

The Effectiveness of *Tai Chi* Exercises on Postural Balance in the Elderly in RS. Hermina Depok

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Submission Date : 13-11-2023 ; Receipt date: 24-11-2023

ABSTRACT

As a person gets older, the functions of his/her body organs decrease. A person will experience many declining abilities, including a decrease in postural balance. Postural balance is the ability to maintain the body in an upright position by aligning the centre of gravity and base of support with appropriate body movements and using minimal muscle activity without excessive muscle contraction. Decreased balance function will increase the risk of falls in the elderly, therefore balance is the most important problem for every elderly. Currently, many methods or types of exercises aim to improve postural balance. One of them is the provision of gymnastics. Tai Chi exercise is an exercise originating from China, which consists of various sequences of movements with the aim of training body coordination and balance. **Objective:** To determine the effectiveness of Tai Chi exercises on postural balance in the elderly. **Methods:** This study used a quasi-experimental method with the research design used was pretest and posttest two group design. The sample in the study was elderly aged 60 years and over with a total of 32 person, where the sample was divided into 2 groups, namely 16 person in the control group and 16 person in the treatment group. The measuring instrument used was the Functional Reach Test which was carried out before and after being given Tai Chi exercises. The research was conducted at RS Hermina Depok, Physiotherapy Clinic, starting from January to March 2023. **Results:** This study shows that Tai Chi exercises significantly improve postural balance in the elderly ($p=0.001$). **Conclusion:** The provision of Tai Chi exercises is significant in improving postural balance in the elderly.

Keywords: Tai Chi, Postural Balance, Elderly, Exercise

ISSN 2722 – 9610
E –ISSN 2722 - 9629

INTRODUCTION

As person get older, they will experience many declines in abilities, including a decrease in postural balance. Postural balance is the ability to maintain the body in an upright position by aligning the *centre of gravity* and *base of support* with appropriate body movements and using minimal muscle activity without excessive

muscle contraction. In other words, the body's ability to maintain equilibrium in every position (Irfan, 2010). According to (Suhartono, 2005) postural balance is the body's ability to maintain the centre of body mass within the limits of stability determined by the base of support. The body's centre of mass is the point where the sum of the forces acting is zero. In normal person, the centre of body mass is located in front of the 2nd sacral vertebra or is 55-57% of a person's body

height above the ground. The limit of stability is the place in space where the body can support a position without changing from the base of support.

A decrease in postural balance affects the balance control components, including a decrease in the sensory system, a decrease in the synergistic response of the postural muscles, a decrease in muscle strength, and a decrease in the range of motion of the joints. So it will have an impact on the ability to maintain postural balance, therefore balance is the most important problem for every elderly person. Decreased balance function will increase the risk of falls in the elderly.

Based on the results of a survey at RS Hermina Depok, 2022. The risk of falls in the elderly increased by 10% from the previous year. Judging from the historical data of patients who came to the physiotherapy clinic due to neurological and musculoskeletal conditions, the majority had an initial history of falls due to decreased balance.

To treat postural balance disorders, many methods have been used to improve postural balance, including *tai chi* exercises. Currently, the Tai Chi exercise method is more liked by person, especially the elderly. *Tai Chi* exercise is a combination of meditation, breathing regulation and various hand and foot movements with fast and slow intensity. *Tai Chi* does not involve body contact, does not require special equipment and can be done anywhere. Several studies have concluded that giving *Tai Chi* exercises to the elderly can improve postural balance and reduce the risk of falls.

Many tests are carried out for balance, one of which is the *Functional reach test*. The *functional reach test* was first developed by Pamela Duncan in 1990. The *functional reach test* is a single, dynamic, fast and simple test that defines functional reach as "the maximum distance to reach forward beyond arm's length while maintaining the base posture". The way to carry out the

functional reach test is in a sitting or standing position.

RESEARCH METHODS

The research carried out was quasi-experimental with a research design in the form of a *pretest-posttest group design*. The sample in the study was elderly person aged 60 years and over, where the sample was divided into 2 groups, namely 16 person in the control group and 16 person in the treatment group. The research was conducted at RS Hermina Depok Poly Physiotherapy, starting from January-March 2023 and was willing to take part in the research program (signing an *informed consent*). The sampling method used the *Purposive Sampling Method*, namely a sample of 32 person selected from the elderly population based on consideration of the inclusion criteria as follows. following: (a) Elderly patients; (b) Age 60 years and over; (c) Willing to be a research subject at RS Hermina Depok; (d) Currently undertaking a physiotherapy program at RS Hermina Depok. The exclusion criteria are as follows: (a) Samples that have unstable blood pressure; (b) Samples that cannot see or hear; (c) Balance disorders due to Parkinson's, multiple sclerosis, or stroke; (d) Post arthroplasty or arthroscopy surgery; (e) Myocardial infarction/post heart surgery; (f) Sample is undergoing chemotherapy.

The research measuring tool used is the *Functional Reach Test*, which is a dynamic test tool to measure functional reach with a person's maximum distance, which is carried out before and after being given *Tai Chi* exercises.

The independent variable of the research is *Tai Chi* exercise and the dependent variable is postural balance in the elderly.

The measurement results are displayed in average form and then data analysis is carried out using parametric statistical tests which assume that the data must be normally

distributed. The data normality test was carried out using the Shapiro-Wilk test with $p > 0.05$ so the data was normally distributed, then if the data was normally distributed continued with the independent t-test to see the effect of giving *Tai Chi* exercises on the postural balance of the elderly in each group. The computer program used in this research is *SPSS version 20*.

RESULTS

Based on measurements carried out in group I and group II to see improvements in postural balance in the elderly. In each group, a characteristic test and data normality test were carried out using the *Shapiro-Wilk Test* which showed that the data was normally distributed in the *pre-test* and *post-test* for both groups.

Table 1. Characteristics of Age Respondents

Age (Year)	Control Group N (%)	Treatment Group N (%)
60-63	10 (62,5)	12 (75)
64-67	2 (12,5)	0
68-71	4 (25)	4 (25)
>71	0	0
Total	16 (100)	16 (100)

Based on the data on the characteristics of respondents based on age, ages 60-63 were the most common in both groups.

Table 2. Characteristics of BMI Respondents

Information	Control Group N (%)	Treatment Group N (%)
Very thin	0 (0)	0 (0)
Thin	5 (31,25)	4 (25)
Normal	7 (43,75)	7 (43,75)
Fat	3 (18,75)	4 (25)
Very fat	1 (6,25)	1 (6,25)

Total	16 (100)	16 (100)
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The characteristics of respondents based on BMI were mostly normal in both groups.

Table 3. *Functional Reach Test* Values

Variable	Average±SD
Pre-Control	9,475±1,040
Post-Control	9,543±1,082
Pre-Treatment	9,456±1,204
Post-Treatment	10,075±1,073
Control Difference	0,068±0,093
Difference in Treatment	0,618±0,150

Based on Table 3, the mean *Functional Reach Test* scores in the pre-control and pre-treatment groups are 9.475 ± 1.040 and 9.543 ± 1.082 . The mean difference between the control group and the treatment group is 0.068 ± 0.093 and 0.618 ± 0.150 .

Table 4. Data Normality Test

Variable	Shapiro Wilk <i>p-value</i>	Information
Pre - Control	0,932	Normal
Pest - Control	0,907	Normal
Control Difference	0,575	Normal
Pre - Treatment	0,657	Normal
Post - Treatment	0,257	Normal
Difference in Treatment	0,123	Normal

Based on the results of the normality test data using *Shapiro Wilk*, a $p\text{-value} > 0.05$ was obtained for all variables.

Table 5. Control Group Effect Test

Variable	Average±SD	<i>p-value</i>
Pre-Control	9,475±1,040	0,0735
Post-Control	9,543±1,082	

The results of the *t-paired* control group effect test produced a p -value > 0.05 , which means that there was no significant difference in the pre and post-control groups.

Table 6. Test of Treatment Group Effects

Variable	Average±SD	<i>p</i> -value
Pre-Treatment	9,456±1,204	0,001
Post-Treatment	10,075±1,073	

The results of the *t-paired* treatment group effect test produced a p -value < 0.05 , which means that there was a significant difference in the pre and post-treatment groups.

Table 7. Two Group Difference Test

Variable	Average±SD	<i>p</i> -value
Control Difference	0,068±0,093	0,001
Difference in Treatment	0,618±0,150	

The results of the difference test between the two groups using *t-paired* produced a p -value < 0.05 , which means that there is a significant difference between the control group and the treatment group.

DISCUSSION

Based on the research results, it was found that there was a change in the *functional reach test* scores in both groups, which means there was an increase in postural balance in old age after being given the intervention.

Physiological changes in the elderly from the musculoskeletal, cardiovascular, respiratory, nervous and cognition systems disrupt motor, sensory and somatosensory functions, resulting in balance disorders. Elderly person experience balance disorders not only statically but especially during dynamics. This is caused by a decrease in muscle strength, bone mass, joint flexibility and proprioceptors which can affect balance.

Tai chi exercises are good for improving postural balance because the *tai chi* exercises train coordination and balance which combines meditation, breathing regulation, and various hand and foot movements at a slow speed which aims to improve knee extensor strength and restore proprioceptive function and flexibility. muscles and improve body stability. *Tai chi* exercises can maintain postural balance so that they can support the body against gravity and the body's centre of mass so that it is parallel and balanced with the fulcrum when other parts move.

Research on *tai chi* exercises has also been conducted previously by Nyman S.R, et al, with the title *A randomised controlled trial comparing the effectiveness of tai chi alongside usual care with usual care alone on the postural balance of community-dwelling person with dementia: protocol for the TACIT trial (TAi CHI for person with dementia)* (2019), thus strengthening the results of this research that *tai chi* exercise can improve postural balance in old age.

CONCLUSION

Providing *Tai Chi* exercises on postural balance in the elderly with significant improvement results. The results of this study support the research hypothesis that postural balance in the elderly can be improved by providing *Tai Chi* exercises.

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