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THE ANALYSIS OF THE FACTORS ASSOCIATED WITH PROGRESSIVE MUSCLE RELAXATION EXERCISES

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Abstract

The purpose of this study is to determine the factors associated with progressive muscle relaxation exercises in elderly people with hypertension at Tresna Werdha Nursing Home, East Jakarta. The method used in this research is the One Group Pretest-Posttest Design approach. A total of 30 elderly with hypertension were involved in this study. The respondents were trained in Progressive Muscle Relaxation. Bivariate data using Pearson's correlation and Kendall's tau were used to test the relationship between respondents' data on systolic and diastolic blood pressure after the intervention of progressive muscle relaxation exercise. The results showed that there was a relationship between pulse and systolic blood pressure before and after the intervention of progressive muscle relaxation with a p-value of 0.000 (< 0.05). There was a relationship between pulse and diastolic blood pressure before and after the intervention of progressive muscle relaxation with a P-Value of 0.003 (< 0.05). There was a significant relationship between the history of comorbidities and the systolic blood pressure before and after the intervention of progressive muscle relaxation with a P-Value = 0.013 (< 0.05). There was a significant relationship between the history of comorbidities and the diastolic blood pressure before and after the intervention of progressive muscle relaxation with a P-Value = 0.002 (< 0.05). The factors associated with progressive muscle relaxation exercises in the elderly with hypertension are pulse rate and history of comorbidities. Progressive muscle relaxation exercises can be used as a daily routine activity for the elderly with hypertension to maintain optimal blood pressure.

Keywords: Elderly, Hypertension Progressive Muscle Relaxation.

1. INTRODUCTION

"Elderly" (senior) refers to individuals who are 60 years of age and older, as defined by the Law of the Republic of Indonesia Number 13 of 1998 concerning the welfare of the elderly. Globally, the elderly population is predicted to continue increasing. In Indonesia, the elderly population is projected to increase at a higher rate than the global elderly population after 2100(1).

As individuals age, their physiological functions naturally decline, making them more susceptible to non-communicable diseases. Additionally, degenerative issues can weaken the body's immune system, making elderly individuals more prone to infectious diseases. According to the results of Riskesdas(2), the most common non-communicable diseases among the elderly in Indonesia are hypertension, arthritis, stroke, chronic obstructive pulmonary disease (COPD), and diabetes mellitus (DM)(1).

Data from the World Health Organization (WHO) in 2015 revealed that approximately 1.13 billion people worldwide have hypertension, indicating that one in three individuals worldwide is diagnosed with hypertension. The number of people affected by hypertension continues to rise each year. It is estimated that by 2025, there will be 1.5 billion individuals affected by hypertension, and it is projected that 9.4 million people die from hypertension and its complications every year. Based on Riskesdas(3), the prevalence of hypertension among the 18-year-old population is 34.1%, with the highest rate observed in South Kalimantan (44.1%), and the lowest rate in Papua (22.2%). Hypertension occurs most commonly in the age groups of 31-44 years (31.6%), 45-54 years (45.3%), and 55-64 years (55.2%)(3).

Efforts to prevent hypertension and reduce its incidence include providing advice to individuals and families with a history of hypertension regarding lifestyle changes. These changes may include reducing obesity, salt intake (total <5 g/day), saturated fat and alcohol intake (men <21 units and women <14 units per week), consuming plenty of fruits and vegetables (at least 7 servings/day), not smoking, and engaging in regular exercise. These measures have been proven to lower blood pressure and reduce the need for medication. Additionally, non-pharmacological therapies, such as progressive muscle relaxation exercises, can be implemented as a preventive measure(4).

A study conducted by Rahmawati, Musviro, and Deviantony in 2018 examined the effectiveness of Progressive Muscle Relaxation (PMR) therapy in reducing blood pressure in patients with hypertension using a one-group pretest and posttest research design. The study found significant differences in systolic and diastolic blood pressure before and after administering Progressive Muscle Relaxation (PMR) therapy to the respondents(5). Progressive muscle relaxation therapy induces relaxation by decreasing sympathetic nerve activity and increasing parasympathetic nerve activity, leading to vasodilation of arteriolar diameter. The parasympathetic nerve releases acetylcholine to inhibit sympathetic nerve activity by reducing cardiac muscle contractility and causing vasodilation of arterioles and veins(6). Progressive muscle relaxation acts as a vasodilator, widening blood vessels and directly lowering blood pressure. This relaxation technique is an affordable, side-effect-free method that is easy to perform and promotes a sense of calm and relaxation in both the body and mind(7).

Progressive Muscle Relaxation (PMR) is a widely recognized technique that involves systematically tensing and relaxing muscle groups to alleviate stress and anxiety. The effectiveness of PMR in various populations has been extensively documented, highlighting its multifaceted benefits, particularly in reducing anxiety, improving sleep quality, and enhancing overall well-being.

Research indicates that PMR can significantly reduce anxiety levels across different demographics, including elderly individuals, cancer patients, and those with chronic conditions. For instance, a systematic review found that PMR interventions effectively improved psychological outcomes such as anxiety and depression in cancer patients, thereby enhancing their quality of life(8). Similarly, studies have shown that PMR can alleviate anxiety in patients with schizophrenia, demonstrating its versatility as a therapeutic tool(9,10). In a clinical trial involving colorectal cancer patients, PMR training was associated with reduced anxiety and improved coping abilities, further supporting its role in symptom management(11).

Moreover, PMR has been shown to positively impact sleep quality. A study focusing on menopausal women revealed that regular PMR practice led to significant improvements in sleep quality, with participants reporting lower scores on sleep disturbance scales post-intervention(12). This aligns with findings from other studies that suggest PMR can effectively address insomnia symptoms, particularly in populations experiencing high levels of stress or anxiety(13,14). The physiological mechanisms underlying these benefits include reductions in cortisol levels, which are often elevated in stressed individuals. PMR has been linked to decreased cortisol production, thereby promoting a state of relaxation conducive to better sleep and overall health(15,16).

In addition to its psychological benefits, PMR is recognized for its physiological effects, such as lowering blood pressure and heart rate. Non-pharmacological interventions like PMR are recommended for managing hypertension, as they can induce a relaxation response that mitigates stress-related physiological changes(17). The combination of PMR with other therapeutic modalities, such as music therapy, has been shown to enhance its effectiveness in reducing physiological markers of stress(17).

Furthermore, the application of PMR in clinical settings, such as among healthcare professionals experiencing work-related stress, has demonstrated significant reductions in anxiety and muscle tension, underscoring its utility in occupational health(18). The structured approach of PMR, which involves focusing on different muscle groups sequentially, not only aids in muscle relaxation but also fosters mindfulness, allowing individuals to redirect their focus away from stressors(19).

The purpose of this study is to determine the factors associated with progressive muscle relaxation in elderly people with hypertension at Tresna Werdha Nursing Home in East Jakarta.

2. RESEARCH METHODS

2.1 Progressive Muscle Relaxation

The stages of the research method on the first day at the nursing home, before the intervention, the respondents were assessed on their data (sex, BMI, history of smoking, consuming medicines, history of comorbidities) and measured systolic and diastolic blood pressure, pulse rate, respiratory rate, and temperature as pre-intervention data. Then, the respondents were trained in Progressive Muscle Relaxation Exercises. After the intervention, the researchers measured systolic and diastolic blood pressure, pulse rate, respiratory rate, temperature, and documented them directly on the observation sheet. The respondents were trained in progressive muscle relaxation exercises for two weeks. After two weeks, at the last meeting, the researchers visited the respondents to collect post-test data for systolic and diastolic blood pressure, pulse rate, respiratory rate, and temperature.

2.2 Subjects

On the first day at the nursing home, before the intervention, the stages of the research method involved assessing the respondents for their data (sex, BMI, history of smoking, consumption of medicines, history of comorbidities). Additionally, their systolic and diastolic blood pressure, pulse rate, respiratory rate, and temperature were measured as pre-intervention data. The respondents were then trained in Progressive Muscle Relaxation Exercises. After the intervention, the researchers directly measured the systolic and diastolic blood pressure, pulse rate, respiratory rate, and temperature, documenting them on the observation sheet. The respondents underwent two weeks of training in progressive muscle relaxation exercises. At the last meeting, after two weeks, the researchers visited the respondents to collect post-test data for systolic and diastolic blood pressure, pulse rate, respiratory rate, and temperature.

2.3 Experimental design

This study uses a pre-experimental method with a one-group pretest-posttest design approach. The inclusion criteria of this study were elderly respondents with blood pressure above normal (120/80 mmHg) who were willing to do progressive muscle relaxation exercises for 12 days. The exclusion criteria were respondents who were on total bed rest, not living in a nursing home, and had no other comorbidities.

The variables in this study were age, sex, BMI, smoking, consuming medicines, history of additional diseases, pulse rate, and respiratory rate. The independent variable was progressive muscle relaxation exercise. The dependent variables were systolic and diastolic blood pressure.

The analyzed data included univariate and bivariate analysis. Univariate analysis was used to describe the characteristics of the respondents: age, sex, BMI, systolic and diastolic blood pressure before and after intervention, pulse rate, respiratory rate, and temperature before and after intervention, smoking, consuming medicines, history of medicines, history of major diseases, and history of additional diseases. Bivariate data using the Wilcoxon test was used to test the differences between systolic and diastolic blood pressure before and after the intervention. Pearson's correlation test was used to examine the relationship between age, pulse rate, and respiratory rate with systolic and diastolic blood pressure after the intervention of progressive muscle relaxation exercise. Kendall's test was used to examine the relationship between age, sex, respiratory rate, and pulse with systolic and diastolic blood pressure after the intervention of progressive muscle relaxation exercise.

3. RESULTS

Data show the characteristics of age, BMI, systolic and diastolic blood pressure before and after intervention (Table 1).

Table 1: Characteristics of respondents

Characteristics	Mean	Median	Minimum	Maximum
Age	80.63	80	67	96
BMI	22.80	22.50	21	28
Systolic blood pressure before intervention	119.67	120	80	150
Diastolic blood pressure before intervention	70.33	70	60	80
Systolic blood pressure after intervention	111.00	110	100	120
Diastolic blood pressure after intervention	71.07	70	60	80

From the table above, it was found that the average value (mean) of the age category was 80.63. The median was 80, and the minimum age of the respondent was 67 years, while the maximum age was 96 years.

The average value (mean) of the BMI category was 22.80 Kg/m2. The median was 22.50 Kg/m2, and the minimum BMI was 21 Kg/m2, while the maximum BMI was 28 Kg/m2.

For the systolic blood pressure category before intervention, the mean was 119.67 mmHg. The median was 120 mmHg, and the minimum value was 80 mmHg, while the maximum value was 150 mmHg.

For the diastolic blood pressure category before intervention, the mean was 70.33 mmHg. The median was 70 mmHg, and the minimum value was 60 mmHg, while the maximum value was 80 mmHg.

For the systolic blood pressure category after intervention, the mean was 111.00 mmHg. The median was 110 mmHg, and the minimum value was 100 mmHg, while the maximum value was 120 mmHg.

For the diastolic blood pressure category after intervention, the mean was 71.07 mmHg. The median was 70 mmHg, and the minimum value was 60 mmHg, while the maximum value was 80 mmHg.

The data shows the characteristics of pulse and respiratory frequency before and after intervention, smoking, consuming medicines, history of medicines, history of major disease, and history of additional disease (Table 2).

Table 2: Frequency and Percentage Data Table

Characteristics	Indicator	Frequency	%
Pulse Before intervention	Bradycardia (<60 x/min)	1	3.3
	Normal (60-100x/min)	29	96.7
Pulse After intervention	Normal (60-100x/min)	30	100
Respiratory Frequency Before intervention	Normal (12-20x/min)	18	60
	Tachypnea (>20x/min)	12	40
Respiratory Frequency After intervention	Normal (12-20x/min)	24	80
Smoking	Yes	7	23
	No	23	76
Consuming medicines	Yes	27	90
	No	3	10
History of Major Disease	Hypertension	30	100
History of Additional Disease	Diabetes Mellitus	9	30
	Osteoarthritis	10	33
	Coronary Heart Disease	4	13
	Stroke	5	17
	Others (hearing loss)	9	30

Before the intervention, the majority of the pulse rate was normal, with as many as 29 respondents (96.7%). After the intervention, the majority of the pulse rate was still normal, with as many as 30 respondents (100%). Before the intervention, there were 5 elderly respondents who had a pulse below 70x/minute, and after the intervention, there were only 2 elderly respondents who had a pulse below 70x/minute.

The writer concluded that there was a difference in pulse rate before and after the intervention of progressive muscle relaxation training. Progressive muscle training can dilate the blood vessels, leading to a decrease in blood pressure and a return to a normal pulse rate.

Before the intervention, it was found that the majority of normal respiratory frequencies were 18 respondents (60%). After the intervention, the majority of the respiratory frequency was found in 24 respondents (80%). Before the intervention, there were 3 elderly respondents who had tachypnea respiratory frequency (RR=22x/minute), and there was no respondent who had tachypnea after the intervention of progressive muscle relaxation exercise.

The writer concluded that there was a difference in the frequency of breathing before and after the intervention of progressive muscle relaxation training. Progressive muscle relaxation exercises can strengthen lung expansion, allowing for increased oxygen intake and reduced tightness.

From the table above, it was found that there were 7 elderly respondents who smoke (23%) and 23 elderly respondents who do not smoke (76%). There were 27 elderly respondents who consumed medicines (90%) and 3 elderly respondents who did not consume medicines (10%). There were 30 elderly respondents who have a history of hypertension (100%), 9 elderly respondents who suffered from diabetes mellitus (30%), 10 elderly respondents who suffered from osteoarthritis (33%), 4 elderly respondents who suffered from coronary heart disease (13%), 5 elderly respondents who suffered from stroke (17%), and 9 elderly respondents who suffered from other diseases, one of which was hearing loss (30%).

Table 3: Relationship of Sex to Systolic and Diastolic Blood Pressure

Variable	P Value
Sex and Systolic Blood Pressure	0.530
Sex and Diastolic Blood Pressure	0.175

Based on Table 3 above, it is known that there was no relationship between sex and systolic blood pressure with a p-value of 0.530, and diastolic blood pressure with a p-value of 0.175 (p-value < 0.05).

Table 4: Relationship of BMI to systolic and diastolic blood pressure

Variable	P-Value
BMI and Systolic Blood Pressure	0.888
BMI and Diastolic Blood Pressure	0.542

Based on Table 4 above, it is known that there was no relationship between BMI and systolic blood pressure, with a P-value of 0.888, and diastolic blood pressure, with a P-value of 0.542 (P-value <0.05).

Table 5: Relationship of pulse to systolic and diastolic blood pressure

Variable	P-Value
Pulse and Systolic Blood Pressure	0.000
Pulse and Diastolic Blood Pressure	0.030

Based on Table 5 above, it is known that there was a significant relationship between pulse rate and systolic blood pressure with a p-value of 0.000, and diastolic blood pressure with a p-value of 0.000 (p < 0.05). There was a significant difference in pulse frequency for the control group before and after the intervention (p = 0.002), with a difference in mean pulse of 2.919. Meanwhile, in the intervention group, there was no significant difference in pulse frequency (p = 0.709).

Table 6: Relationship of respiratory frequency to systolic and diastolic blood pressure

Variable	P-Value
Respiratory frequency and systolic blood pressure	0.596
Respiratory frequency and diastolic blood pressure	0.951

Based on Table 6 above, it is known that there was no relationship between respiratory frequency and systolic blood pressure, with a P-value of 0.596, and diastolic blood pressure, with a P-value of 0.951 (P-value < 0.05).

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Table 7: The relationship of the history of smoking to systolic and diastolic blood pressure

Variable	P-Value
History of Smoking and Systolic Blood Pressure	0.175
History of Smoking and Diastolic Blood Pressure	0.975

Based on table 7 above, it is known that there is no relationship between the history of smoking and systolic blood pressure with a p-value of 0.175, and diastolic blood pressure with a p-value of 0.975 (p-value < 0.05).

Table 8: Relationship of consuming medicines to systolic and diastolic blood pressure

Number	Variable	P-Value
1	Consuming Medicines and Systolic Blood Pressure	0.470
2	Consuming Medicines and Diastolic Blood Pressure	0.617

Based on Table 8 above, it is known that there is no relationship between consuming medicine and systolic blood pressure with a P-value of 0.470, and diastolic blood pressure with a P-value of 0.617 (P-value < 0.05).

Table 9: Relationship of the history of comorbidities to systolic and diastolic blood pressure

Number	Variable	P-Value
1	History of Comorbidities and Systolic Blood Pressure	0.013
2	History of Comorbidities and Diastolic Blood Pressure	0.002

Based on table 9 above, it was known that there was a significant relationship between the history of comorbidities to systolic blood pressure with P-Value = 0.013 and diastolic blood pressure with P-Value = 0.002 (P-value <0.05).

The results of this study indicate that age is not related to blood pressure. According to researchers, the results of this study occurred because of the homogeneity of the respondents, elderly(20,21). In the elderly, the systolic blood pressure increases due to decreased elasticity of blood vessels. The results of this study contradict the theory of Anne and Bernard, which states that old age can lead to hypertension due to stiffness in arteries, resulting in increased blood pressure(22).

According to researchers, the older a person is, the higher their blood pressure is. This is related to changes in anatomical and physiological structures, especially those of the cardiovascular system. Due to the aging process, the ability of the heart and blood vessels to pump blood becomes less efficient. The heart valves become thicker and stiffer, and the elasticity of the blood vessels decreases. Fat and calcium deposits increase, making it easier for hypertension to occur. This opinion is reinforced by the results of research conducted by researchers, where most (70%) of the respondents were between 75-90 years old. This is supported by a study conducted by Sigarlaki in 2006, which reported that 80.5% of hypertension occurred between the ages of 41-77 years(23–25). Based on sex, the data also showed that there was no relationship between sex and blood pressure. According to researchers, the results of this study occurred because the homogeneity of respondents was mostly women. The results of this study differ from the theory of Mario et al. In 2017, which states that sex is a risk factor for hypertension, especially in men who have a higher incidence rate than women in the occurrence of hypertension(23–25).

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Another study that is in line with the results of this study was conducted by Peckermen et al. in 2001 on the effects of age and sex on the sensitivity of the baroreceptor reflex of clients with hypertension. The results showed that age did not significantly affect the sensitivity of the baroreceptor reflex, but if there is an interaction between age and sex in clients with hypertension, it will affect blood pressure reflex, where the decrease in arterial baroreceptor reflex sensitivity may be more specific in males with hypertension than females(26).In this study, it was also found that the BMI factor did not have a significant relationship after progressive muscle relaxation exercise. Most of the elderly are within normal BMI limits. This is supported by research conducted by Rohkuswara and Syarif in 2017, which shows that obesity has a significant relationship with the incidence of stage 1 hypertension in Posbindu PTM KKP Bandung in 2016. The results of bivariate analysis show that respondents who were obese have a 2.008 times higher risk (95% CI: 1,261-3,198) of suffering from stage 1 hypertension than respondents who were not obese. After multivariate analysis, three covariate variables were identified as confounding: age, family history of hypertension, and physical activity.

Therefore, the relationship between obesity and stage 1 hypertension is 1.681 times (95% CI: 1,049-2,696), meaning that obese respondents have a 1.681 times risk of suffering from stage 1 hypertension compared to those who are not obese after controlling for age variables, family history of hypertension, and physical activity(27). This study also shows that there is a significant relationship between pulse before and after progressive muscle relaxation exercise. Pulse is also associated with changes in blood pressure after progressive muscle relaxation. This happens because relaxation exercise can reduce pulse rate and metabolic rate by decreasing blood pressure in patients with hypertension14.

The difference in pulse frequency can occur because hypertension patients do stretching and relaxing, so that the oxygen supply throughout the body is fulfilled and blood flow back to the heart is smooth. This is also in accordance with the theory expressed by(28) that, "During relaxation, the secretion of CRH (corticotropin-releasing hormone) and ACTH (adrenocorticotropin-releasing hormone) in the hypothalamus also decreases." The decrease in these two hormone secretions causes the activity of the sympathetic nerves to decrease, so that adrenaline and noradrenaline expenditure decreases. As a result, there is a decrease in heart rate, dilated blood vessels, reduced blood vessel resistance, and decreased heart pump, so that the arterial blood pressure of the heart decreases(28).

this study, it was found that the respiratory rate factor had no significant relationship after progressive muscle relaxation exercise. Researchers argue that the results of this study indicate that the respiratory frequency of the elderly is still within normal limits. This result is supported by research conducted by Ekarini, Heryati, and Maryam in 2019, showing that deep breath relaxation consists of breathing exercises and practices that are designed and executed to achieve more controlled and efficient ventilation to reduce breathing work16. Breathing exercises can increase lung development, so that alveoli ventilation increases(29).Respondents who did not have a history of smoking accounted for 77%.

This may be due to the fact that most of the respondents were female, as in Indonesia, women tend to not smoke. Smoking is not associated with the development of hypertension, but nicotine can increase the pulse rate and produce peripheral vasoconstriction, leading to a short-term increase in blood pressure after smoking. Additionally, nicotine can decrease the effectiveness of certain antihypertensive medications. Cigarettes contain CO and nicotine, which can damage endothelial cells, reduce oxygen content in red blood cells, and cause ischemia and spasms. Another consequence of smoking is an increase in fibrinogen, platelet aggregation, and lipid levels. Nicotine can also elevate norepinephrine and catecholamines, leading to an increased heart rate and high blood pressure.

In this study, 90% of respondents used antihypertensive medications. According to LeMone & Burke, for category I hypertension (systolic blood pressure between 140-159 mmHg or diastolic blood pressure between 90-99 mmHg), the most commonly used medicine is from the thiazide group. On the other hand, for category II hypertension (systolic blood pressure between 160-179 mmHg or diastolic blood pressure between 100-109 mmHg), a combination of antihypertensive medications is commonly prescribed(30).The aim of antihypertensive therapy is to prevent morbidity and mortality related to the disease. Approximately 20 randomized studies have consistently shown that medication therapy in patients with category II and III hypertension can reduce the incidence of stroke by 30-50%, congestive heart failure by 40-50%, and the progression to accelerated hypertension syndrome(31). The antihypertensive medications given to the respondents in this study were ACE inhibitors (captopril), diuretics (hydrochlorothiazide), and calcium channel blockers (nifedipine), with captopril being the most widely used.

The results revealed that 33% of the respondents had a history of comorbid osteoarthritis, while 30% had a history of diabetes mellitus. This is consistent with the research conducted by Tjekyan, which identified gender, age, BMI, and comorbidities as the most influential risk factors for hypertension(32). Among the 32 people in this study who had hypertension and comorbidities, the most prevalent condition was diabetes mellitus. This finding aligns with the existing literature, which states that common comorbidities associated with hypertension include diabetes mellitus, hyperthyroidism, rheumatism, gout, and hyperlipidemia.

4. CONCLUSION

Progressive muscle relaxation therapy is effective in reducing blood pressure in the elderly with hypertension at Tresna Werdha Nursing Home in East Jakarta. Based on the results of this study, the factors that affect blood pressure in elderly people with hypertension are pulse and history of comorbidities. Routine therapy is expected to maintain optimal blood pressure in the elderly and to reduce the risk of further complications. Education and training for progressive muscle relaxation in the elderly with hypertension is one way that nurses can provide nursing care to elderly individuals suffering from hypertension.

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There is no conflict of interest to disclose

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