The Effect of Laughter Therapy, A Low-Salt Diet, Exercise, and Physical Activity on Reducing Blood Pressure in Elderly Patients at The Sei Kepayang Timur Community Health Center, Asahan Regency

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Abstract.

Hypertension is a common health problem among the elderly and carries a risk of increasing cardiovascular complications. Non-pharmacological efforts such as laughter therapy, a low-salt diet, exercise, and physical activity are important strategies in controlling blood pressure. This study aims to analyze the effectiveness of laughter therapy, a low-salt diet, exercise, and physical activity on reducing blood pressure in elderly patients at the Sei Kepayang Timur Community Health Center in Asahan Regency. The study used a quasi-experimental design with a pre-test and post-test control group approach. The number of respondents was 60 elderly people who were divided equally into an intervention group of 30 people and a control group of 30 people. Data were analyzed using comparative statistical tests (paired t-test and chi-square test) with a significance level of $p < 0.05$. The results showed that in the intervention group, there was a decrease in mean systolic blood pressure from 150.2 mmHg to 135.4 mmHg, with a difference of 14.8 mmHg ($p = 0.000$), and a decrease in diastolic blood pressure from 93.2 mmHg to 84.4 mmHg, with a difference of 8.8 mmHg ($p= 0.000$). Other interventions, including a low-fat diet, exercise, and physical activity, were also shown to be effective in reducing both systolic and diastolic blood pressure. In conclusion, laughter therapy, a low-salt diet, exercise, and physical activity are effective in reducing blood pressure in the elderly. Based on these study results, the elderly are advised to regularly engage in laughter therapy, maintain a low-salt diet, and increase physical activity and exercise. Health institutions need to integrate this non-pharmacological intervention program into promotive and preventive services. Future research is expected to examine long-term effectiveness and expand the sample size.

Keywords: *Laughter Therapy; Low-Salt Diet; Exercise; Physical Activity; Blood Pressure and Elderly.*

I. INTRODUCTION

Blood pressure tends to rise with aging due to physiological changes and diminished vascular flexibility. The body's capacity to adapt to environmental stress decreases with age, which is better described as an advanced stage of life than a sickness [1]. The aging process, with its diminished physical endurance and increased susceptibility to disease, persists into old age. High blood pressure, commonly known as hypertension, is a common condition in the elderly. The risk of high blood pressure increases with age. This phenomenon occurs due to physiological changes in the circulatory system, especially in the blood vessels [2]. High blood pressure is a condition characterized by persistent increases in blood pressure. With each heartbeat, the heart pumps blood into the blood vessels, which then transport it throughout the body. In adults, normal blood pressure is 120 mmHg systolic and 80 mmHg diastolic. Therefore, a person is considered to have high blood pressure if their systolic blood pressure is above 140 mmHg, and their diastolic blood pressure is above 90 mmHg [3].The number of elderly people worldwide in 2020 accounted for 1.4 billion of the total population and is estimated to double to 2.1 billion by 2050. Meanwhile, in Southeast Asia, the number of elderly people is 142 million and is expected to triple by 2050. The Central Statistics Agency reported in 2023 that the percentage of elderly people in Indonesia was 11.75% in 2022, a 1.27% increase from 10.48% the previous year [4]. According to World Health Organization data, the global prevalence of hypertension is 22% of the world's population.

Africa has the highest prevalence at 27%, followed by the Eastern Mediterranean at 26% and Southeast Asia at 25% [5].National data shows that the prevalence of hypertension in the population is 34.11% [6]. The highest prevalence of non-communicable diseases in the elderly is hypertension at 32.5%. Basic Health Research data 2023 shows a significant increase in the prevalence of hypertension in the 18-24

age group by 13.2%, 25-34 years by 20.1%, 35-44 years by 31.6%, 45-54 years by 45.3%, 55-64 years by 55.2%, 65-74 years by 63.2%, and 75 years by 69.5%. From these data, it can be concluded that the highest prevalence of hypertension is in those aged 75 years and above [7].High blood pressure can lead to various health problems, including heart disease, congestive heart failure, stroke, visual impairment, kidney failure, heart failure, and even complications. Appropriate management is essential to prevent complications [8]. There are both drug and non-drug ways to treat high blood pressure. Pharmacological management can utilize various antihypertensive medications [2]. Pharmacological management includes various types of antihypertensive medications, including diuretics, adrenergic blockers (β-blockers), vasodilators, angiotensin-converting enzyme inhibitors (ACE inhibitors), and calcium channel blockers. Non-pharmacological methods are currently being developed for relaxation, such as yoga, meditation, humor therapy, and laughter therapy, which have recently been featured in the media and are routinely practiced by seniors and can help lower blood pressure [9].

Laughter therapy is a non-pharmacological treatment for hypertension [10]. Laughter therapy physiologically reduces stress hormone levels (cortisol and adrenaline), which increase heart rate [11]. Laughter can prevent high blood pressure because it helps control blood pressure by reducing the release of stress-related hormones and promoting relaxation [12]. Laughter therapy involves laughter that begins gradually, so the effects felt by those who laugh are truly beneficial. Laughter therapy for stress reduction has been widely practiced. Laughter for 5-10 minutes can stimulate the release of endorphins and serotonin, a type of natural morphine in the body, as well as melatonin. Laughter can also help control blood pressure by reducing the release of stress-related hormones and promoting relaxation. Experiments have shown a 10-20 mm drop in blood pressure after a patient participates in a 10-minute laughter session [13].Laughter therapy is a non-pharmacological alternative treatment that has a positive effect on physiological well-being [14]. Physiologically, laughter therapy reduces stress hormone levels (cortisol and adrenaline), which increase heart rate [15]. Laughter therapy can help people feel less tense, anxious, angry, and hateful [14]. A smile or laughter produced through the mouth creates a feeling of lightness and joy, which helps widen blood vessels, increase blood vessel flexibility, and improve blood flow [16]. Laughter therapy can help control blood pressure by maintaining endocrine stress and promoting a relaxed state to cope with stress [13].Laughter is known as a simple activity that can have positive effects on the body, such as relaxing muscles, increasing oxygen flow, and improving mood.

Several studies have indicated that laughter can help lower blood pressure through its relaxing effects and the reduction of stress hormones in the body. Seeing this potential, researchers feel it is important to further explore the benefits of laughter therapy, particularly in elderly patients. In addition to laughter therapy, several other factors can influence blood pressure reduction in the elderly, such as a low-salt diet, exercise, and physical activity.A low-salt diet is a non-pharmacological management method for hypertension, aimed at stabilizing blood pressure. One factor contributing to the high incidence of hypertension is excessive salt consumption. Nationally, the average salt consumption in Indonesia is 6.3 grams per day. According to the 2013 Basic Health Research, 26.2% of Indonesians consume excessive salt. Consuming foods high in salt tends to lead to overeating. According to the Total Diet Survey, the average salt consumption for Indonesians aged 18 and over is 6.8 grams, and sodium consumption is 2,700 mg. This amount falls short of the World Health Organization recommendation of limiting sodium intake to 2,400 mg, or approximately 1 teaspoon of salt per day [17].In addition to diet, exercise is also an important factor in lowering blood pressure in the elderly. Regular exercise can stimulate the release of growth hormones, anti-stress hormones, and endorphins, which function to prevent the decline in body function and aging that occurs in the elderly. Exercise with specific movements that involve the body's muscles can maintain muscle strength, joint function, and blood vessel elasticity and openness, thus improving blood flow to various parts of the body and helping to train lung development.

Exercise should be regular and aerobic, as these two properties can lower blood pressure. Aerobic exercise refers to exercise performed continuously that meets the body's oxygen needs, for example, jogging, swimming, gymnastics, and cycling. Physical activity should be done for at least 30 minutes per day and done properly and correctly. One of the benefits of physical activity is maintaining stable blood pressure

within normal limits [18]. Furthermore, daily physical activity also plays a significant role in supporting blood pressure reduction. Physical activity is body movement that requires energy to meet daily needs. By engaging in regular physical activity, seniors can maintain physical and mental health, as well as maintain a healthy and fit quality of life. Systematic physical exercise planning will help seniors stay active, improve physical fitness, and support stable blood pressure. Therefore, seniors' involvement in sports and simple daily physical activities is a crucial step in maintaining health and controlling hypertension. Based on the above background, it appears that laughter therapy, a low-salt diet, exercise, and physical activity play a significant role in maintaining stable blood pressure in the elderly. Therefore, researchers felt the need to conduct further research through a study entitled "The Effect of Laughter Therapy, a Low-Salt Diet, Exercise, and Physical Activity on Blood Pressure Reduction in Elderly Patients at the Sei Kepayang Timur Community Health Center, Asahan Regency."

II. METHODS

This research is a quantitative study using a quasi-experimental design with a one-group pre-test and post-test design. Quantitative methods rely on numerical data to understand social phenomena [19]. The research design used was a quasi-experimental design with a pre-test and post-test approach and a control group (pretest–posttest control group design). In this design, the researchers compared changes in blood pressure between the group given laughter therapy intervention and the control group that did not receive the treatment. The population in this study was elderly patients at the Sei Kepayang Timur Community Health Center in Asahan Regency who experienced high blood pressure. The sample size was obtained based on calculations using the Lwanga & Lemeshow case-control formula, resulting in a sample of 60 individuals. This study included two types of variables: independent variables and dependent variables [20].

The independent variables in this study were laughter therapy (X1), a low-salt diet (X2), exercise (X3), and physical activity (X4). The dependent variable in this study was blood pressure reduction in elderly patients (Y). Data Analysis: Univariate analysis was used to describe the frequency and percentage distribution of respondent characteristics and blood pressure values of elderly patients, namely (a) Respondent Characteristics (this data can include age, gender, and duration of blood pressure), and (b) Blood Pressure Before and After Laughter Therapy, including average blood pressure before therapy, average blood pressure after therapy, and a decrease in average blood pressure after laughter therapy intervention. Bivariate analysis was conducted to determine the difference in blood pressure before and after laughter therapy. The statistical tests used were the paired t-test, the Wilcoxon (alternative) test, and the Chi-Square Test.

III. RESULT AND DISCUSSION

Result

Based on Table 1, the number of respondents in this study was 60 people, divided equally into 30 in the intervention group and 30 in the control group. Respondents aged 55–65 years (66.7%) dominated the intervention group, while the largest age group in the control group was 66–75 years (60%). The gender distribution was similar in both groups, with 50% male and 50% female, respectively. This indicates a good gender balance between the two groups. Regarding the duration of hypertension, the intervention group had an even distribution across all categories, with 33.3% of respondents, while the control group had the highest proportion in the 5–10 years category (46.7%).

Analysis of the distribution of these characteristics indicates that the main differences between the intervention and control groups lie in age range and duration of hypertension. The intervention group tended to consist of younger respondents, while the control group was predominantly older, who are physiologically more likely to have higher blood pressure. Differences in the duration of hypertension between the two groups may also influence response to treatment and blood pressure levels at the time of measurement. Thus, the basic characteristics of respondents can be a factor that needs to be considered in interpreting the effectiveness of laughter therapy interventions on changes in blood pressure in the elderly.

Table 1. The Characteristics Respondents

Characteristics	Category	Intervetion (n=30)	Control (n=30)
Age	55-65 Years	20 (66,7%)	6 (20%)
	55-65 Years	4 (13,3%)	18 (60%)
	>75 Years	6 (20%)	6 (60%)
Gender	Male	15 (50%)	15 (50%)
	Female	15 (50%)	15 (50%)
Long history of high blood pressure	< 5 Years	10 (33,3%)	9 (30%)
	5-10 Years	10 (33,3%)	14 (46,7%)
	>10 Years	10 (33,3%)	7 (23,3%)

Based on the results of the Kolmogorov–Smirnov normality test in the table 2, the number of data (N) is 60, with an Asymp. Sig. (2-tailed) value of 0.291. This significance value is greater than the α limit of 0.05, indicating that the residual distribution does not differ significantly from a normal distribution [21]. Therefore, it can be concluded that the residual data follows a normal distribution. Furthermore, the residual mean value of 0.000 and the standard deviation of 0.453 indicate that the residual data are well standardized. These results indicate that the assumption of normality is met, allowing parametric statistical analysis to be used in the next testing stage. The Most Extreme Differences value, consisting of an Absolute value of 0.355, a Positive value of 0.260, and a Negative value of –0.355, is still within acceptable limits for normally distributed data. Overall, the results of the Kolmogorov–Smirnov test confirm that the analysis model used does not violate the basic assumption of normality, so that the results of the subsequent inferential tests can be considered valid.

Table 2. Normality Test Results

One Sample Kolmogorov-Smirnov		
		Unstandardized Residual
N		60
Normal Parameters	Mean	,00000000
	Std.Deviation	,45306921
Most Extreme Differences	Absolute	,355
	Postive	,260
Test Statistic	Negative	-,355
Asymp. Sig. (2-tailed)	Mean	,355
	Std.Deviation	,291

Table 3 presents data on the average blood pressure of elderly patients receiving laughter therapy, comparing the results of measurements before (pre-test) and after (post-test) the intervention. The data show a consistent and significant decrease in both blood pressure levels. Systolic blood pressure decreased from an average of 150.2 mmHg to 135.4 mmHg, resulting in a mean difference of 14.8 mmHg. Meanwhile, diastolic blood pressure also decreased significantly from 93.2 mmHg to 84.4 mmHg, with a mean difference of 8.8 mmHg. The statistical results show a P value of 0.000 for both systolic and diastolic blood pressure, indicating that this decrease is highly statistically significant and indicates that laughter therapy has a strong effect on lowering blood pressure in the elderly.

Table 3. Average Blood Pressure of Elderly Patients Given Laughter Therapy

Types of Blood Pressure	Treatment	Mean	Difference	SD	P-Value
Systolic	Pre-test	150,2	14,8	12,92	0,000
	Post-test	135,4		11,93	
Diastolic	Pre-test	93,2	8,8	7,58	0,000
	Post-test	84,4		5,56	

The P value of 0.000, which is well below the significance threshold (0.05), definitively proves the effectiveness of laughter therapy as a non-pharmacological intervention. These findings align with research published in the journal, which states that laughter therapy involves the release of endorphins that can trigger vasodilation (widening of blood vessels), thereby contributing to lowering blood pressure. Laughter therapy can lower blood pressure through a non-pharmacological mechanism that is thought to occur due to increased levels of endorphins and catecholamines that trigger relaxation of blood vessel smooth muscle [10], [11], [13]. This mechanism of 14.8 mmHg systolic and 8.8 mmHg diastolic reduction is very promising, indicating that this simple and enjoyable intervention can be integrated as part of hypertension

management in the elderly.Table 4, highlights the impacts of adherence to a low-salt diet on blood pressure in the elderly, differentiating between compliant and non-compliant subjects. Significant findings include P-values of 0.007 and 0.000 for intervention and control groups, respectively, indicating a robust relationship between dietary adherence and improved blood pressure status. In the intervention group, 63.6% of compliant subjects attained normal blood pressure, whereas 87.5% of non-compliant subjects persisted at hypertension stage 1. Conversely, in the control group, only 6.3% were normal, with a notable 100% of non-adherent subjects at Stage 2 Hypertension. This underscores the necessity of dietary adherence and additional interventions for hypertension management. Overall, adherence to a low-salt diet emerges as essential for blood pressure control in older adults, reinforcing the need for supportive health programs that promote dietary education and adherence.

Table 4. Effect of Low-Salt Diet on Lowering Blood Pressure in the Elderly

Low-Salt Diet		**Blood Pressure**								Sig
Group	Compliance	Normal		Prehypertension		Stage1 Hypertension		Stage2 Hypertension		
		n	%	n	%	n	%	n	%	
Intervention	Compliant	14	63,6	2	9,1	6	27,3	0	0	P = 0,007
	Non-Compliant	0	0	1	12,5	7	87,5	0	0	
Control	Compliant	1	6,3	8	50	7	43,8	0	0	P = 0,000
	Non-Compliant	0	0	0	0	0	0	14	46,7	

Table 5 highlights the significant impact of exercise quality on blood pressure in the elderly by comparing the Intervention and control groups. Both groups exhibited a statistically significant P value of 0.000, indicating that the quality of exercise critically influences blood pressure management. In the intervention group, 77.8% of those exercising well achieved normal blood pressure, while none of those exercising poorly did. The control group also showed that good exercise quality led to better outcomes, with 7.7% achieving normal blood pressure, compared to 82.4% in Stage 2 Hypertension among poorly performing control subjects. This points out the importance of quality in exercise programs for hypertension management, supported by literature linking regular, high-quality exercise to improved cardiovascular health and reduced peripheral vascular resistance. The findings stress that health initiatives for the elderly should prioritize both the quality and consistency of exercise to effectively lower blood pressure.

Table 5. Effect of Exercise on Lowering Blood Pressure in the Elderly

Exercise		**Blood Pressure**								Sig
Group	Compliance	Normal		Prehypertension		Stage1 Hypertension		Stage2 Hypertension		
		n	%	n	%	n	%	n	%	
Intervention	Good	14	77,8	2	11,1	2	11,1	0	0	P = 0,000
	Not Good	0	0	1	8,3	1	91,7	0	0	
Control	Good	1	7,7	1	53,8	5	38,5	0	0	P = 0,000
	Not Good	0	0	1	5,9	2	11,8	14	82,4	

Table 6 underscores the significant impact of physical activity on blood pressure among the elderly. Statistical analysis reveals P values of 0.015 for the intervention group and 0.001 for the control group, indicating a strong correlation between physical activity levels and blood pressure status. In the intervention group, 60% of highly active individuals had normal blood pressure, while only 20% of those with low activity did. The control group exhibited a stark contrast, with only 6.7% of high-activity subjects normalized and none of the low-activity subjects achieving normal or prehypertensive status. This suggests that physical activity is essential for blood pressure management in older adults, with regular exercise enhancing nitric oxide release, promoting vasodilation, and significantly reducing hypertension risk. Thus, increasing physical activity among this demographic is crucial for hypertension treatment.

Table 6. Effect of Physical Activity on Lowering Blood Pressure in the Elderly

Physical Activity		**Blood Pressure**								Sig
Group	Compliance	Normal		Prehypertension		Stage1 Hypertension		Stage2 Hypertension		
		n	%	n	%	n	%	n	%	
Intervention	High	12	60	3	15	5	25	0	0	P = 0,015
	Low	2	20	0	0	8	80	0	0	
Control	High	1	6,7	8	53,3	4	26,7	2	13,3	P = 0,001
	Low	0	0	0	0	3	20	1	80	

Discussion

Differences in Blood Pressure Before and After Laughter Therapy in Elderly Patients

The study results indicate that laughter therapy significantly lowers blood pressure in elderly patients. Specifically, systolic blood pressure decreased from an average of 150.2 mmHg (stage 1 hypertension) to 135.4 mmHg (pre-hypertension), a reduction of 14.8 mmHg with high clinical significance ($p = 0.000$). Diastolic blood pressure also saw a reduction from 93.2 mmHg to 84.4 mmHg, a difference of 8.8 mmHg ($p = 0.000$). Laughter therapy, recognized as a simple, cost-effective, and non-pharmacological treatment, operates by enhancing parasympathetic nervous system activity, thereby lowering stress hormone levels, increasing oxygen supply, stretching muscles, and releasing endorphins.

This relaxation aids in reducing vascular tension and blood pressure. Furthermore, this study aligns with previous research by Fitrina (2022), affirming laughter therapy's efficacy in managing hypertension in elderly patients, particularly in lowering systolic blood pressure post-therapy [13]. Laughter therapy also yields psychological benefits by improving mood and reducing stress, both of which can exacerbate hypertension. Practically, laughter therapy emerges as an alternative hypertension management method suitable for the elderly, requiring no side effects and allowing implementation in either home or healthcare settings. The findings strongly advocate for laughter therapy's integration into community health initiatives as a preventive and supportive measure for hypertension management among older adults.

The Effect of Low-Salt Diet on Lowering Blood Pressure in Elderly Patients

The study demonstrates that adherence to a low-salt diet has a significant positive effect on blood pressure among elderly patients. In the intervention group, a substantial 63.6% maintained normal blood pressure, whereas only 12.5% with adherence faced pre-hypertension or stage 1 hypertension, and no respondents experienced stage 2 hypertension. In stark contrast, those who did not follow the low-salt diet had a high prevalence of stage 1 hypertension at 87.5%, with no normal blood pressure cases observed. The statistical analysis, indicated by a p-value of 0.007, confirms a significant correlation between low-salt diet adherence and improved blood pressure outcomes in this demographic.

Excessive salt intake leads to increased blood pressure due to sodium and water retention, resulting in higher plasma volume and increased cardiovascular strain, particularly dangerous for the elderly due to their reduced blood vessel elasticity. A low-salt diet is shown to be effective in maintaining stable blood pressure, reducing the risk of hypertension-related complications like heart disease and stroke. Seniors committed to reducing salt intake show a higher likelihood of sustaining normal blood pressure levels. Conversely, failure to adhere to a low-salt diet exacerbates hypertension and hampers blood pressure management. Consequently, adherence to a low-salt diet is critical in regulating blood pressure in elderly patients, underscoring the necessity for educational initiatives and support from healthcare professionals to promote understanding and consistent implementation of low-salt dietary practices among seniors and their families.

The Effect of Exercise on Lowering Blood Pressure in Elderly Patients

The study highlights a significant association between exercise habits and blood pressure status in elderly patients. In the intervention group, a remarkable 77.8% of respondents with good exercise habits fell into the normal blood pressure category, while those with poor exercise habits showed no individuals with normal blood pressure; instead, 91.7% were classified as stage 1 hypertension. The results were statistically significant, with a p-value of 0.000, underscoring the impact of exercise on blood pressure reduction. Regular exercise enhances cardiovascular function by improving blood vessel elasticity, strengthening the heart, and balancing the autonomic nervous system, which effectively lowers blood pressure. Furthermore, physical activity aids in weight management, cholesterol control, and improved insulin sensitivity, reducing hypertension risk factors. Beyond physical health, active seniors experience improved quality of life due to increased endorphin levels that enhance mood and reduce stress, key triggers for hypertension. The findings imply that regular exercise is crucial in maintaining normal blood pressure among seniors, necessitating community health workers to encourage at least 30 minutes of light to moderate exercise daily, aiming to prevent hypertension and enhance overall well-being.

The Effect of Physical Activity on Lowering Blood Pressure in Elderly Patients

The study found a significant impact of physical activity on blood pressure in elderly patients, with 60% of highly active respondents maintaining normal blood pressure, compared to only 20% among those with low activity levels. The intervention group showed no cases of stage 2 hypertension, while 80% of low activity respondents were in stage 1 hypertension. A statistical analysis yielded a p-value of 0.015, confirming the positive relationship between physical activity and blood pressure status. Physiological benefits of regular physical activity include improved cardiac function, enhanced blood vessel elasticity, reduced peripheral resistance, and lower levels of stress hormones, all contributing to lower blood pressure. Regular moderate to vigorous activities like walking or gardening can stabilize blood pressure and reduce hypertension-related complications. Consequently, the study underscores the need for community health workers to motivate and educate seniors to engage in at least 30 minutes of physical activity daily to mitigate hypertension prevalence and enhance life quality.

IV. CONCLUSION

This study aimed to identify and analyze the effectiveness of various non-pharmacological interventions (a low-salt diet, laughter therapy, and physical activity) in lowering and controlling blood pressure in an elderly population. Statistical analysis consistently demonstrated that all tested interventions had a highly significant effect on reducing systolic and diastolic blood pressure (with P values mostly less than 0.007). Key findings confirmed that there were drastic differences in blood pressure status between subjects who adhered to/underwent high-quality interventions compared to subjects who did not adhere to/underwent low-quality interventions. Specifically, adherence to a low-salt diet and high-quality exercise significantly increased the proportion of elderly people achieving normal blood pressure status. The effectiveness of these interventions depends not only on the intervention itself, but also on the quality and adherence of the elderly in implementing them. The data showed that elderly people who adhered to a low-salt diet and performed "good" quality exercise had the highest proportion of those achieving normal blood pressure (up to 77.8% for exercise and 63.6% for diet). Conversely, non-adherence or poor implementation (including low levels of physical activity) is strongly correlated with more severe hypertension, including Stage 1 and 2 hypertensions.

This is supported by proven physiological mechanisms, where physical activity and laughter therapy induce vasodilation, while sodium restriction prevents fluid retention.Clinically, these findings provide a strong empirical basis for integrating lifestyle interventions as first-line treatment for hypertension in older adults. Laughter therapy data showed a mean reduction in systolic blood pressure of 14.8 mmHg and diastolic blood pressure of 8.8 mmHg, highlighting the potential of emotion-based interventions as effective and enjoyable stress and blood pressure management tools. Furthermore, these findings highlight the need for assessments that focus not only on intervention delivery but also on factors supporting adherence, such as knowledge, self-efficacy, and family support, particularly in control groups that exhibit poor blood pressure outcomes when non-adherent.Based on these findings, it is recommended that public health and clinical programs for older adults with hypertension focus on strengthening lifestyle adherence. Structured educational programs are needed that not only provide information on diet and exercise but also involve mentoring or self-monitoring to ensure quality and consistency of implementation. Further research could explore combined interventions (e.g., a low-salt diet and laughter therapy) simultaneously to assess their synergistic effects and identify specific barriers that hinder adherence to physical activity and diet among older adults.

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