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# Efficacy of sport and slow stroke back massage as a non-pharmacological therapy to lower blood pressure in elderly with chronic hypertension

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## ABSTRACT

**Background and purpose:** The prevalence of hypertension has been increasing along with the increasing elderly population. Non-pharmacological therapies such as sports and slow stroke back massage offer a potential adjuvant therapy for elderly patient with chronic hypertension. This study aims to determine the efficacy of sports and slow stroke back massage as non-pharmacological therapies to lower blood pressure in this age group.

**Methods:** This study was a Parallel Group Randomized Controlled Trial, conducted in Patrang, Jember, East Java. The study involved a total of 72 elderly aged between 60 to 79 years old who had blood pressure of  $\geq 140/90$  mmHg, and not taking antihypertensive drugs. The study participants were assigned randomly into three groups namely, the sports massage, slow stroke back massage, and control groups. Subject characteristics, stress level, physical activity level and eating habit were collected through structured interview using standardized questionnaires (*Global Physical Activity Questionnaire, Food Frequency Questionnaire, Depression Anxiety Stress Scale (DASS 21)*). Blood pressure measurements were done twice, before and after treatment. Before and after comparison was conducted with Wilcoxon test, between group comparison was conducted with Kruskal Wallis test followed by Mann Whitney test.

**Results:** The average systolic blood pressures before and after sports massage were  $168.96 \pm 16.02$  mmHg and  $147.50 \pm 15.95$  mmHg, respectively. For the slow stroke back massage was  $165.42 \pm 12.50$  mmHg before treatment and  $154.58 \pm 16.15$  mmHg after treatment. The systolic and diastolic blood pressures before and after treatment in the treatment groups (sports massage and slow stroke back massage) were statistically different from the control group ( $p < 0.05$ ). Further, the Mann Whitney results indicated that slow stroke back massage was more effective than sports massage in lowering blood pressure in elderly with hypertension.

**Conclusions:** Sport massage and slow stroke back massage are effective as a non-pharmacological therapy in lowering blood pressure in elderly with hypertension. These non-pharmacological therapies should be considered for controlling blood pressure in elderly.

**Keywords:** elderly, hypertension, non-pharmacological therapy, sport massage, slow stroke back massage

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## INTRODUCTION

Globally, the number of elderly people above the age of 60 was around 962 million in 2017 and projected to increase reaching 2.1 billion in 2050.<sup>1</sup> Data from Statistics Indonesia in 2018 showed the number of elderlies in the country was 24.49 million and will expected to raise to reach 63.31 million in 2045. In the same year, 12.64% of population in East Java were elderly and in Jember District it was as high as 13.38%.<sup>2</sup>

Aging process is associated with degenerative diseases such as hypertension.<sup>3</sup> The global hypertension cases in 2015 was around 1.13 billion.<sup>4</sup> The prevalence of hypertension in Indonesia in 2018 among population 18 years and above was 34.1%.<sup>5</sup> While in the East Java Province, the prevalence was 36.32% and in Jember District was 40%.<sup>6</sup> The total number of people with hypertension in Jember in 2018 reached 93,155.<sup>7</sup> In Jember District, the Patrang Public Health Center (PHC) has the highest elderly population

with hypertension.

Hypertension in elderly is a chronic disease that needs continuous adherence to medication in order to control the blood pressure. However, many patients with hypertension have not adhered to their medication where 32.3% have not routinely taken their medication and 13.3% have not taken any medication at all. The reason for these behaviors were 59.8% perceived themselves as healthy, 31.3% were not able to routinely visit health care facilities, 14.5% preferred

traditional medicine, 11.5% frequently forgot to take the medication, 8.1% unable to buy the medication routinely, 4.5% unable to tolerate the side effects, 2% the hypertension medication were unavailable at the health care facilities and 12.5% stated other non-specified reasons.<sup>5</sup> Looking at several barriers to adherence to pharmacological therapy, provision of non-invasive, non-pharmacological therapy such as massages can be an alternatives measure to control blood pressure.

Sport massage and slow stroke back massage are two common massage methods used in nursing. Sport massage used several manipulations such as *effleurage*, *friction*, *petrisage*, and *tapotement* within a duration of 30 minutes, administered with medium intensity and applied in the feet, back and hands.<sup>8</sup> While slow stroke back massage used the *effleurage* manipulation applied on the sides of the vertebrae toward the sacral section for a duration of 10 minutes.<sup>9</sup> The intensity is slow 12-15x/minutes in rhythmical movements.<sup>10</sup> Massage can affect the limbic and nerves activity which lead to stress reduction, further the decrease in sympathetic nerves response will lower blood pressure. Decrease in hypothalamic pituitary adrenocortical activity lowers the cortisol and catecholamines which causes increase in blood pressure. While on the other hand, there is vasodilation due to an increase in blood pressure lowering substance such as nitric oxide, prostacyclin, and histamine. Massage can also affect the mechanical action and decrease in viscosity which can also lower blood pressure.<sup>11</sup>

Previous study shows that sport massage lowered blood pressure of 6.7% elderly with pre-hypertension and 20% of elderly with stage one hypertension.<sup>12</sup> Sport massage is more effective in lowering blood pressure, reducing pulse and breathing frequencies compared to fitness massage.<sup>13</sup> Similar to sport massage, slow stroke back massage given for a 10 minutes duration has been shown to lower blood pressure in elderly.<sup>14-19</sup>

Management of hypertension with pharmacological methods are considered less effective because 32.3% of hypertensive patients do not regularly take drugs and 13.3% do not take drugs at all. Therefore,

a solution to overcome hypertension is needed in an effective, economical, non-invasive and non-pharmacological way such as sports massage and slow stroke back massage. Besides, there is an increasing trend for people to seek non-pharmacological therapy. Therefore, this study aims to determine the effectiveness of sports and slow stroke back massage as non-pharmacological therapies to reduce blood pressure in elderly people with hypertension. The results can be applied to help elderly patients with hypertension in the community.

## METHODS

### Study Design, Time and Location

This study was a Parallel Group Randomized Controlled Trial, conducted in Patrang, Jember, East Java from June to August 2020.

### Sample Size, Selection and Randomization

The sample size in this study was calculated using the two independent groups mean formula (one side), so the minimum sample size for each arm in this study was 22, with an additional of 10% thus resulted in 24 participants in each arm. Jember has 50 PHCs and the sample site (Patrang PHC) selection method used was purposive technique (Willing to be a site of research considering the COVID-19 pandemic, the zone with the lowest COVID-19 cases, still active during the pandemic, had the highest number of visitors at the integrated health services posts/*posyandu* for elderly, and had most hypertension cases). After selecting four elderly *posyandu*, the researcher asking for a list of the names of the elderly who suffer from hypertension, the researchers visited house to house to find elderly who met the eligibility criteria (elderly aged 60-79 years, blood pressure  $\geq 140/90$  mmHg, not taking any antihypertensive drugs and were willing to participate in the study). This research uses triple blind. Elderly who were willing to be subjects were randomized by lottery. The respondents randomly took an envelope provided by the researcher which would assign them to one of the three groups, the sports massage group  $n_1=24$  respondents, slow stroke back massage group  $n_2=24$  respondents

and control group  $n_3=24$  respondents leading to a total respondents of 72.

### Data Collection

Data of subject characteristics, stress level, physical activity level and eating habit were collected through structured interview using standardized questionnaires (Global Physical Activity Questionnaire, Food Frequency Questionnaire, Depression Anxiety Stress Scale (DASS 21)). Body Mass Index (BMI) was acquired by measuring the respondents' height and weight. Weight measurement was taken using a digital weighing scale from @ Camry brand. Height was measured using a measuring tape. Blood pressure measurements were taken twice, before and after treatment, using a mercury *sfigmomanometer* and stethoscope from GEA Medical.

### Intervention and Control

This research took place during the COVID-19 pandemic, hence a strict health protocol was implemented during the intervention period. The intervention group was visited twice a week for four weeks so that the intervention was given eight times. The sports massage group was given the intervention for 30 minutes on the legs, back and hands using *effleurage* manipulation, *friction*, *tapotement*, *walken*, *skin rolling*, and *vibration*. The slow stroke back massage group was given the intervention for 10 minutes on the back using *effleurage* manipulation of 60 rubs per minute. While, the control group was given vitamin B1 50 mg at a dose of 1x1 for 10 days. At the fourth week, the posttest was performed in the same way as the pretest.

### Data Analysis

Data were tested for normality using the Kolmogoro-Smirnov test and was found to be non-normally distributed. Then, before and after comparison was conducted using Wilcoxon test, while between group comparison with Kruskal Wallis test followed by Mann Whitney test.

### Ethical Clearance

The study received the ethical clearance from the Ethics Commission of Nursing Faculty, Jember University No. 2803/UN25.1.14/SP/2020.

## RESULTS

The age of respondents ranges from 60 to 79 years. Most of the respondents were categorized as having normal body mass index/BMI (18.5-25.0) in all three

groups. The mean score of hypertension triggering (high in salt) foods consumption was 109.17. Hypertension triggering foods often consumed include *pindang* (smoked and salted salt-water fish), noodles, freshwater fish and tuna. Likewise,

mean score of hypertension preventing foods was 149.79. Foods to prevent hypertension that were often consumed include tomatoes, bananas, papaya, tempeh and tofu (Table 1). The majority of respondents were female (70.8%), never

**Table 1.** Distribution of respondents' characteristics

Characteristics	Sport Massage		Slow Stroke Back Massage		Control		p
<b>Age (years)</b>	70.63		68.58		69.29		0.528
Min-max	24.48		25.15		24.53		0.886
Mean	97.29		109.17		101.53		0.357
<b>Consumption of hypertension triggering foods</b>	60-165		65-190		55-155		0.276
Min-max	133.54		149.79		143.54		
Mean	100-165		75-235		80-260		
<b>Sex</b>	7 (29.2)		4 (16.7)		10 (41.7)		0.163
Male	17 (70.8)		20 (83.3)		14 (58.3)		
Female	18 (75)		15 (62.5)		11 (45.8)		0.194
<b>Education</b>	3 (12.5)		7 (29.2)		9 (37.5)		
No formal education	1 (4.2)		1 (4.2)		2 (8.3)		
Elementary school	2 (8.3)		1 (4.2)		0		
Junior high school	0		0		2 (8.3)		
Senior high school	18 (75)		14 (58.3)		19 (79.2)		0.244
College	6 (25)		10 (41.7)		5 (20.8)		
<b>Employment</b>	18 (75)		17 (70.8)		18 (75)		0.379
Not employed	4 (16.7)		2 (8.3)		4 (16.7)		
Employed	1 (4.2)		5 (20.8)		1 (4.2)		
<b>Income</b>	1 (4.2)		0		1 (4.2)		
No income	14 (58.3)		14 (58.3)		11 (45.8)		0.604
<IDR 500.000	10 (41.7)		10 (41.7)		13 (54.2)		
IDR 500.000-1.000.000	0		0		0		. <sup>a</sup>
>IDR 1.000.000	24 (100)		24 (100)		24 (100)		
<b>Family history of hypertension</b>	0		0		0		. <sup>a</sup>
Yes	24 (100)		24 (100)		24 (100)		
No	6 (25)		3 (12.5)		7 (29.2)		0.352
<b>Smoking</b>	18 (75)		21 (87.5)		17 (70.8)		
Yes	16 (66.7)		20 (83.3)		14 (58.3)		0.354
No	6 (25)		2 (8.3)		6 (25)		
<b>Physical Activity Level</b>	2 (8.3)		2 (8.3)		4 (16.7)		
Medium	7 (29.2)		6 (25)		4 (16.7)		0.898
Normal	4 (16.7)		4 (16.7)		7 (29.2)		
Low	6 (25)		7 (29.2)		7 (29.2)		
Medium	7 (29.2)		7 (29.2)		6 (25)		
High							

\*One Way Anova and Chi-square

had any formal education (61.1%), not employed (70.8%), earning no income (73.6%) and more than half had a family history of hypertension (54.1%). Lifestyle wise, none of the subjects consumed alcohol and antihypertensive drugs. The majority of respondents (77.8%) did not smoke, had low physical activity (69.4%) and 56.9% of them experienced some level of stress. In Table 1, characteristics of each groups are described and compared, the statistical analysis shows that respondent's characteristics were not statistically different, thus the respondents in the three groups were comparable.

Kolmogorov-Smirnov test showed that the data from all the three arms; sport massage, slow stroke back massage control were non normally distributed. Hence, Wilcoxon test was used to test the mean difference between before and after treatment.

There was a significant difference in the mean systolic blood pressure between before and after treatment in the sports massage group, it decreased by 21.46 mmHg ( $p < 0.001$ ). Similar to the sport massage group, the mean systolic blood pressure between before and after treatment in the slow stroke back massage also decreased by 10.84 mmHg, and the mean difference was statistically significant ( $p < 0.001$ ).

Thus, it can be implied that the decrease in systolic blood pressure after treatment in both interventions are influenced by the slow stroke back massage and sports massage. In contrast, in the control group the mean systolic blood pressure increased by 2.5 mmHg, however the difference was not statistically significant ( $p > 0.05$ ) (Table 2).

Regarding the diastolic blood pressure, there was a decrease in the mean blood pressure after the sports massage intervention by 11.66 mmHg and the difference was statistically significant ( $p < 0.001$ ). The same was found in the slow stroke back massage group, the mean diastolic pressure decreased by 6.25 mmHg with a  $p$  value of 0.004. Therefore, it was concluded that the decrease in mean diastolic blood pressure in the intervention groups were influenced by the treatments. While, in the control group despite the decrease of mean diastolic blood pressure of 0.83 mmHg, it was not statistically significant ( $p > 0.05$ ). Further, the *Kruskal-Wallis* test showed that the mean difference in systolic and diastolic blood pressure between the before and after treatment in the intervention groups was statistically significant for sport massage and slow stroke back massage ( $p < 0.001$ ). Therefore, to find out which intervention was more

effective in lowering blood pressure the *Mann Whitney* test was conducted (Table 3).

Based the multiple group comparison on Table 3, there were significant differences ( $p$  value  $< 0.05$ ) between groups for both systolic and diastolic blood pressure. Both sport (mean reduction = 21.46 mmHg) and slow stroke back massage (mean reduction = 10.84) were able to reduce systolic blood pressure effectively compare to the control group (mean reduction = 2.5 mmHg). For comparison between sport and slow stroke back massage, we can see that sport massage has reduced systolic blood pressure statistically higher than the slow stroke back massage ( $p$  value = 0.012). Similarly, for diastolic blood pressure, sport massage (mean reduction 11.66 mmHg) is significantly more effective ( $p = 0.002$ ) to reduce pressure compare to slow stroke back massage (mean reduction = 6.25 mmHg) and the control groups (mean reduction = 0.83 mmHg) with  $p$  value  $< 0.001$ .

Hence, both massages are effective to reduce systolic and diastolic blood pressure, and sport massages are more effective than slow stroke back massage in term of the amount of blood pressure reduction.

**Table 2.** Difference in systolic and diastolic blood pressure before and after treatment in the three groups

		N	Mean	SD	MD	95%CI		p*	p**
						Lower	Upper		
<b>Systolic (mmHg)</b>									
Sport massage	Before	24	168.96	16.02	21.46	150	210	<0.001	<0.001
	After		147.50	15.95		110	180		
Slow stroke back massage	Before	24	165.42	12.50	10.84	150	190	<0.001	
	After		154.58	16.15		130	190		
Control	Before	24	159.17	11.00	2.50	150	180	0.166	
	After		161.67	13.08		130	180		
<b>Diastolic (mmHg)</b>									
Sport massage	Before	24	99.58	4.64	11.66	90	110	<0.001	<0.001
	After		87.92	8.33		70	100		
Slow stroke back massage	Before	24	99.17	2.82	6.25	90	100	0.004	
	After		92.92	7.51		80	100		
Control	Before	24	98.75	3.38	0.83	90	100	0.414	
	After		97.92	5.09		80	100		

MD=mean difference; \*Wilcoxon Test; \*\*Kruskal-Wallis Test

**Table 3. Comparison of mean reduction in blood pressure between groups**

Group (Experiment arm)	Mean difference before-after	Rank	Total Rank	U	p
<b>Systolic</b>					
Sport massage	21.46	19.56	469.50	169.50	0.012
Slow stroke back massage	10.84	29.44	706.50		
Sport massage	21.46	15.33	368.00	68.00	<0.001
Control	2.5	33.67	808.00		
Slow stroke back massage	10.84	19.67	472.00	17.00	0.014
Control	2.5	29.33	704.00		
<b>Diastolic</b>					
Sport massage	11.66	18.75	450.00	150.00	0.002
Slow stroke back massage	6.25	30.25	726.00		
Sport massage	11.66	13.79	331.00	31.00	<0.001
Control	0.83	35.21	845.00		
Slow stroke back massage	6.25	18.92	454.00	154.00	<0.001
Control	0.83	30.08	722.00		

\*Mann Whitney

## DISCUSSION

Elderly suffering from hypertension often do not regularly take their medication due to various reasons making pharmacological therapy sometime become less effective, while patients with hypertension continue to increase every year. On the other hand, number of people seeking non pharmacology therapy is increasing; therefore, effective, non-invasive, and non-pharmacological treatment that is easy to access such as massage can be an important breakthrough to help reduce hypertension. Research related to sports massage and slow stroke back massage in reducing high blood pressure has been widely published, but none has been researched to see their effectiveness by considering the ease of application and the time required. This study shows that sports massage and slow stroke back massage were able to significantly reduce blood pressure.

For sport massage, the mean systolic blood pressure decreased by 21.46 mmHg and diastolic blood pressure decreased by 11.66 mmHg. This means that sports massage can affect the decrease in both systolic and diastolic blood pressure.

Manipulations of connective tissue through punching, rubbing, or squeezing can improve circulation, improve muscle tone and relaxation. The relaxation process can lengthen muscle fibers, reduce neural impulses to the brain, and further reduce the brain activity and other systems such as lowering heart rate and respiratory rate, blood pressure, and oxygen consumption as well as increased alpha brain activity and peripheral skin temperature that are characteristics of the relaxation response.<sup>20</sup> This result is in line with previous research showing that sports massage can lower blood pressure in elderly suffering from pre-hypertension and grade 1 hypertension.<sup>12</sup>

In addition, this study shows that slow stroke back massage was also able to significantly lower blood pressure. The systolic blood pressure decreased by 10.84 mmHg and diastolic blood pressure decreased by 6.25 mmHg, which means that slow stroke back massage can affect the decrease in systolic and diastolic blood pressure. The same results were found in various other studies, which showed that changes in blood pressure in elderlies were influenced by slow stroke back massage treatment.<sup>17,19,22</sup> Slow stroke back massage

has a sedative effect and is particularly useful for relaxing nerves, reducing stress and tension.<sup>21</sup> Psychologically, massage can positively affect limbic and nervous systems activity so that it has a good effect and can reduce stress. The limbic and nerves system activity will mutually reduce the sympathetic nervous system response so which lowers blood pressure.<sup>11</sup>

Comparison between interventions arm showed that the mean difference of systolic blood pressure in the slow stroke back massage was statistically significantly higher than the sports massage group and control group. The same was found for diastolic blood pressure, where the blood pressure in the slow stroke back massage was also statistically significantly higher than the sports massage group and control group. Thus, it can be concluded that slow stroke back massage was more effective compared to sport massage and control. In addition to being more effective, the slow stroke back massage is easier to be applied compared sports massage. It only uses one

manipulation (effleurage) and the time needed is also shorter, 3-10 minutes. Slow stroke back massage is a massage in the back area that provides a relaxing effect on muscles, tendons and ligaments thereby increasing parasympathetic nerves that can reduce heart rate and cardiac output. Manipulation of slow stroke back massage in this study uses effleurage technique 60 times per minute causing a sedative effect and especially useful for relaxing nerves, reducing stress and reducing stress tension. Psychologically, massage can affect limbic and nervous activity so that it has a good effect and can reduce stress. Cooperation between limbic and neural activity will affect each other, decreases the work of the sympathetic nervous system so that it can lower blood pressure.

The decrease in blood pressure can be influenced positively by both sports massage and slow stroke back massage if they are applied properly and in accordance with standard operating procedures and supported by cooperative research subjects who are willing to follow the direction given by the researcher. Sports massage and slow stroke back massage are interventions that can affect the subject as a whole (soul, body and mind) and are effective, economical, non-invasive

and non-pharmacological complement to consumption of anti-hypertensive medicine. Currently, the number of people looking for non-pharmacological therapies has been increasing due to people's fear of long term use side effects of their medicine. While on the other hand, people are seeking for active involvement to manage their health and play a more active role in their treatment. We hope every individual will be keen to practice massage and make sport massage and slow stroke back massage of interest to the community. These two massages can be used as additional skills for health workers to support hypertension control program pressure and as a complementary therapy that can be combined with antihypertensive drugs; it can be applied at the *posyandu* for the elderly. To support this measure, providing training and mentoring to health cadres and their families is necessary.

Despite the importance of the findings from this study, there were several limitations to this research. The fact that the sample size was small and only came from one health center catchment area will limit its ability for generalization. We also employed convenient sampling method due to the fact that the research was carried out during the COVID-19 pandemic. In addition, the researcher only measured one aspect of the uses of sports massage and slow stroke back massage from various uses such as to reduce pain, anxiety, stress and many more which can also influence blood pressure.

## CONCLUSION

Sports massage and slow stroke back massages were able to lower systolic and diastolic blood pressure effectively. In term of pressure reduction, sport massage reduces higher amount of pressure compared to slow stroke back massage. However, slow stroke back massage is simpler, easier to apply and taking shorter duration compared to sport massage with relatively adequate amount of pressure reduction, then, it should also be as a potential alternative in the community setting. We recommend both sports massage and slow stroke back massage as non-pharmacological therapies to complement current hypertension control

program especially among elderly which can be applied at the elderly integrated health services post (*posyandu lansia*). Prior to this, provision of training and assistance for cadres and families to apply sports massage and slow stroke back massage is necessary.

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## AUTHOR CONTRIBUTION

LUA designed and conducted the study and data analysis, also wrote and edited the manuscript draft. IMS and NLPS were involved in the study design and concept as well as provided feedbacks to the manuscript.

## CONFLICT OF INTEREST

No conflict of interest declared by the authors

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