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# Proposing a Healthy Environment for Elderly People with Hypertension: Taichi gymnastic against blood pressure

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**Abstract.** Hypertension is a problem which is often undergone by elderly people and become an important factor caused heart trouble. Hypertension prevalence is 32.4%, and in the place of this study, hypertension prevalence numbers 50 from 80 elderly people. The design of this study used was quasi experimental non equivalent control group design. The populations were all of elderly people with hypertension as much as 50 elderly people, the samples were 46 elderly people, who was divided into experimental and control groups, each of them were 23 elderly people. The data were obtained through observation analyzed with Wilcoxon signed ranks test, whereas to understand the difference between before after Tai Chi gymnastics used Mann Whitney test. The result of analysis with Wilcoxon signed ranks test was  $p=0,000 < \alpha=0.05$  which meant that there is the effect of Tai Chi gymnastics towards the decrease of blood pressure, while by using Mann Whitney test was gained  $p=0,016 < \alpha=0.05$ , that there was the difference between before and after Tai Chi gymnastics. From the result of the study, it proved that Tai Chi gymnastics can lower the blood pressure if it was undertook three times a week to elderly people with hypertension.

**Keywords:** Elderly people, Hypertension, Tai Chi Gymnastics

## 1. Introduction

Hypertension is a circulatory system disorder that causes a rise in blood pressure above normal, which exceeds 140/90 mmHg. In general, the risk of blood pressure increases slowly with increasing age, systolic pressure continues to increase until the age of 80 years and diastolic pressure can continue to increase until the age of 55-60 years and sometimes decrease slowly. Hypertension is a disease that is often experienced by the elderly and it is a major factor in the causes of heart failure and coronary heart disease. Hypertension has become a major health problem in the world. According to the World Health Organization (WHO) noted that in 2012 at least 893 million cases of hypertension, and is expected to increase in 2025 to 1.15 billion, about 80% of cases of hypertension occur mainly in developing countries. In Indonesia, based on the National Health Indicator Survey (Sirkenas) in 2016 showed the prevalence of hypertension reached 32.4%. In East Java the prevalence of hypertension reached 10.7%. In Surabaya, based on Surabaya's health profile in 2014-2016 the prevalence of hypertension has increased from 3.34% to 10.43% and based on data obtained from the Sidotopo Wetan Health Center Surabaya the prevalence of hypertension in 2014-2016 has increased from 261 patients were 657 patients.



Whereas it based on the initial survey conducted in November 2017 at the Posyandu Lansia RW.05 Sidomulyo Sidotopo Wetan Village, Kenjeran Subdistrict, Surabaya the prevalence of hypertension is 50 out of 80 elderly. The increasing number of hypertensive patients in the world, making this disease a global health problem. The incidence of hypertension is caused by several factors including gender, offspring, bad diet, obesity, never exercising, smoking, drinking alcohol, and often stress, so that proper handling is needed. However, in fact this disease has properties that tend to be unstable and difficult to control, either by treatment or other medical measures. Non-adherence to treatment and prolonged stress can make this disease worse, the administration of drugs for a long time can be detrimental and have a negative impact on the body, therefore drug therapy needs to be given along with non-pharmacological therapy.

Hypertension treatment is broadly divided into two, namely dealing with pharmacological and non-pharmacological treatment. Pharmacological treatment is handling using drugs or compounds that work that can affect blood pressure, grouping pharmacological therapies used to control blood pressure of hypertensive patients such as diuretics, adrenergic inhibitors, ACE-inhibitors, Angiotensin-II-blockers, calcium angiotension, vasodilators direct, and hypertension emergencies such as malignant hypertension. Non-pharmacological treatment is the treatment without the use of antihypertensive drugs, for example hypertension sufferers must do physical activity and exercise regularly. Types of physical activity and exercise that can be done for example by morning walking, cycling, or gymnastics, because exercising regularly for 30-45 minutes with a frequency of 3-5 times a week can help reduce body weight and reduce the risk of various cardiovascular diseases. While the type of effective exercise for the elderly is aerobic exercise with moderate intensity such as walking and elderly gymnastics, types of exercise that are usually carried out by the elderly, low impact aerobics or slow motion exercises such as Tai Chi exercises. The Tai Chi exercise is a form of way to reduce blood pressure in the elderly who suffer from hypertension, because with Tai Chi exercise routinely can make the muscles relax and reduce stress, thereby reducing the production of catecholamine and cortisol hormones and can reduce renin and angiotensin production which are the main factors trigger the occurrence of hypertension. Based on previous research conducted by Anik Supriani in 2014, it was stated that Tai Chi exercises can reduce blood pressure if carried out regularly with a frequency of 3 times a week for 1 month with the time used for Tai Chi exercises 15-30 minutes. Regular physical exercise can result in a working efficiency of the heart, the heart muscle becomes stronger, therefore it can contract less in pumping the same amount of blood, this decrease in heart rate can reduce cardiac output which can eventually lower blood pressure.

The purpose determined the effect of Tai Chi exercise on blood pressure reduction in elderly people with hypertension at the elderly elderly Posyandu RW. 05 Sidotopo Wetan Surabaya.

## **2. Methodology**

The design used experimental with a non equivalent control group design quasi experimental design. The population was all elderly people with hypertension in the elderly Posyandu RW. 05 Sidomulyo Sidotopo Wetan Village, Kenjeran Subdistrict, Surabaya, as many as 50 respondents with non-probability purposive sampling technique. The sample was 46 elderly with blood pressure inclusion criteria exceeding 140/90 mmHg and taking antihypertensive drugs which were divided into treatment and control groups, each amounting to 23 elderly. The instrument used in the type of manual tensimeter and stethoscope for blood pressure measurement, Tai Chi gymnastic exercise activity unit and gymnastic tape, observation sheet of blood pressure measurement pre and post exercise in Tai Chi. This research was conducted in December 2017, before conducting the research, the researcher explained the purpose and objectives of the study as well as providing informed consent and consent sheets to become respondents for the elderly who were willing to become respondents. Before Tai Chi gymnastics, blood pressure measurements were taken in both groups of elderly people.

Then the next day performed Tai Chi exercises in the treatment group for 3 times in 30-45 minutes, and the following day blood pressure measurements were taken again in both groups of the elderly. The data collected through observations were analyzed by Wilcoxon signed ranks test to determine the effect of Tai Chi exercise on blood pressure reduction, while to determine differences in blood pressure before and after Tai Chi exercise using the Mann Whitney test.

### 3. Research Result

#### 3.1 General Data

**Table 1.1** Distribution of Respondent Frequency by Gender at the Elderly Posyandu RW. 05 Sidotopo Wetan Surabaya in 2017

No.	Age	treatment and control of groups	
		Frequency (f)	Percentage (%)
1	60-74 years ( <i>elderly</i> )	25	54%
2	75-90 years ( <i>old</i> )	21	46%
3	>90 years ( <i>very old</i> )	0	0%
Total		46	100%

Based on table 1.1, the results obtained in the elderly treatment and control groups were mostly aged 60-74 years as many as 25 respondents (54%) and none > 90 years old were 0 respondents (0%).

**Table 1.2** Distribution of Frequency of Respondents by Gender at the Posyandu for Elderly RW. 05 Sidomulyo Sidotopo Wetan Surabaya in 2017

No.	Sex	treatment and control of groups	
		Frequency (f)	Percentage (%)
1	Male	13	28%
2	Famale	33	72%
Total		46	100%

Based on table 1.2, the results obtained in the elderly treatment and control groups were mostly female, as many as 33 respondents (72%) and almost half were male as many as 13 respondents (28%).

**Table 1.3** Distribution of Frequency of Respondents Based on drug consumption in the Posyandu for Elderly RW. 05 Sidomulyo Sidotopo Wetan Surabaya in 2017

No.	Medicine Consumption	treatment and control of groups	
		Frequency (f)	Percentage (%)
1	Consumption	23	100%
2	Not Consumption	0	0%
Total		46	100%

Based on table 1.3, the results were obtained in the elderly, the treatment and control groups were all taking drugs as many as 23 respondents (100%) and no one did not consume drugs as many as 0 respondents (0%).

**Table 1.4** Distribution of Frequency of Respondents Based on body weight at Posyandu for Elderly RW. 05 Sidomulyo Sidotopo Wetan Surabaya in 2017

No.	Weight	treatment and control of groups	
		Frequency ( f )	Percentage ( % )
1	<i>Underweight</i> (thin)	5	11%
2	<i>Normal</i> (ideal)	23	50%
3	<i>Overweight</i> (fat)	14	30%
4	<i>Obese</i> (obesity)	4	9%
Total		46	100%

Based on table 1.4, the results were obtained for the elderly in the normal half-weight treatment and control group as many as 23 respondents (50%) and a small portion of obesity was 4 respondents (9%).

**Table 1.5** Distribution of Frequency of Respondents Based on Employment at Posyandu for Elderly RW. 05 Sidomulyo Sidotopo Wetan Surabaya in 2017

No	Occupation	treatment and control of groups	
		Frequency ( f )	Percentage ( % )
1	Not working / retired	37	80%
2	Driver	1	2%
3	Trader	5	11%
4	Tailor	1	2%
5	Pedicab driver	2	4%
Total		46	100%

Based on table 1.5, the results obtained in the elderly treatment and control groups almost all were unemployed / retired as many as 37 respondents (87%) and a small part of the work was driver and tailor as many as 1 respondent (2%).

### 3.2 Specific data

**Table 2.1** Distribution of Respondents' Frequency Based on blood pressure before Tai Chi exercises in the treatment and control group of elderly hypertensive patients at the Posyandu for Elderly RW. 05 Sidomulyo Sidotopo Wetan Surabaya in 2017

No	Hypertension category	Treatment group	
		Frequency (f)	Percentage (%)
1	Normal	0	0
2	Prehypertension	0	0
3	Hypertension TK 1	11	48
4	Hypertension TK 2	12	52
	Total	23	100

No	Hypertension category	Control group	
		Frequency (f)	Percentage (%)
1	Normal	0	0
2	Prehypertension	0	0
3	Hypertension TK 1	18	78
4	Hypertension TK 2	5	22
	Total	23	100

Based on table 2.1, the results of blood pressure were obtained before tai chi gymnastics in the treatment group most experienced hypertension level 2 as many as 12 respondents (52%) and none experienced prehypertension and normal as many as 0 respondents (0%) while in the control group almost all had hypertension level 1 as many as 18 respondents (78%) and none experienced prehypertension and normal as many as 0 respondents (0%).

**Table 2.2** Distribution of Respondent Frequency Based on Blood Pressure After Tai Chi Gymnastics in the treatment and control group of elderly hypertensive patients at the Posyandu for Elderly RW. 05 Sidomulyo Sidotopo Wetan Surabaya in 2017

No	Hypertension category	Treatment group	
		Frequency (f)	Percentage (%)
1	Normal	0	0
2	Prehypertension	9	39
3	Hypertension TK 1	14	61
4	Hypertension TK 2	0	0
	Total	23	100

Based on table 2.2 obtained the results of blood pressure after tai chi gymnastics in the treatment group most experienced hypertension level 1 as many as 14 respondents (61%) and none experienced hypertension level 2 and normal as many as 0 respondents (0%). Whereas in the control group most of them experienced level 1 hypertension as many as 17 respondents (74%) and none were normal as many as 0 respondents (0%).

**Table 2.3** Wilcoxon Statistical Test Results Signed Ranks Test Using IBM SPSS 20.0

	TD after treatment - TD before	TD treatment after the control group - TD before the control group
Z	-4.472 <sup>b</sup>	-1.890 <sup>b</sup>
Asymp. Sig. (2-tailed)	.000	.059

Based on table 2.3 with the Wilcoxon signed ranks test statistical test in the treatment group obtained the significance value of  $p = 0.000 < \alpha = 0.05$ . This meant that  $H_0$  was rejected and it could be concluded that there was an influence of Tai Chi gymnastics on blood pressure reduction in elderly treatment group hypertensive patients

**Table 2.4** Statistical Test Results Mann-Whitney Test uses IBM SPSS 20.0

	TD before the treatment group vs. control	TD after treatment vs control group
Mann-Whitney U	195.500	174.500
Wilcoxon W	471.500	450.500
Z	-1.837	-2.404
Asymp. Sig. (2-tailed)	.066	.016

Based on table 2.4 with the statistical test mann-whitney test results of blood pressure measurements was before (pretest) in the treatment group and control group obtained the significance value of  $p = 0.066 > \alpha = 0.05$ . This meant that  $H_0$  was accepted and it could be concluded that there was no difference in blood pressure before (pretest) in the treatment and control groups. While the results of post-test blood pressure measurements in the treatment and control groups obtained the significance value of  $p = 0.016 < \alpha = 0.05$ . This meant that  $H_0$  was rejected and it could be concluded that there was a difference in posttest blood pressure in the treatment and control groups.

## 4. Discussion

### *4.1 Identification of blood pressure before Tai Chi exercises in the treatment and control group of elderly people with hypertension at the Posyandu Lansia RW. 05 Sidotopo Wetan Surabaya*

Based on the results of blood pressure measurements before Tai Chi exercises in the treatment group, the results showed that most of the patients had level 2 hypertension as many as 12 respondents (52%), level 1 hypertension were 11 respondents (48%), and none experienced prehypertension or normal 0 respondents (0%). Whereas in the control group almost all experienced hypertension level 1 as many as 18 respondents (78%), hypertension level 2 as many as 5 respondents (22%), and none experienced prehypertension or normal as many as 0 respondents (0%). These variations could be influenced by several factors including age, sex, psychological and physical stress, obesity, unhealthy eating patterns, and lack of physical activity.

Based on age factor, the results of most of the elderly in the treatment and control groups aged 60-74 years were 25 elderly (54%). This research is in line with the results of research conducted by Agnesia Nurarima (2012) stating that the risk of developing hypertension at the age of 60 years and over 11.340 times greater than the age of less than 60 years. Another research also states that as many as 75% of elderly people aged 65 and above consider themselves in good health conditions and perfect, elderly physical and cognitive functions become indicators of physical health, changes in organic and systemic systems vary widely, both between individuals and individuals alone and some body systems decrease rapidly. According to Nurarif & Kusuma (2015) the increasing age of a person, there was a decline in the body's system, namely the elasticity of the aortic wall decreases, the heart valve thickens and becomes stiff, the heart's ability to pump blood decreases 1% every year after 20 years old, loses the elasticity of blood vessels so increase capillary vascular resistance and increase blood pressure.

Based on gender, the elderly in the treatment and control groups who came to the posyandu were mostly female with 33 elderly (72%). In a previous study conducted by Rustiana (2014) stated that the incidence of hypertension was greater in female sex than men in women at 67.2% while men were 32.8% [9]. According to Dalimartha (2008), in women there is an increase in blood pressure that is after experiencing menopause because when menopause occurred a decrease in estrogen hormone which causes changes in endothelial function resulting in increased activity of the sympathetic nerves which will then release renin stimulants and converted to angiotensin 2 causing vasoconstriction and increase in blood pressure.

Based on body weight, it was found that half (50%) of the elderly treatment and control groups who came to posyandu were of normal weight and a small portion (9%) were obese. In a previous study conducted by Agnesia Nurarima (2012) stated that obesity was proven to be a risk factor for hypertension. This shows people with obesity have a risk of developing hypertension 9,051 times greater than people who are not obese. According to Garnadi (2012) obesity and obesity will aggravate the work of the heart to pump blood and other vital organs will also get a burden due to the accumulation of fat in the body so that it can cause hypertension.

Based on physical activity, almost all (80%) elderly treatment and control groups who came to the posyandu did not work / retire so they were always at home and rarely engaged in physical activity. In a previous study conducted by Anggara (2013) stated that people who do not exercise regularly have a risk of developing hypertension by 44.1 times compared with people who have regular exercise habits. Other studies state that the health status and function of the body, the presence of illness, and health care are factors that affect physical activity. According to Garnadi (2012) lack of physical activity causes the heart to be untrained, blood vessels stiff, blood circulation does not flow smoothly, causing obesity, and this factor is the cause of hypertension.



#### *4.2 Identification of blood pressure after Tai Chi exercises in the treatment and control group of elderly Hypertension sufferers at Posyandu Lansia RW. 05 Sidotopo Wetan Surabaya*

Based on the results of blood pressure measurements after being given Tai Chi exercise for 3 times in 1 week, the results showed that the treatment group mostly experienced hypertension level 1 as many as 14 respondents (61%), prehypertension as many as 9 respondents (39%), and none had hypertension level 2 and normal are 0 respondents (0%). Whereas in the control group most of them experienced hypertension level 1 as many as 17 respondents (74%), prehypertension as many as 3 respondents (13%), hypertension level 2 as many as 3 respondents (13%), and no normal as many as 0 respondents (0%). From these results there is a change in blood pressure in the treatment group after Tai Chi exercise which is initially a level 2 hypertension prevalence of 52% and after Tai Chi exercise becomes 0%. While in the control group there was also a change, namely the prevalence of hypertension level 2 decreased from 22% to 13%, the decrease in blood pressure in the control group was due to the control group taking antihypertensive drugs. In a previous study conducted by Anik Supriani (2014) stated that almost all hypertensive patients overcome hypertension by taking antihypertensive drugs and rarely with a healthy lifestyle.

According to Istifa (2011) Tai Chi Gymnastics is traditional Chinese exercise with slow motion, deep breathing, and concentration of mind with elements of meditation. Tai Chi exercises are known to help control stress which is one of the risk factors for hypertension, with proper breathing exercises combined with light muscle exercises can make a person relax. Deep breathing techniques and slow movements could increase the concentration of oxygen in the blood, facilitate blood flow, and reduce heart rate.

#### *4.3 Analysis of the effect of Tai Chi gymnastics on blood pressure reduction in the treatment and control group of elderly hypertensive patients in the Posyandu Lansia RW. 05 Sidotopo Wetan Village, Kenjeran Subdistrict, Surabaya*

Based on the results of the statistical test of wilcoxon signed ranks test obtained the significance value of pre-post in the treatment group was  $p = 0,000 < \alpha = 0,05$  which meant that  $H_0$  was rejected and there was influence of Tai Chi exercise on blood pressure reduction. Whereas in the control group obtained a value of  $p = 0.059 > \alpha = 0.05$ , which meant that  $H_0$  was accepted and there was no influence. The decrease in blood pressure in the treatment group was influenced by the provision of Tai Chi gymnastics.

According to Sutanto (2013) Tai Chi gymnastics was a form of way to reduce blood pressure in the elderly who suffer from hypertension, because Tai Chi exercises routinely could make the muscles relax and reduce stress, thereby reducing the production of catecholamine and cortisol hormones and could reduce renin production and angiotensin which was the main factor that triggers hypertension. Based on a previous study conducted by Anik Supriani (2014) states that Tai Chi exercises can reduce blood pressure if carried out regularly with a frequency of 3 times a week for 1 month with the time used for Tai Chi exercises 15-30 minutes. Regular physical exercise can result in a working efficiency of the heart, the heart muscle becomes stronger so it could contract less in pumping the same amount of blood, this decrease in heart rate can reduce cardiac output which could eventually lower blood pressure.

#### *4.5 Analysis of differences in blood pressure were before and after gymnastic Tai Chi treatment and control groups in elderly hypertensive patients in Posyandu Lansia RW. 05 Sidotopo Wetan Village, Kenjeran District, Surabaya*

Based on the results of statistical tests mann-whitney test treatment and control group obtained the significance value of  $p = 0.066 > \alpha = 0.05$ . This meant that  $H_0$  was accepted and it could be concluded that there was no difference in blood pressure before (pretest) in the treatment and control groups. While the results of post-test blood pressure measurements in the treatment and control groups obtained the significance value of  $p = 0.016 < \alpha = 0.05$ . This meant that  $H_0$  was rejected and it could be concluded that there was a difference in posttest blood pressure in the treatment and control groups

Based on the results of the study, blood pressure in the treatment group was before and after being given Tai Chi gymnastics tended to change, which was initially categorized in level 2 hypertension to level 1 hypertension and prehypertension ie systolic blood pressure between 120-140 mmHg and diastolic between 80-100 mmHg. While blood pressure in the control group also experienced changes due to taking antihypertensive drugs. The results showed that in line with the research conducted by Anik Supriani (2014) which stated that there was a difference in the mean posttest value of the experimental group obtained a systolic pressure of 136 mmHg, mean diastolic pressure of 84 mmHg, whereas the control group obtained an average systolic pressure of 144mmHg, and the mean pressure diastolic by 90 mmHg.

Tai Chi exercise is one of the sports from China that resembles meditation therapy with soft movements. The Tai Chi movement which includes body-mind-breath-breath is regularly proven to increase the release of nonadrenaline in the urine, reduce cortisol levels which is a trigger of stress, and reduce sympathetic nerve activity which has a positive impact on the heart (in the form of a stable heart rate and pressure blood drops to normal), This is because sympathetic and parasympathetic nerve activity becomes balanced and harmonious. These exercises can also increase antioxidants to remove free radicals in the body and stabilize blood pressure.

## **5. Conclusion**

- 1) Elderly blood pressure was before Tai Chi exercises in the treatment group mostly experienced hypertension level 2. While in the control group almost all had hypertension level 1.
- 2) Blood pressure Elderly was after Tai Chi exercises in the treatment group most experienced hypertension level 1. While in the control group most experienced hypertension level 1.
- 3) There was influence of Tai Chi exercises on blood pressure reduction in elderly hypertensive patients, with a value of  $p = 0,000 < \alpha = 0.05$ .
- 4) There was a difference in blood pressure after (posttest) between the treatment group and the control group in elderly hypertension with a value of  $p = 0.016 < \alpha 0.05$ .

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