

Review Article: Systematic Review, Meta-Analysis, Integrative Review, Scoping Review

THE EFFECT OF ISOMETRIC EXERCISE ON REDUCING BLOOD PRESSURE IN PEOPLE WITH HYPERTENSION: A LITERATURE REVIEW

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Abstract

Background: Hypertension is a major factor contributing to cardiovascular disease, which is the number one cause of death globally. Basic Health Research Indonesian Ministry of Health data for 2018 showed that hypertension in East Java Province increased in 2018 by 36.32. So, the authors want to know the effect of isometrics on reducing blood pressure.

Objective: The authors want to know the effect of isometrics on reducing blood pressure.

Design: This study design is a systematic review to search and review article from database and the theory underlying this study or guidance in this systematic literature review using PRISMA.

Data Sources: Based on the results of the literature search through six databases, such as EBSCO, Springer, MedPub, Elsevier, Science Direct, and National Nursing Journal with keywords: Hypertension, High Blood Pressure, Resting Blood Pressure, Isometric Training, Isometric Exercise. The data was search since June 2020.

Review Methods: The method used in the preparation of the Literature review using the PRISMA checklist and PICOS. Secondary data obtained from the journal with a predetermined discussion.

Results: Based on 18 articles in the literature review, it can be concluded that the results for the research is Isometric exercises that are performed are very effective in reducing blood pressure.

Conclusion: Isometric exercises that are performed are very effective in reducing blood pressure. The exercise is doing in 3-4 weeks with 4x2 minutes of exercise with a rest duration of 3 minutes.

Keywords: *Hypertension, high blood pressure, resting blood pressure, isometric training, isometric exercise background.*

INTRODUCTION

One of the main factors contributing to cardiovascular disease is hypertension, which causes the highest mortality worldwide (Carlson dkk., 2016). Meanwhile, according to (Planning dkk., 2017), the main death factor

worldwide is hypertension, which is estimated to have resulted in 9.4 million deaths. In terms of primary health research data (Riskesdas) in 2018, it shows that the hypertension rate was 26.2%, an increase of 36.32% in 2018.

Baross, Willes, and Swaine, 2013 in their research, have suggested that isometric exercise can show a decrease in resting blood pressure. Some of the advantages of doing isometric exercises for short periods regularly within 2 minutes can lower blood pressure and heart rate to reach a stable value. Other studies have shown that training sessions are doing over a three until four-week period with a duration of each exercise being 4x2 minutes of double leg isometric exercise separated by a 3-minute rest period.

This study aims to explain the level of influence of Isometric Exercise on Patients with Hypertension through data collection using the Electronic database.

METHODS

Design

This study uses systematic review method by reviewing research articles from previous researchers. The article used as a reference source in accordance with the theme of making systematic review of the author is the Effect of Isometric Exercise on Blood Pressure Reduction in Hypertension Patients in 2020 with the keywords Hypertension, Isometric, Blood Pressure, Resting Blood Pressure, Isometric Exercise, Isometric. The data used in this study used secondary data obtained through previous researchers. How to collect data with electronic databases conducted by EBSCO, Taylor & Francis, Elsevier, Springer, Scholar.

Search Methods

The inclusion and exclusion criteria were as follows:

Table 1. Literature Criteria

Isometric	Hypertension	Blood Pressure
<i>Isometric AND</i>	<i>Hypertension OR</i>	<i>High BP AND</i>
<i>Isometric Exercise</i>	<i>High Blood Pressure</i>	<i>Resting Blood Pressure</i>
<i>OR</i>		
<i>Isometric Training</i>		

Search Outcome

The method used in the preparation of the literature review uses the PRISMA checklist and PICOS. Secondary data obtained came from journals with a predetermined discussion. Based on literature search results through six databases and using keywords that have been adjusted with MeSH, researchers obtained 1,402 articles that matched those keywords. The search results that have been obtained are then examined by researchers by screenrinning by title (n=470), abstract (n=39) and full text (n=19) that are adapted to the theme of literature review. This assessment is based on eligibility based on inclusion and exclusion criteria which then get 19 articles that can be used in literature review. The results of the study article selection are illustrated in the following flow diagram:

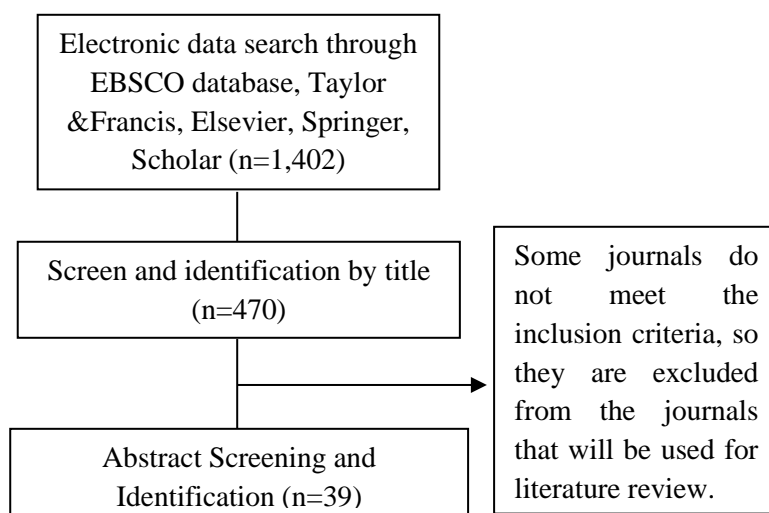


Figure 1. Flowchart Literature Review based on PRISMA

Quality Appraisal

Analyze the quality in each study (n=19) with a checklist of assessment lists with multiple list of questions used to assess the quality of the studies found. The criteria assessment is rated "yes", "no". "unclear", or "invalid" and each criterion with a score of "yes" is rated one point, and the other value is zero. Each study score is then calculated and summed up. Critical appraisal to assess eligible studies conducted by researchers. If the study score meets at least 50% critical appraisal with

the cut-off point value agreed upon by the researcher, the study then entered inclusion criteria. Researchers exclude low-level studies to avoid bias in the validity of results and review recommendations.

Data Abstraction

At this stage researchers reviewed abstracts of articles obtained from various databases. Furthermore, articles that meet the inclusion criteria will be independently extracted.

Data Analysis/ Synthesis

The selected article will be done data processing by compiling the theoretical mapping containing author (including the name of the researcher and the year of publication), title, design and sample, intervention, and results.

RESULTS

Nineteen articles meet the inclusion criteria (Figure 1). Overall, each study discusses isometric exercise and its relation to the decrease in blood pressure in people with hypertensive disease. Studies in accordance with this systematic review were conducted in Korea (Lee dkk., 2019), Jerman (Badrov dkk., 2016; Morrin dkk., 2018), Indonesia (Arum, 2019; Beazley & Jones, 2018; NagiyaParamita et al., 2017; Parlindungan & Lukitasari, 2016; Sefia Nurindra et al., 2016), Inggris (Gill dkk., 2015), jepang (Koike dkk., 2015; Yamagata dan Sako, 2020), Denmark (Jørgensen dkk., 2018), Malaysia (Hooi dkk., 2020). India (Vt dkk., 2019), China (Jin dkk., 2017), Iran (Javidi dkk., 2019), Australia (Carlson dkk., 2016), Brazil (Cahu Rodrigues dkk., 2020), dan Berlin (Pagonas dkk., 2017).

Table 2. Results of the Journal Research Review

Authors name and Years	Research Title	Research Methods	Respondent	Results
(Hooi et al., 2020)	A new isometric exercise training induced reductions of resting blood pressure in hypertensive patients- An exploratory study	An Exploratory study. Cross Sectional.	Ten hypertensive participants had been recruited from University of Malaya and local community clinic through posters and email advert. They were included if they: a) had a medical diagnosis of primary or idiopathic hypertension; b) currently on anti-hypertension medications (β-blockers or/and non-dihydropyridine calcium channel blockers).Exclusion criteria: a) not on hypertensive medication; b) had targets organ damage (i.e. heart failure, renal failure, hypertensive retinopathy or stroke); c) has any joint mobility issue especially the shoulder. Screening included body mass and	These data are expressed in mean and standard deviations (Mean ± SD). One Way ANOVA with repeated measures was used to check for the effects of time (Baseline, 5 minutes after and 10 minutes after). When required, Bonferroni post hoc processes were utilized to evaluate certain differences between means. Estimates of effect size are supplied as Cohen's d values (d = 0.2, small impact; d = 0.5, moderate influence; d = 0.8, large influence). All statistical analyses were completed with IBM SPSS Statistics for Windows, version 23, Armonk, NY: IBM Corporation along with the significance level was set at P < 0.05.

height measurements. A medical history and a list of current medication were also obtained in order to identify other cardiovascular diseases. Ten out of fifteen patients met the additional criteria, all participants gave written informed consent before participation, and also the University of Malaya Research Ethics Committee approved this study.

(Vt et al., 2019)	Effect of isometric exercise on cardiovascular changes in normotensive healthy adults with or without parental history of hypertension	Quasi Experimental The study was conducted on 30 students of Adichunchanagiri Medical College in the age group of 18-20 years. The subjects were divided into 2 groups: Group 1 (study group) consisted of 10 subjects with parental history of hypertension (one parent suffering from hypertension) and Group 2 (Control Group) consisted 20 subjects without parental history of hypertension.	30 students of Adichunchanagiri Medical College in the age group of 18- 20 years.	On analysis of the results Diastolic blood pressure (DBP) shows a significant difference during exercise (83.25 ± 9.4 Vs. 74.6 ± 4.6 , $p < 0.05$).
(Badrov et al., 2016)	Isometric exercise lowers resting blood pressure and improves local brachial artery flow-mediated	This study utilized a prospective cohort design.	Twenty normotensive (<140/<90 mmHg) woman (n=11) and men (n=9). Participant in the current investigation. Woman were aged 23-44 years.	Main effects of time were observed (all $P < 0.05$), whereby IHG training reduced systolic BP ($\Delta 8 \pm 6$ mmHg), diastolic BP ($\Delta 2 \pm 3$ mmHg), mean arterial pressure ($\Delta 4 \pm 3$ mmHg), and pulse pressure ($\Delta 5$

	dilation equally in men and women			± 7 mmHg), accompanied by increases in absolute ($\Delta 0.09 \pm 0.15$ mm) and relative ($\Delta 2.4 \pm 4.1$ %) brachial artery FMD; however, no significant sex differences were observed in the magnitude of post-training change in any variable assessed (all $P > 0.05$).
(Jin et al., 2017)	Effect of isometric handgrip training on resting blood pressure in adults: A meta-analysis of randomized controlled trials	A meta-Analysis Randomized Controlled Trial	A total of 157 participants from the 7 included trials were identified. The sample size in each study varied from 15 to 49.	A total of 7 trials from 6 articles were included, consisting of 157 subjects. The results suggested that SBP (MD=- 8.33, 95% CI: - 11.19 to -5.46; $P < 0.01$)
(Javidi et al., 2019)	Hemodynamic responses to different isometric handgrip protocols in hypertensive men	Quasi-Experimental	Fifteen sedentary men (mean \pm SD, age, 46 ± 6 years; 172 ± 6 cm and body mass, 89 ± 28 kg) with pre to stage 1 hypertension (SBP, 138 ± 7 mmHg; DBP, 89 ± 6 mmHg) volunteered to participate in this randomized controlled crossover study. All participants were free of any chronic disease and no one was taking any medication that could influence BP or other hemodynamic parameters.	The highest increase in SBP was found immediately following HILF protocol and it was significantly ($p < 0.01$) different than HIHF and sham trials. HR in LIHF was significantly greater compared to HILF and sham ($p < 0.01$).
(Gill et al., 2015)	Intensity-dependent reductions in resting blood pressure following short-term isometric exercise training	Cross Sectional	All participants gave written informed consent prior to participation, and the University of North Carolina at Charlotte Institutional Review Board approved this study. In all, 11 male and 29 female normotensive participants (mean age 22.3 ± 3.4 years; body mass of 69.5 ± 15.5 kg; height 170.2 ± 8.7 cm) volunteered to participate.	In addition, sexual dimorphism may exist in the magnitude of reductions, but further work is required to confirm this possibility, which could be important in understanding the mechanisms responsible.
(Morrin et al., 2018)	The use of the CR-10 scale to allow self-regulation of isometric exercise intensity in pre-hypertensive and hypertensive participants	Fourteen pre hypertensive and hypertensive adults completed eight, 2-min	Participants were classified according to the European Society of Hypertension criteria (Mancia et al. 2013); pre-hypertensive participants had a resting seated SBP of 130–139 and/or 85–90	There were significant linear relationships between the estimated exertion on the CR-10 scale, and Δ SBP ($r=0.784$) and %MVC ($r=0.845$). Level-6 was equivalent to an average Δ SBP of 38 mmHg (95% CI; 44, 32 mmHg) and a relative force of

	isometric hand-grip exercises at randomized intensities; participants estimated their perceived exertion at 30-s intervals (estimation task). Subsequently, on three separate occasions, participants performed four 2-min contractions at an exertion level that they perceived to be equivalent to CR-10 “Level-6” (production task).	mmHg; and hypertensive participants had a resting SBP of 140–159 and/or 90–99 mmHg.	33% MVC (95% CI; 36.2, 30%). During the production task, %MVC was not significantly different between the estimation task and each production trial. In at least the first two repetitions of each production trial, Δ SBP was significantly lower than that observed in the estimation task.	
(Carlson et al., 2016)	The efficacy of isometric resistance training utilizing handgrip exercise for blood pressure management: A randomized trial	A recent systematic review and subsequent meta-analysis	Forty hypertensive individuals, aged between 36 and 65 years.	Blood pressure measurements were conducted at baseline and at the end of the protocol using a Finometer. Eight weeks of isometric resistance training resulted in a 7-mmHg reduction of resting systolic blood pressure (SBP) (136±12 to 129±15; P= 0.04) in the 30% group. Reductions of 4mmHg were also seen in mean arterial pressure (MAP) (100±8 to 96±11; P=0.04) in the 30% group. There were no statistically significant reductions in diastolic blood pressure for the 30% group, or any of the data for the 5% group.
(Parlindung an and Lukitasari, 2016)	Isometric Exercise is Beneficial in Lowering Blood Pressure in Hypertensive Patients.	Quasi Experimental	37 respondents in the intervention group and 37 respondents in the control group.	Isometric exercise often lowers blood pressure and does not increase blood pressure, in addition to lowering blood pressure, several other benefits of isometric exercise are increasing bone density,

				improving muscle mass, upper and lower body strength, and reducing the risk of bone fractures.
(Yamagata and Sako, 2020)	High cardiovascular reactivity and muscle strength attenuate hypotensive effects of isometric handgrip training in young women: A randomized controlled trial	A randomized controlled trial	twenty young women were randomly assigned to either the training (n = 10) or control (n = 10) group	Resting systolic BP significantly lowered only in the training group. The change in resting systolic BP following an 8-week intervention was significantly associated with the systolic BP and diastolic BP reactivity to the acute exercise at baseline during set 3 and 4 (P <.05). The handgrip MVC was associated with changes in systolic BP (r = 0.79, P =.007), diastolic BP (r = 0.68, P =.032), and mean arterial pressure (r = 0.79, P =.006). These results indicated that high cardiovascular reactivity and strength attenuate the hypotensive effects following isometric training in young women
(NagiyaPar amita et al., 2017)	The Effect of Step Up Exercise and Isometric Handgrip Exercise on Blood Pressure in Hypertensive Patients at the Batang I Public Health Center, Batang Regency.	This research design used a quasi-experimental research design with two groups pre-test post-test.	The number of samples in this study were 42 respondents with a sampling technique using purposive sampling. Univariate results show that the average age of the respondents is > 60 years.	The results showed that step up exercise had an effect on blood pressure in hypertensive patients with a p-value of 0.000, in isometric handgrip exercise the p-value was 0.000, which means that there is an effect of isometric handgrip exercise on blood pressure in hypertensive patients.
(Arum, 2019)	Hypertension in the Productive Age Population (15-64 Years).	Analytical observation with Cross Sectional technique	People aged 15-64 years with a total sample of 103 people.	Risk factors that are often associated with the incidence of hypertension in people of productive age are obesity and high consumption of potassium.
(Sefia Nurindra et al., 2016)	Comparison of Blood Pressure Before and During Handgrip Isometric Exercise on Class 2011 Students of the Faculty of Medicine, Andalas University.	This research is an experimental study using a randomized crossover study design.	24 male subjects with age 20.7 ± 0.6 years and BMI 21.8 ± 2.1 Kg/m ² .	Systolic blood pressure from 115.2 ± 5.0 mmHg to 135.0 ± 6.5 mmHg (p<0.05) and diastolic from 76.3± 5.0 mmHg to 98.3 ± 8.7 mmHg (p< 0.05). In the control, there was a significant decrease in systolic blood pressure from 113.8 ± 6.1 mmHg to 111.5 ± 7.1 mmHg (p<0.05) and an insignificant decrease in diastolic blood pressure from 75.0 ± 5.9 mmHg to 72 ,9 ± 6.2 mmHg (p>0.05).

(Cahu Rodrigues et al., 2020)	Vascular effects of isometric handgrip training in hypertensives.	A partial analysis of a randomized controlled trial.	33 hypertensive patients (61 ± 2 y.o.; 67% female) who were randomly assigned to two groups: IHT or control group.	The IHT approach has significantly decreased systolic ($\Delta = -16 \pm 2$ vs. $\Delta = -3 \pm 3$ mmHg, $p < 0.001$) and diastolic ($\Delta = -8 \pm 2$ vs. $\Delta = 0 \pm 2$ mmHg, $p = 0.014$) BP. Reductions in central PWV (IHT: 9.1 ± 0.5 vs. 8.0 ± 0.3 m/s; Control: 8.8 ± 0.5 m/s, $p < 0.05$) and shear rate area after occlusion have significantly reduced by using the IHT (37822 ± 6931 vs. 24829 ± 5337 s ⁻¹ , $p < 0.05$). In conclusion, 12 weeks of IHT have reduced the BP and arterial stiffness and improved markers of endothelial function in hypertensive patients.
(Carlson et al., 2016)	The efficacy of isometric resistance training utilizing handgrip exercise for blood pressure management.	A randomized Trial.	Forty hypertensive individuals, aged between 36 and 65 years, conducted IRT for 8 weeks. Participants were randomized into 2 groups, working at an intensity of either 5% or 30% of their maximum voluntary contraction.	Blood pressure measurements were conducted at baseline and at the end of the protocol using a Finometer. Eight weeks of isometric resistance training resulted in a 7-mmHg reduction of resting systolic blood pressure (SBP) (136 ± 12 to 129 ± 15 ; $P = 0.04$) in the 30% group. Reductions of 4mmHg were also seen in mean arterial pressure (MAP) (100 ± 8 to 96 ± 11 ; $P = 0.04$) in the 30% group. There were no statistically significant reductions in diastolic blood pressure for the 30% group, or any of the data for the 5% group.
(Koike et al., 2015)	Cilnidipine but not amlodipine suppresses sympathetic activation elicited by isometric exercise in hypertensive patients.	True experiment.	A total of 37 consecutive outpatients with mild essential hypertension who had been administered AM (n ¼ 18) or CL (n ¼ 19) for at least 6 months at Wakayama Medical University Hospital were enrolled in the study.	Group differences in age, height, weight, body mass index (BMI) and MVC of handgrip were examined by Student's unpaired t-test. Male to female ratio and number of patients administered angiotensin II receptor antagonists or diuretics were compared between the groups by chi-squared test. Student's paired t-test was used for comparisons of BP, PR, VC, VD and LF/HF ratio between before and after IHG within groups. The amplitude of changes in VC and VD between the two groups was assessed by two-way analysis of variance (ANOVA). Data are expressed

				as means ± SEM, with p50.05 taken to indicate a significant difference.
(Pagonas et al., 2017)	Aerobic isometric exercise versus handgrip exercise in hypertension: a randomized controlled trial.	A randomized controlled trial.	A total of 75 hypertensive patients were randomized to one of the following 12-week programs: Isometric handgrip training.	Baseline epidemiological and hemodynamic characteristics did not differ between groups. Aerobic exercise led to a significant reduction of systolic 24-h BP (P ¼ 0.025), office SBP (P ¼ 0.03), systemic vascular resistance (P ¼ 0.001) and small artery elasticity index (P ¼ 0.005). There were no statistically significant changes of these parameters in the isometric exercise and the ‘sham exercise’ groups (P > 0.05 each).
(Jørgensen et al., 2018)	Twenty weeks of isometric handgrip home training to lower blood pressure in hypertensive older adults: a study protocol for a randomized controlled trial.	A randomized Controlled Trial.	Based on previous evidence, we calculated that 50 hypertensives (SBP between 140 and 179 mmHg), older adults (50 + years of age) are needed to achieve a power of 80% or more.	This assessor-blinded, randomized controlled trial will explore the effect of a 20-week IHG home training intervention on resting blood pressure in hypertensive older adults. In addition, the trial will report adherence and potential harms related to the IHG home training.
(Beazley & Jones, 2018)	The effectiveness of isometric handgrip exercise and slow deep breathing exercise on changes in blood pressure in patients with hypertension.	Quasi Experimental	Patients with high blood pressure were taken from Puskesmas Pasar Kepahiang and Puskesmas Bukit Sari. Patients who participated were patients who met the criteria for a systolic blood pressure of more than 130 mmHg and a diastolic blood pressure of more than 90 mmHg. Participants can hold hands with an age range of 18-60 years. Intervening and being cooperative and able to follow suggestions. Meanwhile, patients with bone injuries in the extremities, carpal tunnel syndrome could not be included.	The results showed that there were changes in systolic and diastolic blood pressure after the isometric handgrip exercise intervention (t=8,279, p=0.000), (t=6.154, p=0.000), and changes in systolic and diastolic blood pressure after slow deep breathing exercise (t=3.632, p=0.002), (t=4.226, p=0.001).

DISCUSSION

Participants in this study were patients with high blood pressure. In this study, mention

the factors that influence hypertension. In the study, factors that influence hypertension have been mentioned, including a family history of

the disease and genetic factors. Some other factors include previous lifestyles, such as smoking with excessive capacity, laziness to move and do activities and consume lots of high-fat or instant foods [3]

1) Gender and age: The increasing number of illnesses a person has and appears in is one of the effects of increasing age. In old age, there will be various setbacks in the organs of the body. Therefore, the elderly is very susceptible to high blood pressure. However, in a study conducted by (Arum 2019) cases that often encounter, the number of hypertension cases was found in the elderly community [4] (Arum, 2019)

2) Lifestyle and Diet: irregular exercise, infrequent activity, increased blood cholesterol levels, and prolonged stress.

Isometric Exercises

Research studies reveal that isometric exercises have several positive effects, consisting of decreased blood pressure, increased bone density, increased muscle mass, increased upper and lower body strength, and reduced risk of bone fracture (Parlindungan & Lukitasari, 2016). In its application, the thing that needs to be considered when doing isometric exercises is the strength of the body muscles during warm-up movements and in the rehabilitation exercise program. Muscle atrophy can also be prevented by doing isometric exercises. In its application, the thing that needs to be considered when doing isometric exercises is the strength of the body muscles during warm-up movements and in a rehabilitation exercise program. Muscle atrophy can also be prevented by doing isometric exercises.

The compression of the blood vessel muscles caused by isometric exercises can produce ischemic stimuli, resulting in a shear stress mechanism. The ischemic stimulus will then trigger the brachial artery flow to increase to reduce the ischemic effect on the blood vessels. When the pressure is released, the flow of blood vessels will automatically expand due to the enlargement of the distal blood vessels,

which then triggers shear stress to the arteries. The shear stress mechanism causes Nitric Oxide, made by endothelial cells as a vasodilator for blood vessels to be released. Nitric Oxide is the connector of endothelial cells where endothelial cells are part of the lumen of blood vessels located throughout the body. It has an essential function as a link between smooth muscle cells in blood vessels and the body's circulation. Some Nitric Oxide then spreads to the walls of arteries and veins (smooth muscle) and automatically activates an enzyme that will trigger and stimulate relaxation in the muscles that allow blood vessels to dilate so that the blood becomes soft again and a decrease in blood pressure occurs.

Baross, Willes, and Swaine, 2013 in their research, have suggested that isometric exercise can show a decrease in resting blood pressure. Some of the advantages of doing isometric exercises for short periods regularly within 2 minutes can decrease blood and stable heart rate.

Based on the description above, it can be concluded that isometric exercises effectively reduce blood pressure. Apart from drugs, isometrics can be used as an alternative for hypertensive patients. Not only does it lower blood pressure, some of the benefits of isometric exercise include improving muscle mass and increasing bone density, and reducing the risk of bone fractures.

Exercise Duration

Based on studies conducted Based on a survey conducted by Gill, 2015, exercises were carried out for 3-4 weeks with a duration of each activity 4x2 minutes of double leg isometric exercise separated by a 3-minute rest period. Participants were instructed to breathe normally during isometric exercises to avoid the Valsalva maneuver or so-called forced expiration. This exercise has been shown to reduce blood pressure at rest less (~ 5 mmHg for systolic blood pressure).

This study is directly proportional to the research conducted by Carlson, which states that the patient performs isometric grip

exercises 4x2 minutes with non-dominant hands, each separated by a rest period of 3 minutes, three days a week.

The author can conclude that the average isometric exercise is performed over 3-4 weeks for 4x2 minutes with a rest period of 3 minutes to achieve more effective results.

Exercise Implementation

Based on research conducted by (Hooi et al., 2020), the Implementation of isometric exercises can be done independently at home to be the cheapest alternative for hypertension. Isometric exercises consist of several movements that must do in sequence, including:

- 1). Double Elbow Prone Bridge
- 2). Lateral Right Elbow Bridge
- 3). Both legs of the bridge
- 4). Left Elbow Lateral Bridge
- 5). Both Bridges Prone to Hand
- 6). Right Lateral Bridge
- 7). The Left Foot of the Supine Bridge
- 8). Right Foot Overhead Bridge
- 9). Left Lateral Bridge
- 10). Left Foot Alternative
- 11). Alternating Left Foot Right
- 12). Superman

CONCLUSION

Hypertension is a condition of relatively high blood pressure, where this disease occurs due to several factors in an individual, including genetics, gender, diet, and lifestyle.

Isometric exercises are very effective in reducing blood pressure. Apart from drugs, isometrics can be used as an alternative for hypertensive patients. Not only does it lower blood pressure, some of the benefits of isometric exercise include improving muscle mass and increasing bone density, and reducing the risk of bone fractures.

Isometric exercises are carried out for 3-4 weeks for 4x2 minutes with a rest period of 3 minutes to achieve more effective results. This exercise will be very useful in lowering blood pressure in people with hypertension. Isometric functions as a vasodilator in blood vessels that

play a role in enlarging blood vessels so that blood circulation can be smooth, which affects the decrease in blood pressure.

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DECLARATION OF CONFLICTING INTEREST

Related to conflict of interest that arise when conducting article.

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AUTHOR CONTRIBUTION

Arista Maisyaroh: Conduct preliminary studies, assist in preparing proposals, help make arrangements for a research permit, helps collect research data, perform data processing, help compile research results reports, and assist in the preparation of publications and manuscripts.

Devi Aulia Putri: Conduct preliminary studies, assist in preparing proposals, help make arrangements for a research permit, helps collect research data, perform data processing, help compile research results reports, and assist in the preparation of publications and manuscripts.

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