



Aerobic Low Impact Gymnastic to Lower Blood Pressure and Cholesterol for the Elderly

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Abstract. In old age, individuals encounter a range of physical challenges, including diminished physical abilities, reduced strength, decreased activity levels, and health issues that can dampen their enthusiasm and independence. This research aimed to investigate the impact of Low Impact Aerobic exercise on blood pressure and cholesterol levels among the elderly. The study employed a quasi-experimental method with a one-group pre-test-posttest design, where the group undergoes a pre-test (O), treatment (X), and post-test. The research participants comprise 60 elderly women aged 60-78 from the Larasati elderly school (SALSA) in Bantul Regency, selected based on their physical and mental well-being, willingness to participate, and ability to undergo the exercise regimen. The Low Impact Aerobic Exercise program was conducted twice a week on Tuesdays and Saturdays, totaling 16 sessions. The findings and subsequent discussion indicate a significant positive impact of Low Impact Aerobic exercise on the health of the elderly, particularly in reducing systolic blood pressure and cholesterol levels. This is supported by the results of the Paired Sample T-test using the SPSS software, revealing a p-value of <0.05 for systolic blood pressure and cholesterol variables. Consequently, it can be inferred that there exists a noteworthy disparity in average systolic blood pressure and cholesterol levels before and after the exercise intervention among the participants from the Salamah Elderly School (SALSA) Larasati in Bantul Regency, Yogyakarta.

Keywords: Blood Pressure, Cholesterol, Elderly

1 Introduction

Physical activity encompasses body movements generated by skeletal muscles that necessitate energy expenditure in daily tasks. It plays a crucial role in human survival by mitigating the risk of degenerative diseases and obesity. According to [6], physical activity involves energy-demanding body movements throughout daily routines, spanning from waking up to winding down, contingent upon the intensity and nature of muscle

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engagement. [7] Highlights the link between low physical activity levels and an elevated risk of chronic conditions. Numerous studies support the notion that maintaining moderate physical activity and fitness levels correlates with decreased morbidity and mortality rates. [10] Elaborates on the benefits of regular physical activity, such as weight reduction, blood pressure regulation, and improvements in lipid profiles, including elevated HDL and decreased triglyceride levels. As individuals age, they undergo diverse physical, psychological, and social transformations. These changes encompass alterations in stamina and appearance, potentially leading to feelings of depression in individuals reliant on physical vigor they no longer possess.

In old age, individuals commonly encounter a range of issues, including diminished physical abilities and strength, reduced activity levels, and frequently, health challenges that diminish their enthusiasm and independence. The Coordinating Ministry for PKM reported on July 24, 2021, that the elderly population constitutes 9.9% of Indonesia's total populace, totaling 26.8 million individuals. Elderly individuals often grapple with health concerns due to the natural aging process, rendering them particularly susceptible to health issues and infections like Covid-19. Ade Rustama of the Coordinating Ministry for Human Development and Culture emphasized the significance of safeguarding the health of the elderly. The government has taken steps to ensure the well-being of the elderly, enabling them to age healthily by supporting their daily activities and preserving their physical and mental capacities.

Research conducted by Bernard et al. (2018) in Makassar involved 100 elderly participants and revealed that 70% of them were inactive in community engagements. The diminished involvement of the elderly in social events stems from the limited social opportunities available in their residing areas. The findings indicate that elderly individuals who engage in social activities tend to perceive a higher quality of life.

The Ministry of Health (2016) defines an elderly individual as someone over 60 years old. The global elderly population in 2019 neared 1 billion, with projections indicating a continual increase to 1.4 billion by 2030 and beyond. [20] highlights that aging brings about physiological transformations encompassing alterations in body composition, muscular structure, bone density, joint functionality, cardiovascular performance, respiratory capacity, and cognitive faculties, which progressively decline. Data from [21] reveals a notable surge in degenerative ailments like cardiovascular issues, with a 25.8% to 34.1% escalation in heart and vascular conditions like hypertension in 2018. The rise in cholesterol levels disproportionately affected women (39.6%) compared to men (30.0%), particularly in urban regions over rural areas. Insufficient physical activity can induce hypertension, subsequently elevating blood cholesterol levels, thereby heightening the risk of cardiovascular diseases. [14] advocates for safe physical activities, particularly regular exercises, among the elderly to uphold physical well-being, as they play a pivotal role in reducing blood pressure and cholesterol levels.

The [21] revealed that non-communicable diseases, commonly known as degenerative diseases, prevalent among the elderly in Indonesia include hypertension, diabetes mellitus, high cholesterol, gout, joint ailments, heart conditions, strokes, and obesity. The aging process stands as a primary catalyst for degenerative diseases, as organ functions decline with age. According to Alexis [3] maintaining an ideal body weight is crucial for the elderly due to various health risks associated with being either overweight or underweight. Excessive weight or obesity in the elderly can detrimentally impact health by elevating the likelihood of severe conditions like dyslipidemia (high cholesterol levels), diabetes mellitus, hypertension, and heart diseases. Furthermore, obesity can strain joints, limiting mobility, and potentially leading to respiratory issues. Moreover, individuals with a high body mass index (BMI) face an increased cancer risk.

The primary focus of this research, as indicated by the background, centers on assessing the Impact of Low Impact Aerobic Exercise on Reducing Blood Pressure and Cholesterol Levels among participants of the Larasati Salamah Elderly School (SALSA) in Bantul Regency, Yogyakarta. Elderly individuals encounter various health issues, primarily stemming from the natural decline in bodily functions. As the body's capabilities diminish over time, engaging in regular activities can aid in enhancing adaptability. Degenerative diseases denote health conditions that lead to the gradual deterioration of tissues or organs. These conditions, which encompass a range of ailments, either develop with age or exacerbate during the aging process due to genetic predispositions and lifestyle choices.

2 Method

The research methodology employed in this study is quasi-experimental, which involves a systematic approach aimed at determining the impact of one variable on another by administering specific treatments and controls within defined parameters. The research design adopted was a one-group pre-test-posttest pre-experiment design. This design comprises a single group undergoing a pre-test (O), receiving treatment (X), and undergoing a post-test, with treatment efficacy assessed by comparing pre-test and post-test results. Data collected from the study are subjected to statistical analysis, with pre-test and post-test scores compared for insights. The comparison of these scores seeks to ascertain differences between pre-test and post-test outcomes. Evaluation of these differences focuses solely on the mean of the two values, utilizing a statistical technique known as the t-test. The research involved 30 participants from the Salamah Elderly School (SALSA) Larasati in Bantul Regency, Yogyakarta. Further details on the research subjects, including age demographics, are outlined below:

Table 1. Resaerch Subjects

Ages	Number	Percentage
60 - 65 years old	13	43,3 %
66 - 70 years old	15	50,0 %
More than years old	2	6,7 %
Total	30	100,0 %

From Table 8, it is evident that the predominant age group among the participants from the Salamah Elderly School (SALSA) Larasati in Bantul Regency, Yogyakarta, who were included in the study, falls within the range of 66 to 70 years, comprising 15 individuals, accounting for 50.0% of the total.

3 Result and Discussion

3.1 Pretest and Posttest Measurement Results

The research data, collected pretest and posttest before and after Low Impact Aerobic exercise, were analyzed univariately by examining the mean, minimum, and maximum values. In essence, the univariate analysis results of the research data, encompassing blood pressure and cholesterol, are presented in the subsequent table.

Table 2. Pretest and Posttest Measurement Results

Research		Pretest			Posttest		
		Mean	Min	Maks.	Mean	Min.	Maks
Blood Pressure	Systole	137,7	100	190	125	90	160
	Diastole	77,3	60	100	75	60	90
Cholesterol		220	160	284	202	150	250

Based on Table 2, the systolic blood pressure measurements during the pretest indicated an average (mean) of 137.7 mmHg, with the lowest value (min.) recorded at 100 mmHg and the highest value (max) at 190 mmHg. Conversely, the systolic blood pressure measurements during the posttest displayed an average (mean) of 125 mmHg, with the lowest value (min) at 90 mmHg and the highest value (max) at 160 mmHg. These average values suggest that, overall, the blood pressure of participants from the Salamah (SALSA) Larasati Elderly School in Bantul Regency, Yogyakarta, was high (>130 mmHg) during the pretest, but normalized (<130 mmHg) during the posttest.

The diastolic blood pressure measurements during the pretest revealed an average (mean) of 77.3 mmHg, with the lowest value (min) recorded at 60 mmHg and the highest value (max) at 100 mmHg. In contrast, the diastolic blood pressure measurements during the posttest displayed an average (mean) of 75 mmHg, with the lowest value (min) at 60 mmHg and the highest value (max) at 90 mmHg. These average values indicate that, generally, the diastolic blood pressure of participants from the Salamah

(SALSA) Larasati Elderly School in Bantul Regency, Yogyakarta, was within normal range (<100 mmHg) both during the pretest and posttest.

The cholesterol measurements during the pretest reflected an average (mean) of 220 mg/dL, with the lowest value (min.) recorded at 160 mg/dL and the highest value (max) at 284 mg/dL. On the other hand, the cholesterol measurements during the posttest indicated an average (mean) of 202 mg/dL, with the lowest value (min) at 150 mg/dL and the highest value (max) at 250 mg/dL. These average values suggest that, generally, the cholesterol levels of participants from the Salamah (SALSA) Larasati Elderly School in Bantul Regency, Yogyakarta, were high (>200 mg/dL) both during the pretest and posttest.

3.2 Data Analysis Results

Only two levels of headings should be numbered. Lowerlevel headings remain un-numbered; they are formatted as run-in headings. In line with the research objective of assessing the impact of low-impact aerobic exercise on the health of elderly individuals at the Salamah Elderly School (SALSA) Larasati in Bantul Regency, Yogyakarta, a bivariate data analysis was conducted following a normality test using the Kolmogorov-Smirnov Z test. Data is considered normal if the resulting p-value is greater than 0.05. If the normality test indicates a normal distribution, a paired sample t-test is employed for bivariate analysis. Conversely, if the data is not normally distributed, univariate analysis is conducted using the non-parametric Wilcoxon Signed Rank Test. The results of the Paired Sample T-test conducted through the SPSS software yielded the following outcomes.

Table 3. Paired Sample T-test Results

Resaerch data		Pretest		Posttest	
		Kolmogrov-Smirnov Z	p-value	Kolmogrov-Smirnov Z	p-value
Blood Pres- sure	Sys- tole	1,214	0,105	0,848	0.468
	Diastole	1,192	0,117	1,412	0.073
	Cholesterol	0.386	0,998	0,608	0,853

Based on the results of the Kolmogorov-Smirnov Z test conducted with the SPSS program, a statistical value of $p > 0.05$ was obtained, indicating that the data was deemed to be normally distributed. Consequently, bivariate analysis to assess the impact of Low Impact Aerobic exercise on the health of the elderly was performed using a paired sample t-test. The results of the data normality test conducted through the SPSS program yielded the following outcomes.

Table 4. Paired Sample T-test Results

Research Variables		Average Numbers			t-count	p Value
		Pretest	Posttest	diviation		
Blood	Systole	137,7	125,0	-12,7	4,535	0,00
Pressure	Diastole	77,3	75,3	-2,0	1,063	0,30
	Cholesterol	220,1	201,7	-18,4	5,465	0,00

The results of the Paired Sample T-test conducted using the SPSS program revealed a p-value < 0.05 for the variables systolic blood pressure and cholesterol. These findings indicate a significant difference in the average systolic blood pressure and cholesterol levels before and after engaging in Low Impact Aerobic exercise by members of the Salamah Elderly School (SALSA) Larasati in Bantul Regency, Yogyakarta. However, the diastolic blood pressure variable demonstrated a p-value > 0.05, suggesting no significant difference in average diastolic blood pressure before and after the Low Impact Aerobic exercise among the school members.

In summary, the results suggest that Low Impact Aerobic exercise has a notable impact on the health of the elderly, particularly in reducing systolic blood pressure and blood cholesterol levels. This is evidenced by the decrease in average systolic blood pressure from 137.7 mmHg to 125.0 mmHg, and a reduction in blood cholesterol levels from 220.1 mg/dL to 201.7 mg/dL.

As individuals age, there is a noticeable decline in various bodily functions, including a reduction in the functionality of blood vessels [23]. Common ailments observed in the elderly often stem from this decline, with hypertension or high blood pressure being a prevalent condition among them. High blood pressure stands out as a disease associated with significant morbidity and mortality rates. According to [16], high blood pressure is a condition characterized by elevated systemic arterial blood pressure, encompassing both systolic and diastolic pressures.

The data on hypertension-related deaths in Indonesia indicates a significant toll of 427,218 fatalities attributed to this condition. The distribution of hypertension across age groups reveals a prevalence of 31.6% in the 31-44 age bracket, 45.3% in the 45-54 age range, and 55.2% in the 55-64 age category. Among individuals diagnosed with hypertension, 8.8% were aware of their condition, 13.3% were diagnosed but did not receive medication, and 32.3% did not adhere to their prescribed medication regimen. This highlights a concerning trend where a majority of hypertensive individuals remain unaware of their condition, leading to untreated cases [21].

According to [8], the prevalence of heart disease in Indonesia, diagnosed by physicians, peaks among individuals over 75 years of age, standing at 4.7%. Aging often coincides with a decline in physical activity levels, impacting the regulation of cholesterol levels. It is essential for individuals to burn around 1500-1700 calories of fat to maintain normal cholesterol levels, while men may require 2000 to 2500 calories to effectively burn fat. Reduced physical activity in the elderly can impede the metabolism and combustion

of cholesterol, resulting in its accumulation in blood vessels. Elderly individuals are particularly vulnerable to cholesterol build-up due to decreased mobility, leading to an increased presence of cholesterol in the liver.

Engaging in gymnastics as a physical activity involves a coordinated blend of movements that engage various motor skills such as strength, speed, balance, flexibility, agility, and accuracy across different parts of the body [1]. When considering the elderly population, low-impact aerobic exercises, particularly beneficial for individuals with hypertension, prove to be an effective form of aerobic activity. Tailored for seniors, these exercises feature gentle movements, moderate intensity, simplicity in execution, and exclude high-impact actions like jumps, hence termed as low-impact exercises.

The data analysis from this study highlights the substantial impact of Low Impact Aerobic exercise on enhancing the health of elderly individuals by notably reducing systolic blood pressure and blood cholesterol levels. The findings from the Paired Sample T-test conducted using the SPSS software reveal a p-value of <0.05 for systolic blood pressure and cholesterol variables. These results signify a significant disparity in the average systolic blood pressure and cholesterol levels before and after the implementation of Low Impact Aerobic exercises among participants from the Salamah (Salsa) Larasati elderly school in Bantul Regency, Yogyakarta. The evidence is reinforced by the decline in average systolic blood pressure from 137.7 mmHg to 125.0 mmHg and a reduction in blood cholesterol levels from 220.1 mg/dL to 201.7 mg/dL.

The concept aligns with Triyanto's (2014) view that low-impact aerobics entails gentle movements like marching in place, arm bending, and body stretching accompanied by motivating yet not overly loud music. The primary objective of low-impact aerobic exercise is to enhance physical fitness and optimize aerobic capacity, particularly beneficial for older individuals. This perspective is further reinforced by Harber (2009), emphasizing that low-impact aerobic exercise is geared towards enhancing and preserving cardiovascular health, lung function, blood circulation, muscle strength, and joint flexibility. Engaging in physical activity can yield positive effects on various bodily systems, notably the cardiovascular system. Harber's (2009) assertion underscores that low-impact aerobic exercise serves as a valuable aerobic workout for bolstering and sustaining heart health, lung function, blood flow, muscle tone, and joint flexibility. Training through physical activities can positively impact multiple bodily systems, with a notable focus on the cardiovascular system.

The discovery aligns with Raharjo's (2016) study, which involved conducting Low Impact Aerobic exercise sessions 2 to 3 times a week. Raharjo's data analysis revealed notable differences pre and post the Low Impact Aerobic exercise regimen for the elderly, showcasing an effective approach to maintaining and enhancing fitness levels among older individuals. In comparison to standard elderly workouts, the frequency of exercise in Low Impact Aerobics adheres to recommendations from McAddle (2011), advocating for 2 to 3 weekly sessions. Training intensity is determined by the training load level, a pivotal aspect of this program. For novices, it is advisable to maintain

intensity within 60 to 80 percent of the maximum heart rate (MHR), with MHR calculated using the formula 220 minus the individual's age. Moreover, the duration of practice is crucial; achieving optimal cardiovascular and pulmonary benefits entails engaging in a 30-minute continuous exercise within the training zone, preceded by a 10-minute warm-up session.

The health status of the elderly does not only remain unchanged before and after engaging in Low Impact Aerobic exercise due to their advanced age; there is also a decrease in muscle mass and strength, a reduction in maximum heart rate, and an increase in body fat content. Aging often leads to alterations in sensory functions, organ performance disruptions, psychological shifts, and the onset of various illnesses. Given the multitude of changes that accompany aging, seniors frequently encounter numerous health issues. Therefore, preserving their well-being necessitates diverse strategies such as medical attention, medication, adopting a healthy lifestyle, and incorporating Low Impact Aerobic exercise into their routine. Low Impact Aerobic Exercise for the elderly plays a pivotal role in enhancing organ function and boosting the immune system post regular workouts, as elucidated by Drajat (2009). Beyond enhancing physical fitness, Low Impact Aerobic exercise for seniors also significantly impacts mental health. This association stems from the human body's hormone system, which functions akin to natural morphine through endogenous opioids.

4 Conclusion

After analyzing the research findings and discussions, it is evident that Low Impact Aerobic exercise significantly benefits the health of the elderly, particularly in reducing systolic blood pressure and blood cholesterol levels. This is supported by the Paired Sample T-test results using the SPSS program, indicating a p-value of <0.05 for systolic blood pressure and cholesterol variables. The data suggests a substantial variance in average systolic blood pressure and cholesterol levels pre and post Low Impact Aerobic exercise among members of the Salamah Elderly School (SALSA) Larasati in Bantul Regency, Yogyakarta. Notably, there was a decline in average systolic blood pressure from 137.7 mmHg to 125.0 mmHg and a decrease in blood cholesterol from 220.1 mg/dL to 201.7 mg/dL. Engaging in regular Low Impact Aerobic exercise is a key approach to enhancing elderly fitness. Future research should encompass other factors influencing elderly health, such as daily activities, medication, stress, diet, and sleep patterns. Additionally, researchers are advised to incorporate a control group in future studies for comprehensive analysis.

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References

1. Adethia Siti Nurafifah (2021) Senam Aerobik Low Impact dapat Menurunkan Tekanan Darah pada Lansia dengan Hipertensi. Vol. 1 No. 01 (2021): Indonesian Scholar Journal of Nursing and Midwifery Science Vol. 01 No. 01, August 2021
2. Aditya Cahyad (2021) Menjaga Kesehatan Fisik Dan Mental Lanjut Usia Melalui Program Posyandu Lansia. Jurnal Pengabdian Masyarakat Darul Ulum. Vol. 1 No 1 2021.
3. Alexis M. McKee, MD and John E. Morley, MB, BCh. (2021) Obesity in the Elderly. National Library of Medicine. <http://creativecommons.org/licenses/by-nc-nd/2.0/> Bookshelf ID: NBK532533 PMID: 30379513
4. Amelia Ramadhani, et al (2016) Pengaruh Senam Lansia Terhadap Kadar Gula darah Pada Lansia di BPLU Senja Cerah Manado. Jurnal e-Biomedik (eBm), Volume 4, Nomor 1, Januari-Juni 2016
5. Desi Ayu Praastiwi et al (2021) Gambaran Kadar Kolesterol Total Pada Lansia Di Puskesmas I Denpasar Selatan. Meditory: Vol 9, No 2.
6. Ellis Makawekes, Levi Suling, Vandri Kallo (2020) Pengaruh Aktifitas Fisik Terhadap Tekanan Darah Pada Usia Lanjut 60-70 Tahun. Jurnal Keperawatan. Volume 8 Nomor 1 [Februari 2020], 83-90 ISSN 2302-1152
7. Elizabeth Anderson (2019) Physical activity, exercise, and chronic diseases: A brief review. Sport Medecine and Health Science. Volume 1, Issue 1, December 2019, Pages 3-10. <https://doi.org/10.1016/j.smhs.2019.08.006>
8. Helvi darsi (2018) Pengaruh Senam Aerobik Low Impact Terhadap Peningkatan V02MAX. Gelanggang Olahraga: Jurnal Pendidikan Jasmani dan Olahraga Volume 1, Nomor 2 Januari-Juni 2018 DOI : <https://doi.org/10.31539/jpjo.v1i2.134>
9. I.A. Pascha Paramurthi, Made Dhita Prianthara, dan Kadek Liza Widya Astari (2021) Hubungan Indeks Massa Tubuh Terhadap Kualitas Tidur Pada Lanjut Usia Di Desa Penatih. PREPOTIF Jurnal Kesehatan Masyarakat Volume 5, Nomor 1, April 2021
10. Jonathan Myers (2019) Physical Activity, Cardiorespiratory Fitness, and the Metabolic Syndrome. (). . , (), -. doi:10.3390/nul11071652
11. Lilazi (2021) Pengaruh Aktivitas Fisik Terhadap Kadar Kolesterol Total Pada Ibu Ibu PKK Desa Cinta Kasih Kecamatan Belimbing Tahun 2021. Palembang:
12. Lin, Yi-Tien; Chen, Mingchih; Ho, Chien-Chang; Lee, Tian-Shyug (2020). Relationships among Leisure Physical Activity, Sedentary Lifestyle, Physical Fitness, and Happiness in Adults 65 Years or Older in Taiwan. International Journal of Environmental Research and Public Health, 17(14), 5235-. doi:10.3390/ijerph17145235
13. Murilo Rezende Oliveira et al m(2022) Covid-19 and the impact on the physical activity level of elderly people: A systematic review. Experimental Gerontology. (M.R. Oliveira). Contents lists available at ScienceDirect Experimental Gerontology journal homepage: www.elsevier.com/locate/expgero <https://doi.org/10.1016/j.exger.2021.111675>
14. M. Silva, Fernanda; Petrica, João; Serrano, João; Paulo, Rui; Ramalho, André; Lucas, Dineia; Ferreira, José Pedro; Duarte-Mendes, Pedro (2019). The Sedentary Time and Physical Activity Levels on Physical Fitness in the Elderly: A Comparative Cross Sectional Study. International Journal of Environmental Research and Public Health, 16(19), 3697-. doi:10.3390/ijerph16193697
15. Nilawati. Sri (2008) Care yourself kolesterol. Jakarta: Penebar Plus.
16. Nyahmini Ambar Sari dan Siti Sarifah (2016) Senam Aerobik Low Impact Intensitas Sedang Terhadap Perubahan Tekanan Darah Pada Lansia. PROFESI, Volume 13, Nomor 2, Maret 2016

17. Popi Elivano Avanda (2023) Peningkatan Kondisi Fisik Melalui Vareasi Senam Aerobik. NEM, 2023
18. Romero-Corral, A., Caples, S.M., LopezJimenez, F. and Somers, V.K., 2010. Interactions between obesity and obstructive sleep apnea: implications for treatment. *Chest*, 137(3), pp.711-719.
19. Ribeiro, S. M. L., Luz, S. dos S., & Aquino, R. de C. (2015). The Role of Nutrition and Physical Activity in Cholesterol and Aging. *Clinics in Geriatric Medicine*, 31(3), 401–416. doi:10.1016/j.cger.2015.04.010
20. Risnawati, Erni Eka Sari (2022) Pengaruh Senam Lansia Terhadap Penurunan Tekanan Darah dan Kadar Kolesterol Darah Pada Lansia. *Surya Medika Jurnal Ilmiah Ilmu Keperawatan Dan Ilmu Kesehatan Masyarakat Volume 17 No. 02 Juli 2022*, Hal 52-58
21. Riskesdas (2018) Hasil Utama Riskesdas 2018. Tersedia pada: https://kesmas.kemkes.go.id/asset_s/upload/dir_519d41d8cd98f00/file_s/Hasil-riskesdas-2018_1274.pdf.
22. Rivian Virlando Suryadinata, Bambang Wirjatmadi, Merryana Adriani and Amelia Lorensia (2020) Effect of Age and Weight on Physical Activity. *Journal of Public Health Research Volume 9, Issue 2*.
23. Sasono Mardiyono (2023) Pengaruh Senam Bugar Lansia Terhadap Perubahan Tekanan Darah Pada Lansia Hipertensi Tahun 2023. *Madani: Jurnal Ilmiah Multidisiplin Volume 1, Nomor 6, Juli 2023, Halaman 316-326 E-ISSN: 2986-6340 DOI: <https://doi.org/10.5281/zenodo.8123915>*
24. Syahnur Rahman (2016) Faktor Faktor Yang Mendasari Stres Pada Lansia. *JPP: Vol 16, No 1*.
25. Sudargo, T., Freitag, H., Kusmayanti, N. A., & Rosiyani, F. (2018). Pola makan dan obesitas. Yogyakarta: UGM press.
- Yuniartika, W. & Muhammad, F. (2019). Family Support on the Activities of Elderly Hypertension Patients in Elderly Gymnastics Activities. *Jurnal Ners*,14(3si),354-357.[doi:http://dx.doi.org/10.20473/jn.v14i3\(si\).17213](http://dx.doi.org/10.20473/jn.v14i3(si).17213)

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