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# Effect of Taichi Exercise on Blood Pressure in a Family with Hypertension in Banjarsengon Village: A Case Study

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**ABSTRACT**
Hypertension is a critical global health issue that affects quality of life and increases the risk of cardiovascular disease. The purpose of this case study is to assess the efficacy of Taichi exercise as a nonpharmacological therapy for decreasing blood pressure in the family with hypertension. Mrs. H, a 49-year-old single mother with a history of hypertension lived in Banjarsengon Village, Jember. The Taichi exercise intervention was performed twice a week for three weeks. Following six sessions of Taichi exercise, total systolic blood pressure decreased by 10 mmHg and diastolic by 6 mmHg. Family empowerment through the participation of Mrs. H's children in supporting the implementation of Taichi exercise is key in this therapeutic approach. The results of this study suggest that Taichi exercise has potential as a safe and effective alternative therapy for the management of hypertension. In order for the hypertension management program in families to have maximum impact, it is very necessary to increase family empowerment through health workers in community health centers who are monitored periodically.

**KEYWORDS**
Exercise, Family, Hypertension, Nursing, Tai chi

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## 1. BACKGROUND

Hypertension is a global health issue with the prevalence being high during the last 30 years (World Health Organization, 2023). Hypertension is known as a "silent killer" since it does not present normal symptoms and is often discovered as a complication (Lewis et al., 2014: 713). If hypertension is not effectively controlled, the risk of consequences such as stroke, heart attack, kidney failure, and retinopathy increase (Smeltzer & Bare., 2018: 2406). In Indonesia, hypertension is common (30.8%), with low treatment adherence (Indonesia Ministry of Health, 2023b). Hypertension is one of the top 15 morbidities in Banjarsengon Public Health Center's working area (Public Health of Jember, 2023). To effectively address the issue of hypertension, suitable control techniques must be used.

Hypertension can be managed with lifestyle changes. Lifestyle changes are prioritized as first-line therapy above

pharmaceuticals (Kurdi et al., 2022). This is because medication is frequently associated with potentially serious side effects such as sexual dysfunction, liver dysfunction, and an increased risk of hospitalization owing to hypotension, acute renal injury, and electrolyte abnormalities (Akinyede et al., 2020; Albasri et al., 2021). Furthermore, the majority of hypertension patients require long-term therapy, which can result in noncompliance and lifelong reliance (Fan et al., 2019). As a result, an increasing number of people are resorting to nonpharmacological therapy, including physical exercise, which has been demonstrated to reduce blood pressure by 4–9 mmHg (Indonesia Ministry of Health, 2023a).

Taichi is one of the recommended workouts because it causes vasodilation and lowers blood pressure by producing nitric oxide and prostacyclin (Zhang et al., 2024; Tsoi et al., 2023). Furthermore, it lowers blood pressure more effectively than aerobic exercises like jogging, brisk walking, cycling, and stair climbing (Li et al., 2024). As a result, Taichi exercise has the potential to be an alternate treatment for hypertension patients.

Nurses have an essential role in managing hypertension in both individuals and families through physical activity. According to Friedman (2003), in (Nies & McEwen., 2015: 1340), the family is the primary focus of nursing care. Families can be a valuable resource for health messengers who influence one another, as well as a case-finding effort.

## 2. CASE DESCRIPTON

According to the assessment results of the Nursing Clinical Study Program in RW 08 Banjarsengon Village on May 10, 2024, 24.1% of the 116 people had hypertension, including one family with a blood pressure of 150/90 mmHg. The findings of the assessment with the Hypertension Knowledge Level Scale and Baecke questionnaires revealed that awareness about hypertension and family daily physical activity remains poor.

Based on the subjective and objective data collected, the researcher identified the main nursing problem of inadequate health maintenance (D.0117) as the inability to address the problem of hypertension, which is defined by the family's lack of awareness of healthy conduct. Researchers intend to supplement the primary nursing intervention of physical activity promotion (I.05183) with nonpharmacological therapy in the form of Taichi exercise in order to

overcome hypertension difficulties. Thus, the purpose of this study is to investigate the effect of Taichi exercise on blood pressure in a hypertensive family.

## 3. METHODS

This study used a case study method and was conducted on June 5-22, 2024 in Banjarsengon Village in one family who met the inclusion criteria: having family members with hypertension (systolic blood pressure ≥ 140 mmHg or diastolic ≥ 90 mmHg), being able to understand and follow the procedure, and being willing to sign an informed consent. This study's exclusion criteria include hypertensive crisis, joint deformity, cognitive impairment, pregnancy, uncontrolled severe sickness, or refusal to continue participating. Blood pressure monitors and observation sheets are required. Yang-style 8-form Taichi movements were done 6 times (2 times per week for 3 weeks). Blood pressure was taken prior to and 30 minutes after activity. Equality analysis before intervention and control group models was performed with an independent t-test with $\alpha = 0.05$. To determine the change in the average value of the intervention and control groups using the dependent t test. This study has the signature of approval of each respondent in inform consent.

## 4. RESULTS

### Family Members' Characteristics

This study focused on Mrs. H's family in Banjarsengon Village, which was in the sixth stage of family development and included a single-parent family with prosperous and independent family stages I. Mrs. H (49 years old) and An. F (10 years old) are the family members. Mrs. H works as a housewife, and An. F attends elementary school. Mrs. H's household income is reliant on her eldest child, who has married and left home.

Mrs. H stated during the examination that she had preeclampsia ten years ago, as well as hypertension and a stroke two years prior. The complaints of dizziness, headache, and neck heaviness were dismissed. Mrs. H stated that her right arm felt too weak to write with. Examination results: blood pressure 150/90 mmHg, pulse pressure 80 x/min, respiration rate 17 x/min, right arm muscle strength 5543. Mrs. H was diagnosed as mildly obese with a BMI > 25.1 (BW: 65 kg, optimum BW: 53.1 kg, TB: 159 cm, BMI: 25.7) and an abdominal circumference of 90 cm (≥80 cm). Checking GDS yielded 137 mg/dL.

Mrs. H's family had moderate dysfunction, as determined by the family APGAR assessment, with a score of 6 (range 4-6). Mrs. H scored 8 on the Hypertension Knowledge Level Scale questionnaire, indicating a low level of understanding (≤17). Mrs. H also received a score of 20 on the Depression, Anxiety, and Stress Scale questionnaire, indicating moderate stress. Mrs. H scored 5.125 on the Baecke questionnaire, suggesting a low level of physical activity (low category < 7.5).

According to the assessment results, the nursing problem is inadequate health maintenance (PPNI, 2017). Nursing interventions focused on encouraging physical activity (PPNI, 2018a) using Taichi exercises, which were performed six times over three weeks in order to improve Mrs. H's family health maintenance (PPNI, 2018b).

Mrs. H's evaluation revealed that she had hypertension, as well as risk factors for modest obesity and moderate stress. Obesity is a disorder characterized by excess adipose tissue or fat, which can have negative consequences for health. The World Health Organization defines obesity as having a BMI greater than 25 and an abdominal circumference greater than 88 cm for women. According to a 14-year retrospective study, body mass index is the biggest risk factor for hypertension, with obese women being five times more likely to develop hypertension. Excess fat in the respiratory tract causes obstructive sleep apnea. Hypoxic situations cause the body to engage the sympathetic nervous system, which increases heart activity (Shariq & McKenzie, 2020).

Furthermore, stress promotes the development of hypertension. Stress can cause the release of adrenaline, cortisol, and catecholamine chemicals, which raise heart rate and constrict blood vessels (Pires et al., 2022; Qiu et al., 2023). As a result, losing weight and reducing stress are critical in combating hypertension.

**Table 1.** Pre and Post-Test Blood Pressure Measurement Results Mrs. H, June 2024

| Meeting | Blood Pressure | | Difference | |
|---|---|---|---|---|
| | Pre-Test | Post-Test | Sistolic | Diastolic |
| June 5, 2024 | 150/98 mmHg | 148/96 mmHg | 2 mmHg | 2 mmHg |
| June 6, 2024 | 148/94 mmHg | 144/90 mmHg | 4 mmHg | 4 mmHg |
| June 12, 2024 | 148/90 mmHg | 146/88 mmHg | 2 mmHg | 2 mmHg |
| June 13, 2024 | 144/88 mmHg | 140/86 mmHg | 4 mmHg | 2 mmHg |
| June 17, 2024 | 146/82 mmHg | 140/76 mmHg | 6 mmHg | 6 mmHg |
| June 22, 2024 | 144/84 mmHg | 140/80 mmHg | 4 mmHg | 4 mmHg |

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Mrs. H's blood pressure dropped after the Taichi exercise intervention. The largest decrease came at the fifth meeting, with a 6 mmHg difference in systolic and diastolic pressure. Over six meetings, the average systolic blood pressure decreased by ±3.6 mmHg and diastolic by ±3 mmHg, for a total decrease of 10 mmHg and 6 mmHg.

This study found that Taichi exercise intervention can lower blood pressure in hypertensive individuals aged 49. This is consistent with the findings of Zhong et al., (2020), who conducted a systematic evaluation of 28 randomized controlled trial studies. As a result, Taichi exercise can considerably reduce blood pressure in hypertension patients. Furthermore, the Taichi exercise group experienced the highest reduction in blood pressure when compared to those who received simply health education or no treatment at all. Individuals with hypertension under 50 years old had a threefold drop in blood pressure compared to those over 50 (Zhong et al., 2020).

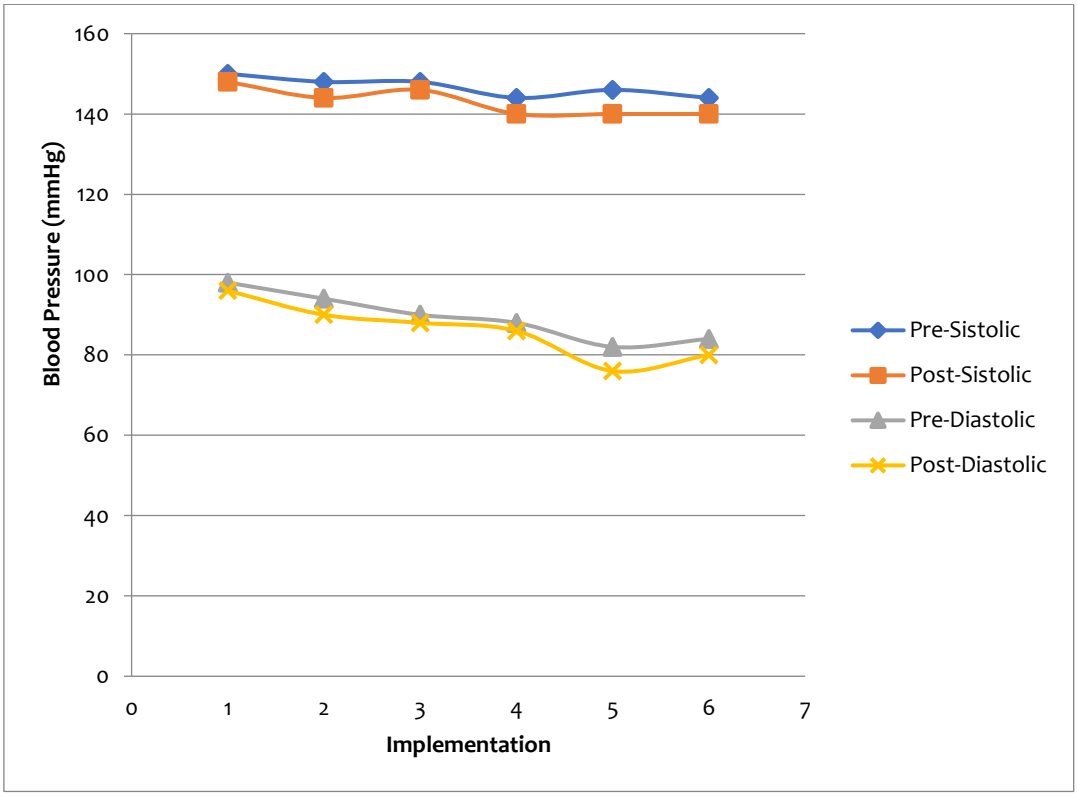


**Figure 2.** Observation of Blood Pressure Pre and Post Intervention of Taichi Exercise on Mrs. H

The findings of this study are congruent with those of Liang et al. (2020), who found that Taichi exercise significantly reduced systolic and diastolic blood pressure by 12.47 mmHg and 6.46 mmHg, respectively. Furthermore, showed that

lowering systolic blood pressure by 10 mmHg reduces the risk of death from heart failure, stroke, and cardiovascular disease by 28%, 27%, 20%, and 13%, respectively. Thus, Taichi exercise might be advised as an alternative treatment for hypertension, particularly for customers under the age of 50 (Liang et al., 2020).

Blood pressure fluctuations can occur through a variety of mechanisms. For starters, during Taichi exercise practice, the amount of salt lost may exceed regular intake levels, resulting in lower blood pressure. Second, after exercise, Taichi exercise practitioners have higher nitric oxide metabolite levels than sedentary and sedentary participants. Furthermore, as an endothelium-dependent vasodilator, nitric oxide is vital in regulating vascular tension. Nitric oxide can also reduce vascular resistance, which reduces hypertension. Third, the inflammasome Nucleotide-binding domain, Leucine-Rich-containing family, Pyrin domain-containing-3 (NLRP3) causes endothelial cell damage, and Taichi exercise can reduce NLRP3 expression, decreasing blood pressure. Fourth, Taichi exercise can broaden the mind, making it more open and hopeful, as well as reduce the effects of bad mood on the nerve system induced by blood pressure variations (Pan et al., 2021). Other studies have found that changes in blood pressure can occur as a result of increased parasympathetic nervous system activity and baroreceptor alterations following Taichi practice (Liang et al., 2020).

Mrs. H noticed that Taichi had other benefits besides decreasing blood pressure, such as making her body feel more comfortable and making her sweat more. Furthermore, no adverse effects were seen on the target during the intervention's execution. This is consistent with previous research, which found that Taichi is a light exercise that is simple to learn, has no reported side effects, is inexpensive, does not require a lot of space or special equipment, and can be practiced alone or in groups. Thus, Taichi exercise can be a safe and beneficial alternative to exercise therapy for hypertensive patients (Breit & Kelley, 2022; Dong et al., 2020; Kurdi et al., 2021).

**Family Empowerment Process**

Mrs. H's family empowerment centered on the third family health task identified by (Friedman, 1998), which is the family's ability to care for sick members through Taichi exercise (Table 2).

**Table 2.** Family Empowerment During the Taichi Exercise Intervention

| Meeting | Family Role |
|---|---|
| June 6, 2024 | Mrs. H had hemiparesis in her upper extremities, so An. F assisted her in filling out the Taichi exercise observation checklist and playing the Taichi exercise video. |
| June 12, 2024 | An. F supported Mrs. H in downloading the Taichi exercise video and playing it on her mobile phone. |
| June 13, 2024 | An. F helped prepare the area for the exercise by removing unnecessary furniture and sweeping the floor before going for Tadarusan. |
| June 17, 2024 | An. F helped to remind and fill out the observation checklist. |
| June 22, 2024 | An. F helped remember and fill out the observation checklist. |

Table 2 shows the impact of Mrs. H's family empowerment on the implementation of Taichi exercises. Empowerment could not be carried out during the first meeting since An. F was playing outside the house. At the second and third meetings, the researcher had time to teach An. F how to complete the independent exercise observation sheet, download and play the Taichi training video on his phone, and send a message to Mrs. H to remind her of her exercise schedule. Mrs. H reported that An. F assisted her in arranging the exercise area and filling out the observation sheet checklist at the fourth, fifth, and sixth meetings. However, until the end of the meeting, An. F refused to participate in the Taichi exercise since he preferred to play. As a result, the family empowerment process has not worked as smoothly as it could have because family members have been unable to exercise together. This could be owing to An. F, and there was only one family member (the youngest child) who backed Mrs. H's treatment.

The process of empowering Mrs. H's family revealed that the empowerment was inadequate because there was only one family member at home who supported care. Mrs. H's family is a single-parent family, which accounts for this. Mrs. H must serve as both the family's head and the mother of her elementary school-aged kid in place of her deceased husband. According to Pujihasvuty et al., (2021), the process of single-parent households performing family practice functions is still not optimal. Being a single-parent has unique obstacles for mothers. They must provide their children's psychological needs, such as love, security, and attention, as well as their physical requirements, such as clothing, food, shelter, health, education, and other

material necessities (Kaakinen et al., 2015: 51); Pujihasvuty et al., 2021)

However, the researcher reinforced the family's functions, particularly those related to health care. The findings revealed that An. F is able to use technology to aid in the application of Taichi exercise via video playback on the gadget. In addition, An. F assisted in filling out the observation sheet for the implementation of exercise due to Mrs. H's restrictions, which included finger muscle weakness caused by a stroke. An. F also set up the exercise area and reminded her of the individual exercise program. Despite his young age, An. F is able to play the role of facilitator and motivator in the family. As a facilitator, the family is required to meet all of the demands of their sick family members, whereas as a motivator, the family gives support and reminders to continue with healthy living practices as planned (Simorangkir et al., 2023). Mrs. H's family empowerment was impeded by her dual duty as a single parent, but An. F was able to improve the family's health-care function.

**Confounding Factor**

The researcher reasoned that the usage of antihypertensive medicines could influence the findings of blood pressure measurements. The client was prescribed Candesartan 8 mg once a day before bedtime, with a peak efficacy of 3-4 hours and an elimination half-life of about 9 hours. Although Taichi exercise was conducted outside of the drug's effective time, the use of Candesartan may have influenced the observed blood pressure drop (Bulsara et al., 2024).

**Research Limitation**

There are various limitations to this study. Firstly, because Taichi exercise was performed independently, the results may be less accurate. Second, the Taichi exercise movements shown in the Taichi Association video may differ from those employed in earlier research. Third, because the researcher did not live with the respondents, factors such as nutrition, daily activity, stress, and cigarette exposure that may influence hypertension could not be controlled, so blood pressure decrease may be less consistent. Fourth, due to conflicting schedules, other family members were not present when Taichi exercise was implemented.

## 5. CONCLUSION

Mrs. H's hypertensive family is experiencing inefficient health maintenance

nursing concerns. Taichi physical exercise methods are intended to reduce blood pressure. Taichi exercise reduces blood pressure, with a total decrease of 10 mmHg in systolic pressure and 6 mmHg in diastolic pressure. The decrease in blood pressure is caused by factors such as salt reduction, increased nitric oxide, and decreased expression of the NLRP3 inflammasome. Mrs. H's family empowerment process was less optimal since it only involved one family member, despite the limitations of the family head's dual duty as a single parent. Friedman's family systems method can give more effective help by focusing on family system dynamics.

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## AUTHOR CONTRIBUTIONS

Substantial contributions to conception, data collection, data analysis, and writing: Syifa Amalia & Fahruddin Kurdi. Revising the article: Syifa Amalia.

## CONFLICT OF INTEREST

The authors declare no conflict of interest

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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