Stewart et al. (2003) demonstrated that increased aerobic fitness is positively associated with physical component of the SF-36 health score. In addition, more recent study has reported that even a normal lifestyle which comprises small amounts of routine physical activity, contributes to slight increase in aerobic fitness.[14] Interestingly, the findings in the present study were consistent with a study of Cochrane et al. (1998) which demonstrated that 10-week exercise program which was designed to increase endurance, strengthening, balance, flexibility, coordination and mobility contributed to improvement in physical functioning, body flexibility and general health perception (by SF-36 health score). [13] The improved aerobic fitness not only determines the better QOL but also indicates a reduction in cardiovascular disease risk. In addition, this study found that Thai Wand Exercise training decreased abdominal obesity. The inversed correlation between fat mass and HRQOL [14, 24] implied that the better HRQOL the less risk of cardiovascular disease.

After matching for age and sex, Thai Wand Exercise training reduced abdominal obesity which is an important cardiovascular risk factor. [25] Several previous studies demonstrated the reduction in abdominal fat in response to the exercise training in the elderly. [16, 26] The greater energy expenditure in this study due to Thai Wand Exercise was responsible for the reduction in abdominal obesity. Moreover, it is worth noting that most movements of Thai Wand

Exercise occur around waist. The frequent contraction and stretching of the abdominal and back muscles may contribute to the waist circumference reduction. Moreover, it is noted that there was an increase in WHR in the control group after 15 weeks in the present study. This may suggest that the physical inactivity may be responsible for the abdominal obesity in this group since the daily energy expenditure in the control group is lower than recommended value. [27]

By improving general health perception subscale in health-related QOL, function capacity, body flexibility and abdominal obesity with only a cheap wand, Thai Wand Exercise program could lead to saving in health care cost, especially from intervention of cardiovascular disease. The cost of providing Thai Wand Exercise program is only approximately $4 for a three feet long wand. Moreover, there was unchanged hsCRP concentration after 15-week period in both groups in this study (unpublished data). Being a measure for inflammatory activity, this finding is in accordance with the fact that there were no exercise related injuries, another positive aspect of this form of exercise. Therefore, this is a low-cost intervention without exercise-related injuries.

In conclusion the present study shows that general health perceptions subscale of HRQOL, functional capacity, body flexibility and abdominal obesity can be improved by Thai Wand Exercise training in older individuals. This may partly reduce some cardiovascular disease risk factors. An advantage of this form of exercise is that this is a convenient, low impact on the joints and effective at home fitness program, with the only equipment need, a three feet long stick. But the major attraction is that it is also suited for the elderly who are not allegeable for the common training procedures.

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