

EFFECT OF TAI CHI QIGONG ON AEROBIC CAPACITY IN ELDERLY EXAMINED BY USING 6-MINUTE WALK TEST

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ABSTRACT

Introduction: The derivation of aerobic capacity affects elderly greatly, that is why prevention is needed. One of the example is exercise, such as Tai Chi.

Aim: This research is a pre-experimental study to discover the effect of Tai Chi on aerobic capacity in elderly.

Methods: Tai Chi intervention is given over the course of 8 weeks or 40 meetings, with a maximum of 5 times a week meetings, each has duration of 60 minutes. Qigong style Tai Chi is used. Aerobic capacity is rated by using 6-Minute Walk Test (6MWT) which followed by counting in the result to a regression formula to get VO₂max. A total of 17 samples are succeed to satisfy the inclusion and exclusion criterias, as well as completing the whole research with more than 75% exercise attendance. The data retrieval of 6MWT is done before intervention, on the fourth week, and after intervention.

Results: There is a derivation of aerobic capacity in elderly, from 25,103070 ml/kg/min (before intervention) to 24,4344 ml/kg/min (fourth week) unsignificantly ($p=0,234$). There is an escalation of aerobic capacity in elderly from 24,4344 ml/kg/min (fourth week) to 25,248976 ml/kg/min (after intervention) significantly ($p=0,04$). There is an escalation of aerobic capacity in elderly, from 25,103070 ml/kg/min (before intervention) to 25,248976 ml/kg/min (after intervention), but it is unsignificantly escalated ($p=0,800$).

Conclusion: Tai Chi Qigong has not give a significant effect on aerobic capacity in elderly during the 8-weeks intervention or 40 meetings.

Keywords: elderly, aerobic capacity, Tai Chi, 6-Minute Walk Test, VO₂max

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INTRODUCTION

According to Undang-Undang Republik Indonesia Number 13 of 1998 concerning the welfare of the elderly, the elderly population or *lansia* is a person over the age of 60.⁽¹⁾ Indonesia has experienced an increase in the proportion of the elderly population since 2000 and this has been estimated by the Bureau of the Census USA since 1993. The Bureau of the Census states that the elderly population in 2025 will increase by 414% as a result of an increase in life expectancy that reaches 70.7 years old. The increase in life expectancy is due to developments in various aspects of technology and science, such as medicine, nutrition, and progress in the preventive and rehabilitative fields⁽²⁾.

Aerobic capacity is the body's ability to take, deliver, and use oxygen. The impact of decreasing aerobic capacity can be in the form of decreased functional capacity, decreased activity, and increased morbidity so that the elderly become less potential. Elders who are not potential are elderly who have no ability to meet their own needs and are usually dependent on others⁽³⁾. Elderly who are not potential will be a burden on the country's development, moreover with the increase in the number of elderly people in Indonesia.

Therefore prevention needs to be done. Prevention that can be done to improve aerobic capacity is through exercise. One type of exercise is Tai Chi. Tai Chi is a sport of soul and body originating from Asian traditions, including martial arts, traditional medicine, and philosophy⁽⁴⁾. Tai Chi consists of slow movements with deep breathing and requires concentration in carrying it out. The movements in Tai Chi include warming up, cooling, stretching, and core movements that have varied training intensities. The type of Tai Chi is also diverse, but the Qigong type of Tai Chi which consists of 18 movements is more often used for the elderly. From several studies, Tai Chi has a positive effect on health, especially it can improve aerobic ability, balance, and muscle strength^(5,6). In addition, Tai Chi is a prevention option because it does not require expensive tools, but only instructors.

Researchers want to know the effects of Tai Chi in improving aerobic capacity. Tai Chi will be carried out for 8 weeks with a frequency of 5 times a week and the duration of training for 60 minutes. To test the aerobic capacity, a test that has been tested for validity and reliability is carried out, namely the 6-Minute Walk Test (6MWT). The 6MWT

is a test to measure the distance a person goes the longest in 6 minutes. The researcher chose to use 6MWT in this study because it is not expensive and is very easy to implement because it only requires minimal equipment, facilities, and time and has minimal risk. The results of 6MWT will then be included in the regression formula to produce VO_{2max} as an indicator of aerobic capacity.⁽⁷⁾

METHODS

The population of this study were all elderly (> 60 years old) at St. Joseph's Elderly House from June to September 2016. The inclusion criteria of this study were those aged 60 years and over, able to walk without tools, able to communicate and follow directions well (MMSE score of at least 21)⁽⁸⁾, and was willing to take part in this study by signing an informed consent.

The exclusion criteria for this study were having practiced Tai Chi before in the last 3 months, resting pulse rate above 120 times per minute⁽⁹⁾, hypertension above 180/100 mmHg^(8,9), and pain that does not allow movement.

Aerobic capacity is assessed using 6MWT. This test is done by calculating the farthest distance that can be reached in 6-minute walk. After initial examinations such as vital signs, and

oxygen saturation and an explanation of 6MWT, the study subjects began walking at the start line when the researcher instructed "started". Subjects were asked to walk normally for 6 minutes, and were allowed to slow down and stop to rest. Subjects were also asked not to speak unless the subject had questions or problems. The test is carried out in the same corridor every time the test is carried out which has no interference or obstruction. During the test, researchers are also needed to provide verbal support such as "Good, continue". After 6 minutes of walking, the researchers measured the patient's walking distance (6MWD) and checked the subject's vital signs and oxygen saturation.⁽⁹⁻¹²⁾

The data collection for 6MWT will be carried out before and after the intervention and every 4 weeks. From these data it is then entered into the VO_{2max} regression formula, VO_{2max} (ml / kg / min) = 70,161 + (0.023 x 6MWD [m]) - (0.276 x body weight [kg]) - (6.79 x sex, with male = 0 and female = 1) - (0.193 x resting HR [bpm]) - (0.191 x age [year]).⁽¹³⁾

Data processing was done by testing the normality of Tai Chi attendance and VO_{2max} results derived from 6MWT results using SPSS 23. VO_{2max} data before, week 4, and after

intervention were then compared using T-paired test and the results were considered significant if $p < 0.05$.

RESULT

Tai Chi intervention is given for 8 weeks or 40 meetings starting on June 27, 2016 and ending on August 24, 2016. This study was not completed in 8 weeks because there were days that were not given Tai Chi intervention. Data collection on the 4th week was held on July 22 and 25, 2016 while data collection after intervention was carried out on August 26, 2016 and September 3, 2016. Data collection of the 4th week was successfully carried out on 23 people because data of 4 people could not be retrieved. Data retrieval after the intervention was carried out on 22 people because data of 1 person could not be retrieved. Of the 22 people who took part in the study, 5 subjects who did not attend Tai Chi more than equal to 30 meetings or 75% of attendees and made the final number of subjects in this study amounted to 17 people. Based on Table 1, it can be explained that the elderly with age above 75 years (Old) constitute the majority in the subject of this study that is equal to 12 people (70.6%). Elderly women dominate the total

number of research subjects, amounting to 12 people (70.6%).

Table 1. Subjects Characteristics

Variable	Classification	Frequency (n)	Percentage (%)
Age	<i>Elderly:</i> 60-74 years old	5	29,4
	<i>Old:</i> \geq 75 years old	12	70,6
Total		17	100
Gender	Male	5	29,4
	Female	12	70,6
Total		17	100

Aerobic capacity (VO_{2max}) before intervention had a mean of 25.103070 ml / kg / min, whereas at week 4 had a mean of 24.4344 ml / kg / min which showed a decrease in aerobic capacity (VO_{2max}) in the week 4. So that the results of the comparison between aerobic capacity (VO_{2max}) before intervention with aerobic capacity (VO_{2max}) week 4 found that there was a decrease in aerobic capacity (VO_{2max}) which was not significant at week 4 when compared with before intervention ($p = 0.234$, $p > 0.05$).

Aerobic capacity (VO_{2max}) week 4 had a mean of 24.4344 ml / kg / min, whereas in aerobic capacity (VO_{2max}) after intervention had a mean of 25.248976 ml / kg / min. Comparative results of aerobic capacity (VO_{2max}) in the 4th week with aerobic capacity

(VO_{2max}) after the intervention found that there was a significant increase in aerobic capacity (VO_{2max}) after intervention when compared with aerobic capacity (VO_{2max}) of week 4 ($p = 0.04$, $p < 0.05$).

Aerobic capacity (VO_{2max}) before intervention had a mean of 25.103070 ml / kg / min, whereas in aerobic capacity (VO_{2max}) after intervention had a mean of 25.248976 ml / kg / min. Comparative results between aerobic capacity (VO_{2max}) before intervention with aerobic capacity (VO_{2max}) after intervention found that there was an increase in aerobic capacity (VO_{2max}) after intervention when compared to aerobic capacity (VO_{2max}) before intervention but the increase was not significant ($p = 0.800$, $p > 0.05$).

DISCUSSION

From the results of the research and analysis, it was suspected that there was no increase in aerobic capacity (VO_{2max}) caused by the introduction of the Tai Chi movement at the beginning of the intervention. Tai Chi cannot be fully implemented since the beginning of the intervention and causes the intensity of Tai Chi itself to be incompatible with the theory. As stated by Guccione (2012), even though training in the elderly is better started with low intensity to make

the elderly adapt slowly, exercises carried out with an intensity of less than 60% of the maximum intensity will not produce significant changes.⁽⁷⁾ It was suggested that the first 4 weeks of this intervention aims to form a program that is structured according to the circumstances of the research subject and forms adaptations to the subject. The absence of this increase depends also on the individual each subject, general health, weight, age, and the presence of diseases that accompany.

Decreasing aerobic capacity (VO_{2max}) in this study may also be caused due to health conditions such as lung disease or musculoskeletal disorders that have not been evaluated so that it can be a confounding factor in the results of the study as well as overtraining. As stated in Frownfelter (2012), training is said to be optimal by avoiding fatigue and the effect of training will appear more if the exercise is accumulated slowly compared to conventional methods that use exercises with rigid and fixed intensity, duration, and frequency.⁽¹⁴⁾

The Tai Chi movement with a total of 18 new movements can be started at week 5, and this can be seen in the results of a significant increase between the 4th week and after intervention. So that it can be concluded that the Tai Chi

movement which is carried out entirely has an effect on the aerobic capacity of the elderly. In addition, the research subjects also may have gotten used to it and memorized it when compared to before the 4th week.

The increase in aerobic capacity (VO_{2max}) is in line with several studies which state that there is an increase in aerobic capacity (VO_{2max}) with Tai Chi intervention. Frownfelter (2012) concluded that there was a decrease in systolic blood pressure affecting aerobic capacity.⁽¹⁴⁾ This was also similar in the journal by Rogers et al. (2010), which concluded from 3 other studies that there was a significant decrease in systolic and diastolic blood pressure, which in turn will affect aerobic capacity and 1 study that reports a significant increase in VO_{2max} .⁽¹⁵⁾ In addition, in a study conducted by Lan et al (2013), the results were 18 to 19% increase in elderly aerobic capacity compared to sedentary elderly.⁽⁸⁾ A study by Chao (2002) specifically used Tai Chi Qigong in his research and obtained results in an increase in aerobic capacity (VO_{2max}) to 50% in the elderly.⁽¹⁴⁾

The increase in aerobic capacity that was not significant after the intervention when compared with before the intervention was thought to occur

because the intervention time was too short when compared with other studies that intervened with longer time, for instance > 12 weeks. The research conducted by Chan et al. (2011) showed the result of an increase in cardio-respiratory function, namely aerobic capacity (VO_{2max}) in Tai Chi Qigong intervention for 12 weeks or 3 months with a frequency of exercise twice a week with a duration of 60 minutes for each exercises.⁽¹⁶⁾

In the study of Sakata et al. (2008) who had the same results turned out to use the exercise with different frequency and duration of training. The study used 1 time a week of Tai Chi Qigong practice with a duration of 90 minutes (45 minutes of Tai Chi Qigong practice, 20 minutes of teaching about Tai Chi Qigong and rest, and 25 optional exercises, such as walking in the pool or ergometer exercises) and accompanied by 5 times a week Tai Chi Qigong practice at home for at least 20 minutes.⁽¹⁷⁾

Rogers et al. (2010), also concluded the results of a study conducted by Pippa (2007) that specifically resulted in an increase in 6MWT results, but with an intervention time of 16 weeks with a frequency of 2 times a week and a duration of 90

minutes.⁽¹⁵⁾ If counted based on amount of Tai Chi exercise, this study has a number of exercises that are as much as 40 times, but it does not show significant results. Therefore, as concluded by Qing-Hua Song (2014), the provision of Tai Chi intervention will show more significant results if the intervention is long-term.⁽¹⁸⁾

The limitations of the study in terms of the sample are the lack of the number of samples in this study so that the results of the study cannot adequately represent the population, and the population selection before the intervention was active so that the increase was not too significant. Whereas in terms of conducting research, this study has limitations in terms of time so that it can only intervene within 8 weeks, no definite guidance regarding the 6MWT pathway is due to differences in various studies, no clear examination of the intensity of exercise on Tai Chi interventions, do not know the activity of research subjects in the range time of intervention other than doing Tai Chi that might affect the results of the study, not investigating diseases or other health conditions that could affect both in terms of results or implementation, such as pulmonary disease and intermittent musculoskeletal disorders, and there is a

possibility of bias using regression formulas for VO_{2max} .

CONCLUSION

This study aims to determine the effect of Tai Chi in improving aerobic capacity. Based on the results of the research and analysis described, it can be concluded that there is an increase in aerobic capacity (VO_{2max}) between before and after the intervention, but this is not significant.

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