Original Article

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The influence of 1-year Tai Chi practice on health behavior in adults

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Agata Milert[1ACDE], Wiktoria Klich[2ABDE], Tomasz Ridan[3CDE], Joanna Morgaś[4BCE]

[1] Section of Kinesitherapy, Faculty of Motor Rehabilitation, The University of Physical Education in Krakow
[2] Doctoral Studies, Faculty of Motor Rehabilitation, The University of
[3] Section of Kinesitherapy, Faculty of Motor Rehabilitation, The University of Physical Education in Krakow
[4] Locomotor Rehabilitation Center "Krzeszowice"

Abstract

Introduction: *Tai Chi is a type of movement derived from Traditional Chinese Medicine, gaining popularity in Poland in recent years. The aim of the study was to evaluate the effect of 1-year practice of Tai Chi on health behavior in adults.* ***Material and Methods:*** *The study was conducted from September 2014 to October 2015 among 62 students of the Tai Chi Chuan School in Krakow ranging from 30 to 50 years old. The study involved 37 women as well as 25 men. The main test method used in our study was the Health Behavior Inventory (IZZ).* ***Results:*** *Results of this study indicate significant improvement of the average score of Health Behavior Index (p=0.000): from 75,1pts before Tai Chi program to 83,1pts after one year of practicing. The average value of this parameter among women increased from 75,9pts to 83,1pts (p=0.000) and among men from 73,9pts to 83,0pts (p=0.000). The beneficial effect of 1-year Tai Chi practice was observed in all examined health behavior categories (proper nutrition habits, preventive behavior, positive mental attitude as well as proper nutrition) in the entire group as well as in men and women separately. The improvement observed was statistically significant (p<0.05). Before starting the Tai Chi program the average score of Health Behavior Index was significantly lower when compared to the normative group (p=0.000) but after one year practice an improvement was observed and the level of statistically not significant difference was achieved (p=0.483).* ***Conclusion:*** *The beneficial effect of 1-year Tai Chi training on overall improvement on health habits supports the need of further promotion of this physical activity among adults.*

Keywords: *Tai Chi, health behavior, adults*

Address for correspondence:

Wiktoria Klich, Doctoral Studies, Faculty of Motor Rehabilitation, The University of Physical Education in Krakow, e-mail: wikipodaj@o2.pl

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INTRODUCTION

Tai Chi is a form of physical activity which originated in China and derived from Chinese martial arts. In the Western world it is called mind-body exercises [1]. Tai chi training combines physical movement, breathing techniques and meditation. According to Traditional Chinese Medicine, regular Tai Chi practicing improves vital life energy (Qi) flow along meridians, creating health and wellness.

Nowadays this form of activity is gaining more and more popularity in Europe and the USA, where it is practised primarily by older people [2-4]. The increasing interest in Tai Chi exercises has been observed in Poland in recent years [5]. Tai Chi is widely considered as a fairly safe form of physical activity, practicing of which requires relatively low cost and can be beneficial for physical, mental and social aspects of health.

Tai Chi practicing involves smooth, flowing movements of low impact and low intensity, associated with attentiveness, relaxation and controlled breathing. Tai Chi movements are circular and spiraling. Practicing Tai Chi is based on continuous movement performed in half speed, requiring good coordination, flexibility, timing and balance. While doing Tai Chi mind should control every movement of the body and any tension in the mind and body (joints, muscles, tendons etc) should be released. Tai Chi can be practiced both individually and in groups, indoors or outdoors which makes it universal form of activity.

In recent years the number of scientific reports confirming health benefits of regular Tai Chi practice has been growing. Despite the fact that most of them focus on the impact of Tai Chi on the physical realm (e.g. improving body balance [6] strength of the leg muscles, elasticity of the tendons [7]) it is hard not to mention the influence of this form of activity on the other aspects of health. Due to both physical and psychological benefits from tai chi practice it is also called „meditation in motion" [8]. Performing Tai Chi forms as well as singular exercises engages awareness, which helps distract attention from day-to-day stress enabling physical and psychological relaxation. In addition, the performance of smooth, slow, harmonious movements of the whole body calms and helps to compose to oneself.

Long-term negative stimuli acting on the human body can lead to psychological stress, anxiety, depression, mood disturbance, low self-esteem [9]. These disorders can cause dysfunction of many organs and systems: musculoskeletal, cardio-respiratory, nervous, immune and others. For this reason, regular practice of Tai Chi may be beneficial for health by affecting physical, mental, emotional and social realm, contributing to a better quality of life (QOL)of practitioners.

Tai Chi exercises, due to the small number of contraindications, are popular primarily among the elderly and people with limited mobility. This does not mean, however that the tai chi practice by younger individuals, especially those living in the Western civilization countries, do not bring them health benefits. A common life style of economically active population is often characterized by low physical activity, irregular eating habits and smoking. Together with the growing nervous tension and numerous stress situations these behaviors can lead to the so-called lifestyle diseases [10-11]. These include i.a. heart disease, stroke, cancer, diabetes and respiratory infections as well as osteoporosis, allergic diseases and psychological problems. These causes and effects form a kind of a vicious circle, in which the presence of risk factors of one disease greatly increases the probability of another. Interruption of this mechanism, especially at the initial stage, is possible mainly by a change into healthy lifestyle. However, it should be kept in mind that the lifestyle changes initiated in adulthood are often limited and harder to keep up with. Childhood and adolescence are decisive for the behavior formation, and therefore the effective development of healthy habits should be based on health education started as early as possible.

The main objective of the study was to evaluate the effect of the 1-year practice of Tai Chi on health behavior in adults. The results are discussed in relation to the four categories of

health behaviors: proper nutrition habits (PNH) preventive behaviors (PB) positive mental attitude (PMA) as well as health practices (HP). The results were compared with standardization group.

MATERIAL AND METHODS

Subjects

The study was conducted among the students of the Tai Chi Chuan School in Krakow, Poland, who since September 2014 to September 2015 regularly participated in Tai Chi classes (classes 2 times a week for 90 min). Inclusion criteria were: Age range of 30-50 years, No medical conditions excluding from participating in exercises, Attendance of at least 85% of Tai Chi classes, written consent to participate in research.

The first stage of research involved 74 students who met the age requirement and were willing to participate. After 1-year of training 12 students did not take part in the second stage of research or did not meet the criterion of attendance. Finally, the study group consisted of 62 students: 37 women and 25 men. The age mean in the group was 42 years and body mass index (BMI) (kilograms per meter squared) was 23.17. Before beginning Tai Chi classes 33 women (89%) and 15 men (60%) had a BMI within the normal range, other participants in the study were overweight. Baseline characteristics for age and BMI in men and women age are shown in table 1.

Tai Chi classes were conducted in groups of 6-12 students by instructors with a minimum of 5 years experience. Classes consisted of 3 parts: the warm up (20 min), training session (60 min) and the cool down (10 min).

Classes were carried out in the 1st degree course of Chen Taijiquan Style. In the first months the training included selected Qigong exercises, designed to teach how to feel and control the state of tension and relaxation in the body. Building a proper structure of the body, both in static positions and in movement, was based on the correct alignment and the loading of the spine and limb joints. Gradually the smooth shifting of the body weight during steps in a various directions was introduced. Than they were joined by the upper limb movements in order to improve the balance and coordination. The next step was to learn first four forms of Can Si Gong (exercises typical of Chen style), in order to learn the basics of conducting Qi energy. The main principles of the Tai Chi were introduced stepwise, based on the 19-movement form of Chen style. Mastering of this short form ended the 1-year practice of Tai Chi.

Protocol

The impact of the 1-year Tai Chi training on the level of health behavior in adults was based on Health Behavior Inventory (IZZ) developed by Juczyński. This questionnaire is designed to study the severity of health behavior in healthy and afflicted subjects.

Table 1. Baseline characteristics

		n	%	Mean	SD	min	max
Age	Men	25	40.32	42.84	5.97	30	50
	Women	37	59.68	41.92	6.78	30	50
	Total	62	100.00	42.29	6.43	30	50
BMI	Men	25	40.32	25.11	3.80	19.75	35.51
	Women	37	59.68	21.85	2.75	18.25	29.39
	Total	62	100.00	23.17	3.57	18.25	35.51

SD - standard deviation

The inventory measures the overall score of health behavior and its four categories: proper nutrition habits (PNH), preventive behaviors (PB), positive mental attitude (PMA) and health practices (HP) [12]. The severity of each category was evaluated based on the arithmetic mean of the answers to 6 indicating questions. The subjects evaluated the incidence of their health-related behaviors, using the five-step scale: 1 - almost never, 2 - rarely 3 - from time to time, 4 - often 5 - almost always. The results were summed to calculate the overall rate of the severity of health behaviors (in the range of 24-120 points). The higher rate pointed to a higher severity of declared health behaviors. The results were converted on the sten proposed by the author of Health Behavior Inventory The results of 1-4 sten are interpreted as low score, those at level 5 and 6 sten as average score, while results of 7-10 sten as high score. The outcomes have been compared with the mean scores of the normative group obtained by Juczyński [13].

Statistics

For the purpose of statistical analysis the mean values and standard deviations of the examined variables were determined. The significance of differences between mean values of numerical variables obtained in pre- and post-training measurement was determined using paired t-test, and to assess the significance of differences between the study and normative group - unpaired t-test. Chi square test was used for the analysis of the values expressed in sten scale. The level of significance for all statistical tests was set at 0.05. Calculations were performed using the statistical package Statistica V10.0.

RESULTS

Statistical analysis of the results of the severity of IZZ score of 62 subjects showed statistically significant differences between the measurements conducted before and after the 1-year tai chi practice both in the whole group and separately for women and men ($p = 0.000$). The average value of all categories improved as a result of tai chi practice. It was noticed that the greatest increase was in the preventive behavior - PB (0.41 points) and least in proper nutrition habits - PNH (0.21 points). For women, the greatest improvement was seen in health practices - HP (0.45 points) but among men in preventive behavior - PB (0.57 points). In both subgroups the smallest progress was observed in proper nutrition habits - PNH: 0.19 points in women and 0.24 points in men (table 2).

Table 2. Mean values and standard deviation of variables in the Tai Chi group in the tests pre and post 1-year training period

Variables		Men		Woman		Total	
		Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value
IZZ	Pre-training	73.88 ± 16.63	0.000*	75.92 ± 10.01	0.000*	75.10 ± 13.00	0.000*
	Post-training	83.00 ± 13.79		83.08 ± 9.82		83.05 ± 11.47	
PNH	Pre-training	3.25 ± 1.01	0.002*	3.45 ± 0.74	0.000*	3.37 ± 0.86	0.000*
	Post-training	3.49 ± 0.82		3.64 ± 0.78		3.58 ± 0.79	
PB	Pre-training	2.82 ± 0.92	0.000*	3.12 ± 0.68	0.000*	3.00 ± 0.79	0.000*
	Post-training	3.39 ± 0.86		3.43 ± 0.63		3.41 ± 0.73	
PMA	Pre-training	3.27 ± 0.78	0.000*	3.13 ± 0.71	0.000*	3.19 ± 0.73	0.000*
	Post-training	3.68 ± 0.64		3.37 ± 0.58		3.49 ± 0.62	
HP	Pre-training	2.97 ± 0.79	0.001*	2.96 ± 0.72	0.000*	2.96 ± 074	0.000*
	Post-training	3.27 ± 0.64		3.41 ± 0.65		3.35 ± 0.64	

IZZ – Health behavior index; PNH - proper nutrition habits; PB - preventive behavior; PMA - positive mental attitude; HP - health practices; SD - standard deviation; p-values of paired t-test.
*Significant difference between pre- and post-training tests ($p < 0.05$).

Then the results of IZZ score were converted to standardized 10-degree sten scale. Results within 1-4 sten are considered for low score of health behavior, 5-6 sten for average score and 7-10 sten for high score [12]. Before the beginning of the tai chi program almost half of women (48.65%) and men (48%) were characterized by the low level of health behavior. For men, the average level was present in 24% and high in 28% of respondents, while for women the high level was noticed only for 2 students (5.41%). After a year of participation in tai chi exercises, the statistically significant improvement in the level of health behavior in the whole group (p=0.007) and in the subgroup of women (0.045) was observed. For men, the improvement was not statistically significant (p = 0.112). The percentage of students with high level of health behaviors in the study group was 29.03%; 18.92% among women and 44,00% among men (table 3).

The next stage of the analysis was to evaluate the differences between men and women in the observed rate of change of health behavior and its components. The test results revealed statistically significant difference in the change of the preventive behaviors. Men achieved significantly higher progress than women. For other variables, no significant differences were observed (table 4).

The final stage of the analysis was to compare the results obtained in our study with the average of the normative group comprised of 235 men and 261 women aged 30-50 years [12]. The results reached in pre-training study for the whole group indicated the statistically significant difference obtained for the IZZ rate and three of the four categories of health behavior: PB, PMA and HP ($p<0.05$). The mean values in the present study were lower than in the normative group. For PNH variable the result obtained in the first study was higher

Table 3. Level of Health Behavior Index (IZZ) of the studied group pre and post 1-year Tai Chi training

	Sten	IZZ level	Pre-training		Post-training	
			N	%	N	%
Men	1-4	Low	12	48.00	5	20.00
	5-6	Average	6	24.00	9	36.00
	7-10	High	7	28.00	11	44.00
Women	1-4	Low	18	48.65	9	24.32
	5-6	Average	17	45.95	21	56.76
	7-10	High	2	5.41	7	18.92
Total	1-4	Low	30	48.39	14	22.58
	5-6	Average	23	37.10	30	48.39
	7-10	High	9	14.52	18	29.03

Table 4. Mean values of the progress in variables in men and women practicing Tai Chi for 1-year period

Variables	Men	Woman	P Value
IZZ	9.12	7.16	0.153
Sten	1.24	0.92	0.158
PNH	0.24	0.19	0.609
PB	0.57	0.32	0.033*
PMA	0.41	0.24	0.146
HP	0.30	0.45	0.2016

IZZ – Health behavior index; PNH - proper nutrition habits; PB - preventive behavior; PMA - positive mental attitude; HP - health practices; SD - standard deviation; p-values of Chi square test.
*Significant difference in progress between men and women ($p< 0.05$).

Table 5. Mean values of variables in the Tai Chi group in the tests pre- and post 1-year training period in relation this standardization group.

Variables		Men			Woman			Total		
		Mean	State.	p-value	Mean	State.	p-value	Mean	State.	p-value
IZZ	Pre-training	73.88	78.5	0.127	75.92	84.03	0.000*	75.10	81.82	0.000*
	Post-training	83.00		0.138	83.08		0.662	83.05		0.483
PNH	Pre-training	3.25	2.85	0.020*	3.45	3.60	0.256	3.37	3.22	0.150
	Post-training	3.49		0.006*	3.64		0.769	3.58		0.000*
PB	Pre-training	2.82	3.30	0.004*	3.12	3.48	0.008*	3.00	3.42	0.000*
	Post-training	3.39		0.609	3.43		0.396	3.41		0.922
PMA	Pre-training	3.27	3.24	0.832	3.13	3.74	0.000*	3.19	3.52	0.000*
	Post-training	3.68		0.002*	3.37		0.003*	3.49		0.730
HP	Pre-training	2.97	3.08	0.578	2.96	3.53	0.000*	2.96	3.32	0.001*
	Post-training	3.27		0.280	3.41		0.351	3.35		0.769

State. – standardization group; IZZ – Health behavior index; PNH - proper nutrition habits; PB - preventive behavior; PMA - positive mental attitude; HP - health practices; *Significant difference between Tai Chi group and standardization group in pre- and post-training tests ($p < 0.05$).

than in the normative group, however the difference was not statistically significant ($p>0.05$). After a year of Tai Chi training, the outcome in the study group reached results almost similar to those of the normative group. For the IZZ rate average result higher by 7.95 points and HB by 0.03 point were obtained, however in either cases the difference was not statistically significant. Proper nutrition habits after 1-year Tai Chi training increased by 0.39 points and reached the value significantly higher than that for the normative group ($p<0.05$). The results of other health behaviors also improved matching the values for the normative group. After 1-year of Tai Chi practice IZZ rate values increased by 9.12 points for men and by 7.19 points for women matching the values for the normative groups. The proper nutrition habits for men before and after Tai Chi training, reached the value significantly higher than for the normative group ($p<0.05$). For women, PNH was slightly lower than for the normative group, however did not differ significantly either in the first or in the second survey. In the first study, PB for examined men and women was significantly lower than for the standardization group, whereas after 1-year Tai Chi training PB increased matching the normative values. PMA differed significantly between men and women: for the first survey of men, the mean value of PMA was similar to the average value obtained in the normative group, whereas after 1-year Tai Chi training PMA was significantly higher than the normative group value ($p<0.05$). For women, after 1-year of Tai Chi exercise, despite the result improved by 0.24 points the outcomes of both measurements were significantly lower than for the normative group. HP for men, before and after Tai Chi training, did not differ significantly from the values obtained for the standardization group. For women, the average value of this variable in the first study was significantly lower than in the normative group and after 1-year training it reached the value matching the average of the variable for the women standardization group (table 5).

DISCUSSION

One of the major changes taking place in the contemporary awareness of adults is the recognition of behavior factors directly determining human health. Majority of the population undertakes various pro-health activities, however due to health realm complexity it is not always possible to cover all its aspects. The Tai Chi practice simultaneously affects the physical, psychological and social issues. Combining these elements is particularly valuable due to direct relationship between psychological well-being and physical fitness, emphasized in many

scientific studies. Although many authors point out that Tai Chi can be enjoyed irrespective of age or gender [14] majority of the studies proving the beneficial effects of its practicing was conducted among older people. Also, most of these studies report some methodological problems including eg. different forms or intensity of Tai Chi [15]. The reviews and meta-analysis of the tai chi impact on the practitioners emphasize the need for further research in this field [16].

In Poland, studies conducted among people practicing Tai Chi are rare. The results obtained by Walczak et al. show a beneficial effect of physical activity on many aspects of health, including physical and mental realm. Due to the large span of respondents' age (20-80 years) it is, however difficult to relate these results to the results of our study [17].

In view of the tool applied – Health Behavior Inventory, interpretation of the results was made on the basis of Juczyński's work and Arendt et al's. study conducted among the Polish population of the similar age range [12,13,18].

Between the four categories of health behaviors examined by IZZ, Tai Chi practice affects directly PMA (e.g. statements of avoiding strong emotions, stress and tension) and HP (e.g. statements of recreation or physical activity habits). The answers given by the respondents indicate that when starting the Tai Chi practice their PMA and HP were significantly lower than for the normative group. Following 1-year Tai Chi practice PMA and HP values increased reaching the level of normative group being lower by 0.03 pts for PMA and higher by 0.03 pts for HP. While the improvement for HP is not surprising (to participate in the survey the subjects had to attend Tai Chi classes twice a week), it is worth emphasizing positive impact of this form of activity on the emotional state. It is also worth considering the fact that the mental illness is a leading cause of disability for people aged 15-44 [19] .

Our study shows a significant difference of the average number of points obtained for PMA between men and women before starting the Tai Chi program. The results for men showed a level higher by 0.03 points compared to standardization group and lower by 0.08 points compared to the results of Arendt et al. study. For women PMA results were lower by 0.61 points than for normative group. As a result of 1-year Tai Chi practice the average points for this category increased by 0.41 points for men and by 0.24 points for women. For men, this result is much higher than for the normative group or the group surveyed by Arendt et al. The result obtained by women is by far below the standardization data. The results of our study indicate significant differences for PMA outcome between men and women of 30-50 years. They also reveal the need for implementation of educational programs aimed at developing positive mental attitude by women much earlier than in the elderly stage.

Our results suggest a beneficial effect of 1-year participation in the Tai Chi exercises on the overall score of health behavior of adults. Comparison of the value of this score to the normative values before starting the Tai Chi program indicates it was significantly lower for the study group. 1-year Tai Chi training resulted in improvement of the overall score of health behavior, slightly exceeding the standardization value.

It is worth noting that the improvements were also observed for PNH and PB. Admittedly Tai Chi practicing does not have direct impact on these health aspects, however it should be stressed that it was conducted in groups, which allowed practitioners to exchange their opinions on various health issues. These discussions and exchange of opinions could result in correcting improper eating habits or not complying with health recommendations, leading to higher PNH and PB levels when compared to the results of the study conducted before the 1-year Tai Chi training. This observation may also indicate a significant environmental impact in forming health behavior in adults.

CONCLUSION

Regularly conducted Tai Chi training has beneficial effect on health behavior of adults. Therefore, it is worth to promote this form of movement. In the light of the study it seems justified to implement the elements of this form of movement into health preventive programs regarding both physical, mental and social aspects.

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