The Effects of Brisk Marching on Anthropometry, Functional Exercise Capacity and Physical Performance among Elderly Women

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Background and Objective: Elderly people, in general, demonstrate decreases in functional exercise capacity and physical performance. It has been established that aerobic exercise help provide health benefits in every age group including elderly people. The present study investigated the changes in anthropometry, functional exercise capacity and physical performance as a consequence of brisk marching training in elderly Thai women.

Methods: It was carried out in 41 subjects with no history of neuromuscular or cardiopulmonary or metabolic disorders aged between 55 to 76 years. They were divided into two groups: control group (C, n=20), and exercise group (E, n=21) engaging to brisk marching at 79.71±3.05% of HRmax, 30 min/session, 4.83±0.40 sessions/week for 12 consecutive weeks.

Results: Brisk marching training significantly ($p<0.05$) reduced body weight (1.8%), body mass index (BMI) (1.7%), waist (4.0%) and hip circumferences (3.4%), waist to hip ratio (WHR) (1.1%) and %total body fat (3.5%). Moreover, back and leg strength, trunk flexibility r epresenting physical performance and distance of a 6MWT representing functional exercise capacity were significantly increased by 5.4%, 12.6%, 14.2% and 11.0 % respectively ($p<0.05$) after training.

Conclusion: This study demonstrated that brisk marching at moderate intensity improvements in functional exercise capacity, physical performance and anthropometric variables. Therefore, regular exercise should be recommended to the elderly in order to decrease risks of health deterioration.

Key words: brisk marching, functional exercise capacity, physical performance, elderly

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Introduction

Elderly people are defined as people being older than 50 or 55 years old[1]. There are marked changes in structural and functional with the aging process resulting in a decline in physical activity and eventually a reduction in functional exercise capacity[2]. Among the age-related changes, the ones that contribute the most to loss of functional autonomy are reductions in muscle strength, flexibility, and cardiorespiratory capacity[3, 4]. Furthermore, a loss of muscular strength, reductions in cardiovascular capacity, joint mobility and cognitive capacity as a consequence of aging[5] and eventually a poor quality of life are prominent.

That aerobic exercise improves the functional capacity of older adults have been shown previously[6]. Okamoto and coworkers studied brisk walking for 20

minutes or more a day or two or more days a week. Their results suggest that increasing the number of steps walked daily improves physical fitness[7]. Moreover, regular exercise can improve the cardiovascular status: reduces the risk of cardiac disease, high blood pressure, cerebrovascular disease, body weight and prevents obesity and diabetes mellitus[8]. Recently, it has been shown that respiratory muscle strength, pulmonary function, e.g. vital capacity, inspiratory reserve volume and inspiratory capacity, physical performance and cardiovascular endurance and modification of cardiac autonomic control are enhanced by brisk marching in sedentary Thais[9, 10]. Unfortunately, there have been no studies regarding the effects of brisk marching on functional exercise capacity and physical performance among the elderly Thai.

Objectives

The objective of this study was designed to investigate such effects of brisk marching with moderate intensity for 12 consecutive weeks in the elderly Thai.

Materials and Methods

Study design and population

The study was analytical and descriptive approved by the Human Research Ethics Committee, Khon Kaen University. Each participant was informed of the purpose of the study and provided written informed consent. Forty-one elderly women aged between 55-76 years were recruited. All subjects were completed a confidential health-screening questionnaires. They were healthy with BMI of 18.5–24.9 kg/m^2 with no history of cardiovascular (i.e. coronary heart disease, arrhythmia and chronic heart failure), neuromuscular, arthritic, pulmonary, severe microvascular diseases, diabetes mellitus, hypertension or other debilitating diseases.

Anthropometry measurement

Height and weight were measured according to the WHO guidelines[11]. WC and HC were used to calculate waist to hip ratio (WHR) based on the World Health Organization (WHO) Guidelines 2012[12].

Functional exercise capacity

The distance of six-minute walk test (6MWT) was measured based on American Thoracic Society (ATS) Statement Guidelines for the six-minute walk test[13].

Physical performance

Muscle strength was determined by a back and leg dynamometer (Takei Physical Fitness Test, Back-A) whereas flexibility was determined by a trunk flexibility sit-and-reach box.

Experimental protocols

All participants were divided into two groups: control (C, n=20) and exercise groups (E, n=21). Both groups engaged to a run in period by walking 40-60 min/day for 2 weeks. Only the E group performed brisk marching exercise (5 min warm-up, 20 min of 79.71$\pm$3.05% HRmax and 5 min cool-down), 3 to 5 days/week for 12 consecutive weeks.

Statistical analysis

Data were expressed as means $\pm$ SD. The Stata 10 Statistical software was used to perform the statistical analysis. Unpaired t-test was used to compare differences in characteristics and all parameters between the C and E groups. Two-sample Wilcoxon rank-sum (Mann-Whitney) test was used when data deviate from normality. A value of $p<0.05$ was taken to be the threshold of statistical significance.

Results

As shown in Table 1, before training the anthropometric variables in the C were similar to those of the E groups. Interestingly, it was revealed that weight, BMI, WC, HC, WHR and fat% were significantly lower in post brisk marching exercise compared to pre-exercise by 1.8%, 1.7%, 4.0%, 3.4% and 1.1% and 3.5 ($p<0.05$), respectively (Table 1, Fig. 1). Furthermore, there were

no differences in those parameters when comparisons were made between the week 0 and week 12 in the C group.

Table 2 and Fig. 2 demonstrated significantly increases in distance of a 6MWT, back and leg strength and trunk flexibility by 11.0%, 5.4%, 12.6% and 14.2% ($p<0.05$), respectively, after 12 weeks of brisk marching in the E group but not in the C group.

Discussion

The important finding of this study is that brisk marching exercise at moderate intensity for over 12 weeks improves anthropometry, functional exercise capacity and physical performance in elderly Thai women. These

Table 1 Anthropometry assessed pre- and post-brisk marching training in control and exercise groups

	Control group (n=20)		Exercise group (n=21)	
	Pre-	Post-	Pre-	Post-
Age (years)	63.8±5.1		62.8±5.5	
Weight (kg)	54.3±4.3	54.5±5.0	55.2±5.5	54.2±5.5*
BMI (kg/m^2)	22.5±2.1	22.6±2.5	23.0±2.0	22.6±1.9*
WC (in)	33.3±3.8	33.7±4.0	33.5±3.6	32.0±3.3*
HC (in)	38.5±2.4	39.0±2.7	37.9±2.2	36.5±2.3*
WHR	0.86±0.07	0.86±0.10	0.88±0.06	0.87±0.06*
% total body fat	34.2±7.1	34.5±6.0	34.4±5.0	33.1±5.4*

BMI, body mass index; WC, waist circumference; HC, hip circumference; WHR, waist to hip ratio. Data are mean ± SD tested by Wilcoxon signed-rank test. *p<0.05 pre- versus post- 12 weeks

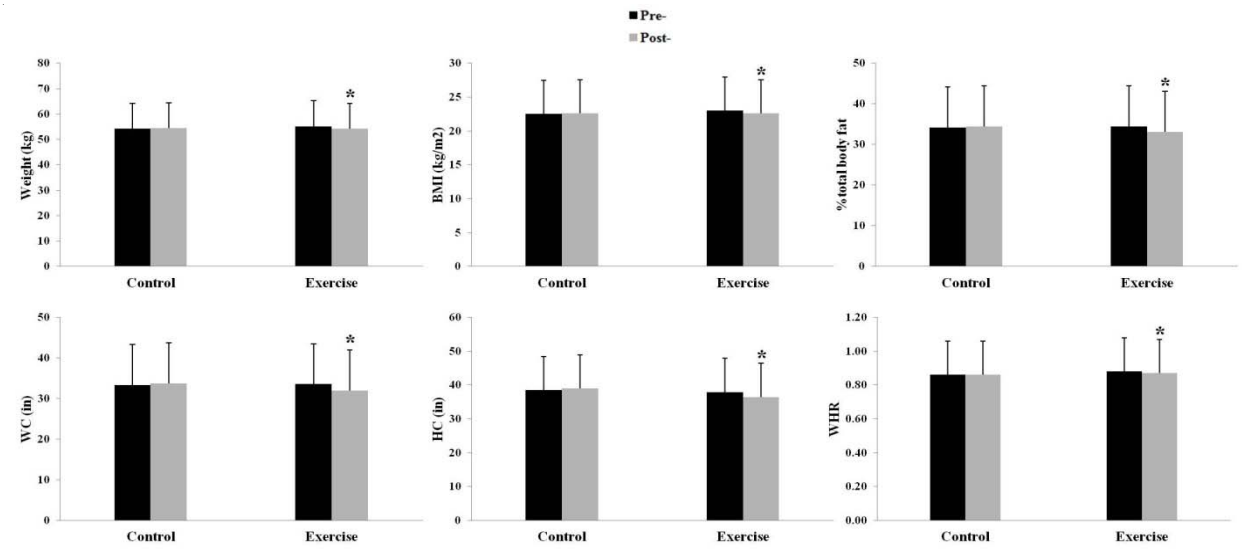

Figure 1 Anthropometry assessed pre- and post- brisk marching training in control (n=20) and exercise (n=21) groups. Abbreviations are as in Table 1. *p<0.05 pre- versus post-twelve weeks

Proceeding

Table 2 Functional exercise capacity and physical performance assessed pre- and post- brisk marching training in control and exercise groups

	Control group (n=20)		Exercise group (n=21)	
	Pre-	Post-	Pre-	Post-
Functional exercise capacity:				
Distance of 6MWT (m)	550.4±55.1	546.4±68.7	544.5±66.4	604.5±64.8*
Physical performance:				
Back (kg)	60.8±19.2	60.9±22.4	66.1±21.5	69.7±22.0*
Leg (kg)	59.7±19.4	60.7±21.2	59.4±17.9	66.9±18.9*
Trunk flexibility (cm)	17.3±6.8	16.7±7.8	14.1±5.0	16.1±5.7*

6MWT, six-minute walk test. Data are mean ± SD tested by paired t-test. *p<0.05 pre- versus post- 12 weeks

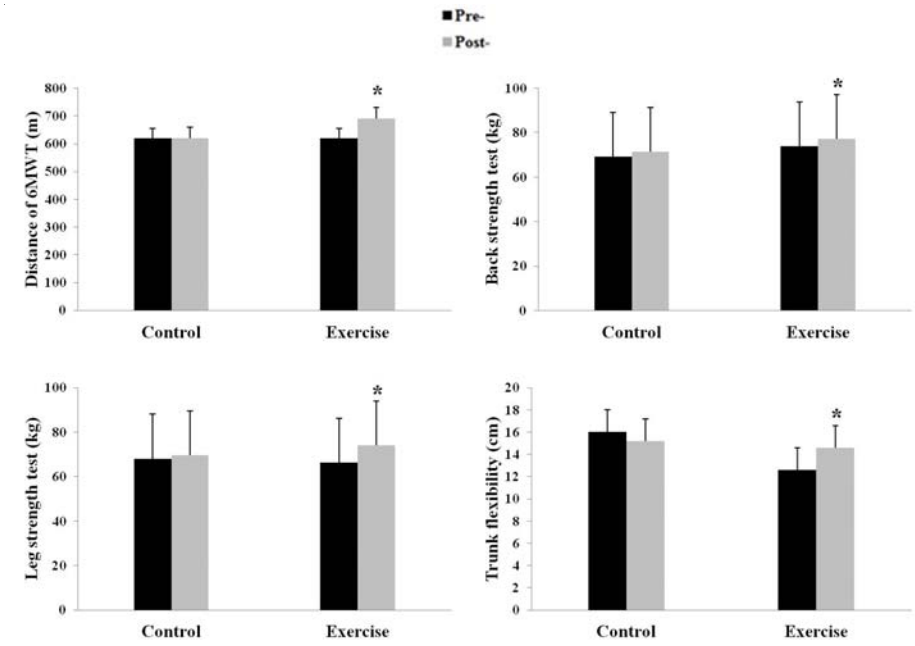

Figure 2 Functional exercise capacity and physical performance assessed pre- and post- brisk marching training in control (n=20) and exercise (n=21) groups. Abbreviations are as in Table 2. *p<0.05 pre- versus post-twelve weeks

findings are in agreement with previous studies. Decreased fat mass following aerobic exercise at moderate-intensity has been reported[14]. In 2006, it has been demonstrated that 30 minute walking-running training three days a week for 12 weeks causes a significant difference in BMI and BW between prior and 12 weeks after training[15]. Similarly, training effects of 16 weeks of progressive aerobic moderate intensity and strength based training in older women and men resulted in significantly decreases in BW, WC and BMI[16]. During exercise the energy source produced by aerobic and anaerobic systems mainly come from fat[17] and

carbohydrate (CHO)[18], respectively. Previous studies demonstrated that exercise influences the metabolism by increasing CHO and fat oxidation rates[19].

A study in the elderly (50-60 y) who underwent a brisk walking program, 40 min 4 times weekly for 13 weeks at the intensity about 50% of HRR which is moderate intensity found a significant increase in leg strength in a one-leg squat[20]. After the 2-month walking exercises program muscle strength improve in the elderly[21]. American College of Sports Medicine, they suggest that regular stretching exercise improves range of motion, although there is little effect observed acutely or immediately except as can be attributed to muscle-warming activities[22].

In addition, a study in 18 patients with severe chronic heart failure, mean age was 53 years; all subjects underwent three weeks of exercise training showed an increase in the maximum distance walked[23]. Moreover, aerobic exercise training by brisk marching at moderate intensity increases the distance of the 6MWT among healthy sedentary Thais[10].

Conclusion

Twelve weeks of brisk marching exercise training at moderate intensity is a health benefit exercise as it improves anthropometry, functional exercise capacity and physical performance in elderly women.

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