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EFFECTS OF TAI CHI TRAINING ON PHYSICAL FITNESS IN OVERWEIGHT AND OBESE ELDERLY MEN

INTRODUCTION

The reason for age-related early decline in physical fitness, including aerobic endurance [2], muscular mass and strength [5] and suppleness [1] is inactivity. Also, overweight and obesity are consequences of limited exercise. A number of ways of solving this problem has been searched for. In recent years researchers have been particularly interested in exercise programmes including elements of Tai Chi. After analysing 47 sets of study results Wang et al. [9] noted a generally beneficial effect of Tai Chi on muscular strength, suppleness and body balance in elderly people. However, it was also noted that in many studies concerning the effects of Tai Chi the basic methodological principles of conducting research had not been strictly observed.

The purpose of this study was to assess the effect of eighteen-week Tai Chi training on physical fitness of overweight ($BMI > 25 \text{ kg/m}^2$) elderly men.

assigned to either the experimental ($N=22$) or control ($N=43$) groups.

The Tai Chi group participated in an 18-week exercise class held twice a week in the morning. Each exercise session lasted 45 minutes and was led by a certified Tai Chi instructor. It included a 10-minute warm-up (including stretching and balancing exercise), 30 minutes of Tai Chi practice, and was followed by 5 minutes of calming exercise. The form of Tai Chi Chuan, out of the 24 Tai Chi forms, is a popular form, and we used five-sequence movement. The subjects imitated the instructor's motions and postures at the same speed. During sessions, the instructor constantly monitored the subjects and corrected the body position, joint angles and form-to-form transition.

Physical fitness was measured using the Senior Fitness Test [8]. We measured lower body strength (chair stand test), aerobic endurance (2-minute step test), flexibility (chair sit-and-reach test) and agility (8-foot up-and-go test).

METHODS

The study was carried out on subjects older than 65 years. We identified 65 men with the BMI above 25 kg/m^2 . All subjects were residents of Poznań and they had never practiced Tai Chi before. They were relatively sedentary and had not participated in any other forms of sport or exercise for health or recreational purposes for at least five years. All subjects were predominantly healthy and those who had a history of significant cardiovascular, pulmonary, metabolic, or musculoskeletal disease or neurological diseases were excluded from the experiment. The participants were randomly

RESULTS

Table 1 presents results of the subjects from the exercise group and control group at the beginning and at the end of the experiment.

After the experiment no statistically significant changes in the BMI values were noted. This relates both to the men in the experimental group and in the control group. Statistically significant differences were noted in changes of results of physical fitness tests between the 1st and 2nd dates of examinations. The men participating in exercise classes improved their lower body strength measured with a number of full cycles of getting up from

and sitting down on a chair, from over 16 to over 20 cycles ($p \leq 0.01$). Aerobic endurance estimated on the basis of the number of steps increased from 99 to 129 ($p \leq 0.01$). The exercise classes resulted also in a increase in agility manifested by reduction of the time of a test in men in the experimental group from 6.0 to 4.8 seconds ($p \leq 0.01$).

found its causes in the low muscular mass. An increase in muscular strength can certainly result from intensive power training [3] but, as the results of our own studies indicate, also light training (in overweight men) results in a statistically significant desired outcome. On the other hand, Tai Chi as a form of exercise may not be a sufficient stimulus for a decrease in body mass.

Table 1. Values of measured parameters (BMI and physical fitness components) before and after the training program and differences between the 1st and 2nd measurements

		Before Median	After Median	Difference	P
BMI (kg/m ²)	Tai Chi	27.4 (25.1–34.2)	27.4 (24.7–34.0)	0	0.551
	Control	28.9 (25.4–41.1)	28.8 (25.1–40.3)	–0.1	
Lower body strength (n)	Tai Chi	16.5 (9.0–23.0)	20.5 (11.0–30.0)	–4.0	0.002**
	Control	15.0 (3.0–21.0)	16.0 (4.0–30.0)	–1.0	
Aerobic endurance (numbers)	Tai Chi	99.0 (52.0–202.0)	129.0 (72.0–234.0)	–30.0	0.000**
	Control	102.0 (59.0–146.0)	109.0 (63.0–144.0)	–7.0	
Flexibility (cm)	Tai Chi	22.0 (10.0–41.0)	24.0 (6.0–39.0)	–2.0	0.728
	Control	12.0 (–10.0–53.0)	18.0 (–7.0–40.0)	–6.0	
Agility (s)	Tai Chi	6.0 (4.9–9.0)	4.8 (3.9–6.7)	1.2	0.001**
	Control	6.0 (4.0–10.0)	5.8 (4–10.7)	0.2	

** $p \leq 0.01$

In the control group changes in the values of all studied variables were rather small on the second date of examinations as compared to the initial results. Differences in the size of changes between the groups were statistically significant at $p \leq 0.01$.

DISCUSSION

On the basis of the results of the study it may be concluded that 18-week training does not affect the ratio of body weight to height (BMI) in overweight elderly men. The lack of changes in the BMI values may be, however, caused by the fact that with the decrease of the fat mass, the lean body mass increases, which in consequence does not change the total body mass.

The simultaneous increase in the level of physical fitness of the studied men indicates to some extent the probability of decrease in the fat mass with an increase in lean body mass at the same time. In the experimental group a greater improvement in all studied components of physical fitness was noted in comparison with the control group ($p \leq 0.01$). The increase in lower body strength observed in the experimental group is probably an indirect result of training-induced increase in muscular mass. Also Newman at al. [6], indicating a lower level of muscular strength in elderly people,

The study shows a statistically significant effect of Tai Chi on the increase of aerobic endurance ($p \leq 0.01$). An improvement in this motor ability is a consequence of many changes which are taking place in the bodies of the training subjects, but it is also a consequence of an increase in muscular mass [4]. Paterson at al. [7] emphasize that an improvement in cardiorespiratory fitness is a desired phenomenon (especially in elderly people) as it lowers the risk of becoming dependant on external assistance. In this sense, Tai Chi may be a significant element in prevention against aging effects.

The lack of training effects on the subjects' suppleness is not surprising. Both in the experimental group and in the control group no statistically significant changes in the level of suppleness were noted during the experiment. A potential improvement in this variable requires special exercises focused on improvement of mobility of joints, e.g. increase in the elasticity of soft tissues surrounding a joint [11]. Besides, at an elderly age some limitations of joint movements be irreversible, e.g. for mechanical reasons [10].

In summary, a positive effect of Tai Chi on selected components of physical fitness in overweight and obese elderly men can be observed. The training-induced changes in the BMI did not differ between the studied groups of men. However, the lack of changes in

the values of this index may be related to the situation in which the undertaken physical activity results only in changes in body composition.

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