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Effect of Progressive Muscle Relaxation Therapy on Stress and Blood Pressure in the Pre-Hypertensive Group

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Abstract
Introduction: *Prehypertension is a condition that precedes the onset of hypertension and typically presents without noticeable symptoms in affected individuals. One of the major contributing risk factors for hypertension among young adults is an unhealthy lifestyle, including elevated stress levels.* ***Objective:*** *This study aims to determine the effect of Progressive Muscle Relaxation (PMR) Therapy on stress and blood pressure among individuals with prehypertension.* ***Method:*** *A quantitative approach was used with a quasi-experimental two-group pre–posttest design involving 40 participants selected through purposive sampling, divided into intervention and control groups.* ***Result and Discussion:*** *The intervention consisted of PMR therapy administered for two consecutive weeks, with each session lasting 20 minutes. Statistical analysis using paired sample t-test showed that, prior to the intervention, 55% of participants in the intervention group experienced moderate stress, with an average blood pressure of 130.80 mmHg systolic and 85.15 mmHg diastolic. After the intervention, 60% fell into the mild stress category, and the average blood pressure decreased to 117.20 mmHg systolic and 76.15 mmHg diastolic. The significance value of 0.000 < 0.05 indicates a meaningful effect of PMR therapy on reducing stress and blood pressure in prehypertensive individuals.* ***Conclusion:*** *This therapy effectively enhances relaxation, reduces muscle tension, and serves as a beneficial nonpharmacological intervention for community use.*

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Introduction

Health Lately we often hear about the incidence of hypertension at a relatively younger age in our society. This can be seen from the prevalence of hypertension in Indonesia in 2013 in the young age group, namely the age group of 18-24 years of 8.7%, the age group of 25-34 years of age of 14.7%, and in the age group of 35-44 years of age of 24.8% (Ina, Selly, & Feoh, 2020); (Nurhayati, Ariyanto, & Syafriakhwan, 2023). Based on the latest research results in 2018, this figure has increased significantly to 13.2% in the age group of 18-24 years, 20.1% in the age group of 25-34 years, and 31.6% in the age group of 35-44 years (Riskesdas, 2018); (Hernawan & Prestiaji, 2023); (Nursakinah & Handayani, 2021).

Some of the highest risk factors that contribute to hypertension in young adult patients are unhealthy lifestyle behaviors including smoking, lack of exercise, consuming less nutritious foods, and stress Stress is the main risk factor for hypertension. About 75–90% of doctor visits in the United States are stress-related. Stress has proven to be one of the important problems that exist in the population (Aryani, Simanjuntak, & Sipayung, 2024); (Endah, 2024). In the case of stress in America, statistics show that stress- related diseases include depression, anxiety, high blood pressure, and so on. The prevalence of stress events is quite high where almost more than 350 million people in the world experience stress and is the 4th ranked disease in the world according to WHO (Ayu Hidayatunnafi'ah, 2023); (Ekarini, Wahyuni, & Sulistyowati, 2020)

The magnitude of the increase in blood pressure that is not properly controlled, can trigger the occurrence of cardiovascular disease. The higher the blood pressure, the higher the risk of damage to the heart and blood vessels in major organs such as the brain and kidneys. When a person has been diagnosed with hypertension, the person must immediately control his blood pressure or hypertension as soon as possible. This is intended to control blood pressure to remain in optimal condition (Ministry of Health of the Republic of Indonesia, 2019).

Management of hypertension in a non-pharmacological way can be applied to efforts to live a healthy lifestyle which is recommended including reducing the consumption of salt, coffee/caffeine, alcohol, quitting smoking, losing weight, doing exercise and physical activity and managing stress well (Pratiwi & Soesanto, 2023); (Arini, 2025). Regular exercise can be done by doing the right physical exercises including walking, gardening, cleaning the house, gymnastics, and Progressive Muscle Relaxation Therapy. Non- pharmacological treatment is in great demand by the public because it tends to be easier and does not cost much. Non- pharmacological treatment also does not have harmful effects (Putra, Nurhikmawati, Khalid, Wiriansya, & Arifuddin, 2024); (Iqbal & Handayani, 2022). Several studies have also proven that complementary medicine is an intervention/treatment that must be done in every hypertension treatment.

Progressive Muscle Relaxation *Therapy is* a method that involves stretching and relaxing the muscles and focuses on the feeling of relaxation. The goal of this therapy is to achieve a state of total relaxation, including a state of physiological relaxation that can relax the mind by releasing the pituitary gland to stimulate the hypothalamus. This Progressive Muscle Relaxation Therapy also has the benefit of helping to reduce peripheral resistance and can increase the elasticity of muscle blood vessels and blood circulation will be more perfect in the absorption and distribution of oxygen.

Method

This research uses a quantitative method. This type of research is Quasi Experimental with a two-group pre-post-test design approach with control. The population of this study is all residents in one of the Rukun Warga 03 Sarijadi, Bandung city. Meanwhile, the research sample amounted to 40 respondents who were taken using *purposive sampling techniques* in accordance with the inclusion criteria.

This study consists of 3 variables, namely free and bound variables. The independent variable of this study was progressive muscle relaxation, while the bound variable of this study was stress and blood pressure. The variable measure of stress level using (*Depression Anxiety Stress Scale 42*) DASS-42 with validity and reliability values produced an Alpha of 0.880 and there were 14 questionnaire statements representing stress level indicators where all statements were declared valid (Kurniyawan et al., 2022). Meanwhile, blood pressure measuring devices use a stethoscope and a sphygnomanometer.

Data collection was carried out at village association activities so that samples could be easily reached. Previously, respondents were pre-tested by measuring blood pressure, stress level questionnaire results and selecting according to inclusion criteria. Then a progressive muscle relaxation intervention was carried out according to the Standard Operating Procedure (SOP) which was carried out in 1 session for 15-20 minutes for 2 consecutive weeks. The final stage of data collection is to conduct a posttest by measuring blood pressure after the intervention and measuring stress levels.

The analysis of univariate data in this study consisted of respondent characteristics, stress levels, and blood pressure presented in the frequency distribution. Meanwhile, bivariate analysis uses the *Paired Sample t-test parametric test* , namely the effect of progressive muscle relaxation on stress levels and the effect of progressive muscle relaxation on blood pressure. The significance value used in this study is <0.05 which means that the hypothesis is accepted.

Result and Discussion

1. Result

In this study, 40 respondents were involved in accordance with the inclusion criteria that had been set. The results of the study presented data on the characteristics of response, frequency distribution of stress levels and blood pressure, and the results of the analysis of the Paired Sample t-test on the effect of progressive muscle relaxation on stress levels and blood pressure in the pre- hypertension group presented in the table below.

Table 1
Characteristics of Respondents (n=40)

Respondent Characteristics	Intervention		Control	
	F	%	F	%
Age				
18-39 years old	14	70%	11	55%
40-59 years old	5	25%	8	40%
≥60 years old	1	5%	1	5%
Gender				
Man	6	30%	8	40%
Woman	14	70%	12	60%
Education				
ES	0	0%	2	10%
JHS	1	5%	2	10%
SHS	10	50%	12	60%
College	9	45%	4	20%
Work				
Civil Servant	1	5%	0	0%
Private	13	65%	10	5%
Self employed	2	10%	3	15%
Pension	1	5%	0	0%
House Wife	3	15%	5	25%
Not Working	0	0%	2	10%
Family History of Hypertension				
Yes	11	55%	16	80%
No	9	45%	4	20%

The data on respondent characteristics in the table above is known that most of the respondents were aged 18-39 years old, which amounted to 14 respondents (70.0%) in the intervention group and 11 respondents (55.0%) in the control group. In the gender, respondents were dominated by women with a total of 14 respondents (70.0%) in the intervention while in the control group as many as 12 respondents (60.0%). At the education level, 10 respondents (50.0%) were dominated by high school education in the intervention group and 12 respondents (60.0%) in the control group. In the respondents' work, 13 respondents (65.0%) were dominated by private work in the intervention group and 10 respondents (50.0%) in the control group. Meanwhile, respondents with a family history of hypertension were known to have 11 respondents with hypertension (55.0%) in the intervention group and in the control group as many as 16 respondents (80.0%).

Table 2
Distribution and frequency of pre-and post-intervention stress levels in the intervention and control groups (n=40)

Stress Level	Intervention		Control	
	F	%	F	%
Pre-Intervention				
Mild	0	0%	0	0%
Moderate	11	55%	14	70%
Severe	9	45%	6	30%
Post-Intervention				
Mild	12	60%	0	0%
Severe	8	40%	13	65%
	0	0%	7	35%

Table 2 shows that there was a change in stress categories before and after the intervention. In the intervention group, before being given the intervention, most of the respondents, totaling 11 (55.0%), had a moderate stress level category. After the intervention, the stress level was mostly in the mild category with a total of 12 respondents (60.0%).

Table 3

Distribution and Frequency of Blood Pressure Pre and post interventions were carried out in the control group and intervention

Blood	Min	Max	Median	Mean±SD
Pre-Intervention				
Intervention Groups				
Systole	124	138	130.0	130.80±4.526
Diastole	83	87	85.00	85.15±1.182
Control Group				
Systole	125	137	130.50	130.50±3.216
Diastole	84	88	86.00	85.80±1.281
Post-Intervention				
Intervention Groups				
Systole	114	120	117.50	117.20±1.852
Diastole	72	80	76.00	76.15±2.720
Control Group				
Systole	127	136	131.00	131.40±2.326
Diastole	84	88	86.00	85.90±1.089

Table 3 shows that there was a change in blood pressure before and after the intervention in the intervention group. Before the intervention, the average systole blood pressure was 130.80 mmHg and for diastole blood pressure was 85.15 mmHg. And after the intervention, the average systolic blood pressure was 117.20 mmHg and diastole blood pressure was 76.15 mmHg.

Table 4

Results of Paired Sample t-test Effect of Progressive Muscle Relaxation Therapy on Stress Levels and Blood Pressure in the Pre- Hypertension Group (n=40)

	Mean	SD	ONE	95%CI		P-Value
				Lower	Upper	
Intervention Groups						
Pre-test	24.20	3.915	0.875			
Post-test	18.45	2.762	0.618	-8.022	-3.478	**0.000**
Control Group						
Pre-test	23.65	3.870	0.865			
Post-test	24.45	3.187	0.713	2.694	0.884	**0.388**

The results of the Paired Sample t-test showed that there was a decrease in stress levels in the intervention group with a significance result showing a p-value of 0.000<0.05 which means that there is an effect of progressive muscle relaxation therapy on stress levels in the pre-hypertensive group.

Table 5
Paired Sample t-test test results The effect of progressive muscle relaxation therapy on blood pressure in the intervention and control groups

	Mean	SD	SE	95%Cl		P-Value
				Lower	Upper	
Intervention Groups						
Systole Blood Pressure						
Pre-test	130.80	4.526	1.012	-15.993	-11.207	**0.000**
Post-test	117.20	1.852	0.414			
Diastole Blood Pressure						
Pre-test	85.15	1.182	0.264	-10.270	-7.730	**0.000**
Post-test	76.15	2.720	0.608			
Control Group						
Systole Blood Pressure						
Pre-test	130.35	3.216	0.719	-0.169	2.269	**0.087**
Post-test	131.40	2.326	0.520			
Diastole Blood Pressure						
Pre-test	85.80	1.281	0.287	-0.835	1.035	**0.825**
Post-test	85.90	1.210	0.270			

Table 5 shows that blood pressure after intervention to the intervention group decreased blood pressure. With a significance value of 0.000<0.05, which means that there is an effect of progressive muscle relaxation on blood pressure in the pre-hypertension intervention group.

2. Discussion

Respondent Characteristics

Based on the results of the research that has been carried out, the age of the respondents is dominated by the age of 18 – 39 years as many as 25 people consisting of control and intervention groups. Research by Nurhayati et al, in (2023) states that as we age, the cardiovascular circulatory system in the body can deteriorate, which can have an impact on the incidence of hypertension.

In this study, the number of female respondents was more than male respondents. The results of this study are in accordance with research conducted by Delavera et al. (2021) that the incidence of hypertension in women is greater than in men. Women are 95% more at risk of hypertension than men. According to Hasana & Harfe'I (2019), women and men have different responses in dealing with problems, including health problems. Women tend to spend more time thinking and feeling anxious, but men tend to think less and not care about the problem. Therefore, women will be more easily stressed than men so that their quality of life will be affected and even tend to be bad.

The results of a study conducted by Vargas, Ingram, and Gillum (2010) show that hypertension is more experienced by respondents with less than 12 years of education compared to those who are more than 12 years old. According to the results of this study, the results of hypertension were experienced by more respondents with an education level of ≤12 years of 22 respondents compared to the education level of >12 years of 13 respondents. This is because educational status plays an important role in health conditions among many factors, such as access to the health system, level of information,

understanding of medication and awareness to control blood pressure (Lyra et al., 2012). Referring to the results of previous research that said that work can affect stress levels, the result of the study is that stress arises when employees are unable to meet what their job demands. Unclarity of what is the responsibility, lack of time in completing tasks, lack of facility support to carry out work are examples of stress triggers (Wintoro et al., 2018), but in the research that has been conducted, the results of the distribution of respondents according to job categories were found that the number of respondents with the dominant job category was the private sector as many as 23 respondents in the control and intervention group.

In Indonesia, hypertension in workers tends to increase. Based on basic health research by the Ministry of Health of the Republic of Indonesia (2019), it is stated that the prevalence of hypertension in workers, especially private employees, nationally is 24.37%. The prevalence of hypertension in workers in DKI Jakarta Province is 13.4%. Based on the diagnosis of health workers, the prevalence of hypertension in workers in North Jakarta is 10.4%. Research conducted by Afiatna (2020) states that workers in Indonesia with hypertension have a 2.17 times greater risk of injury at work than a workforce that does not have hypertension. Workers who experience hypertension will experience a decrease in productivity, causing work accidents.

Productive age that experiences stress is caused by encountering many problems in their lives. According to Yosep and Sutini (2016), a person who experiences events that cause changes in a person's life is a psychosocial stressor. Some causes of psychosocial stressors are marriage, work, environment, finances, family factors, and disasters. Where a person can be said to have post- traumatic stress disorder when experiencing stress.

This study shows that most of the respondents have a family background that suffers from hypertension hypertension is a disease that can be passed down from generation to generation. According to the principles of genetics, this phenomenon may be caused by the influence of genetic factors that contribute to diseases that are hereditary. Inheritance factors are passed down through genes found in the DNA of every living organism (Meilinda, 2017).

Effect of Progressive Muscle Relaxation Therapy on Stress and Hypertension Levels in Pre-Hypertension Group

Based on the results of the research data, it was shown that there was an effect after progressive muscle relaxation therapy was carried out and there was a decrease in stress levels and a decrease in blood pressure in the intervention group who experienced pre-hypertension in the Sarijadi Health Center Working Area, Bandung City. Before being given progressive muscle relaxation therapy, it was shown that the results of respondents' stress levels in the control and intervention groups were in the moderate stress category of 25 respondents and severe stress levels of

15 respondents. After being given progressive muscle relaxation therapy interventions, it was found that the stress level in the control group did not change significantly, namely the moderate category of 13 respondents (65.0%) and the level of stress in the severe category as many as 7 respondents. (35,0%). However, in the intervention group, there was a decrease in the stress level of respondents, namely the level of stress with the light category as many as 12 respondents (60.0%) and the level of stress in the moderate category as many as 8 respondents (40.0%).

Based on the results of the study data, it was shown that there was a decrease in blood pressure in the intervention group given progressive muscle relaxation therapy compared to the control group. Before being given the intervention, progressive muscle relaxation therapy showed that the blood pressure results of the respondents in the control group were at an average systole blood pressure of 130.50 mmHg and an average diastole blood pressure of

85.80. Meanwhile, in the intervention group, the results were obtained with an average systolic blood pressure of 130.80 and an average diastole blood pressure of 85.15. After being given a progressive muscle relaxation therapy intervention, it was found that blood pressure in the control group did not experience significant changes, namely systole blood pressure of 131.40 mmHg and diastole blood pressure of 85.65 mmHg. In contrast to the results in the intervention group that had been given progressive muscle relaxation therapy with the results after progressive muscle relaxation therapy was carried out, namely systolic blood pressure with an average of 117.20 mmHg and diastole blood pressure with an average of 76.15 mmHg.

The results of the analysis obtained a p-value of 0.000 ($p<0.05$) on blood pressure in the intervention group so that there was an effect of progressive muscle relaxation therapy on stress and blood pressure in the pre-hypertension group in the working area of the sarijadi health center, the intervention was carried out in the form of progressive muscle relaxation therapy for 20 minutes 1x a day for 2 consecutive weeks with 4 meetings.

The results of the study conducted by (Aulia Putri et al., 2021) the one entitled "The Effect of Progressive Muscle Relaxation on Stress Levels and Blood Pressure in Hypertensive Patients in Lumajang Regency" found the effect of progressive muscle relaxation on stress levels and blood pressure in hypertensive patients. The results of the analysis obtained a significance value of 0.000 ($P<0.05$). Progressive muscle relaxation emphasizes a relaxed state and reduces muscle tension so that it can lower blood pressure and stress. Progressive muscle relaxation interventions are one of the effective nonpharmacological therapies to lower blood pressure and stress and are suitable for application in the community. Changes in blood pressure are affected by several things such as stress. Stress or depression can increase blood pressure at any time. The hormone adrenaline will increase when we are stressed so that the heart pumps blood faster which results in an increase in blood pressure (Oliveros et al., 2020). Stress can be a direct cause in the production or exacerbation of diseases that increase the risk of hypertensive diseases (Chaudhuri, 2019). Stressful conditions are produced by psychophysiologically triggered threats to homeostasis leading to an increase in blood pressure and the risk of developing hypertension (Chamik et al., 2018). Stress is associated with autonomic hyperactivity, dysregulation of the pituitary adrenal axis, and maladaptive lifestyle factors such as smoking, alcohol consumption, obesity, and lack of activities such as exercise (Conversano et al., 2021). This proves that progressive muscle relaxation is a good exercise to reduce stress so that blood pressure can be controlled.

The results of this study are also in line with the previous study conducted by (Irawan et al., 2018) the one entitled "The Effect of Progressive Muscle Relaxation on Stress and Blood Pressure in Hypertensive Clients", where the results of this study show a p value $=0.000 >0.05$, so it can be concluded that there is an effect of progressive muscle relaxation on stress and blood pressure of hypertension clients in Langsa City. Thus, the results of this study can prove that there is an effect of progressive muscle relaxation therapy on stress and blood pressure in the pre- hypertension group.

Conclusion

Progressive muscle relaxation emphasizes a relaxed state and reduces muscle tension so that it can lower blood pressure and stress. Progressive muscle relaxation interventions are one of the effective nonpharmacological therapies to lower blood pressure and stress and are suitable for application in the community.

The results of this study on the stress level in the pre-test and post-test intervention groups, showed a change in the stress level of the respondents. By looking at the Paired Sample T-test which showed a significant number between the pre-test and post-test values with a significance value of p=0.000 <0.05 which means that there is an effect of progressive muscle relaxation therapy on stress levels in the pre-hypertension intervention group

The results of this study showed blood pressure in the pre-test and post- test intervention groups on cystic blood pressure, By looking at the Paired Sample T-test which showed a significant number between the pre-test and post- test values with significance values showed changes in systolic blood pressure as evidenced by the value of p=0.000 < 0.05 and in diastole blood pressure with a value of p=0.000 <0.05 which means that there is an effect of progressive muscle relaxation therapy on blood pressure in the pre-hypertension group.

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