

The relationship between sedentary lifestyle, neck disability, and high blood pressure among bankers



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ABSTRACT

Background: A sedentary lifestyle greatly affects a person's life. Inactive lifestyle changes can result in increased neck disability. Sedentary behavior can also affect vascular, metabolic, and autonomic systems. This study aimed to determine the relationship between a sedentary lifestyle, neck disability, and high blood pressure in bank employees.

Methods: The research method used is an observational analytical study with a cross-sectional approach and a sampling technique, namely purposive sampling. The number of samples obtained was 93 samples aged 18-55 years. The independent variable measured was sedentary lifestyle using the International Physical Activity Questionnaire (IPAQ) questionnaire. The dependent variables measured were neck disability using the Neck Disability Index (NDI) questionnaire and high blood pressure measured using a sphygmomanometer.

Results: Based on the non-parametric Spearman Rho test, a value of $p = 0.001$ ($p < 0.05$) was obtained, which showed that there was a significant relationship between a sedentary lifestyle and neck disability and high blood pressure and the value of the correlation coefficient ranging from $r = -0.831$ to -0.928 and negative values indicating an undirected relationship with a very high level of correlation. Based on the results of multivariate analysis with regression logistic tests showed a significant relationship between a sedentary lifestyle and neck disability and high blood pressure characterized by p values < 0.05 .

Conclusion: Based on the study's results, there is a negative relationship between a sedentary lifestyle and neck disability and high blood pressure in bank employees. When a sedentary lifestyle shows low measurement results, it will indicate that the individual has a neck disability and high blood pressure.

Keywords: high blood pressure, neck disability, sedentary lifestyle.

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INTRODUCTION

During the pandemic, many activities are usually done outside. Still, they are now hindered by the COVID-19 virus, so our physical activity is reduced, and we tend to just sit in front of the computer, watch TV, and lie down. As a result, physical activity becomes minimal, so energy expenditure becomes very low.¹ This kind of lifestyle is also known as a sedentary lifestyle. The word 'sedentary' comes from the Latin 'sedere', which means to sit.² Thus, sedentary lifestyle refers to a term to characterize behaviors that have a relationship with low energy expenditure, which can be in the form of sitting for a very long time at work, at home, while driving, and while resting.

Some of the physical activities that are

classified as sedentary behaviors are sitting while doing activities either at home or at work but not at bedtime. Sedentary lifestyles can be considered behaviors characterized by little or no physical activity or physical movement, resulting in low energy expenditure, namely 1.5 METs.³ MET (Metabolic Equivalent Task) is a unit used to assess how much energy humans expend during their activities. One MET is the energy expenditure of a person at rest.⁴ The level of physical activity performed by a person in an activity can be quantitatively classified based on its intensity, which is 1.0-1.5 METs (sedentary lifestyle), 1.6-2.9 METs (light intensity), 3-5.9 METs (moderate intensity), and ≥ 6 METs (vigorous intensity).⁵

Approximately 31% of the overall population aged ≥ 15 years are engaged

in low physical activity, and there is an increase in deaths of about 3.2 million people per year. In addition to physical inactivity, a sedentary lifestyle is a serious problem, and many people engage in it for a long time. For example, Americans spend 55% of their waking hours (7.7 hours a day) engaged in sedentary lifestyles, while Europeans spend 40% of their free time (2.7 hours a day) watching television.⁶ Based on Riskesdas, it shows that in Indonesian children aged ≥ 10 years, around 33.5% lack physical activity.² Meanwhile, data from Bali Province shows that around 26% of Bali aged ≥ 10 years lack physical activity.

A sedentary lifestyle affects the human body through various processes. It can lead to reduced lipoprotein lipase activity, inhibited muscle glucose and protein

delivery, inhibited lipid metabolism, and reduced carbohydrate metabolism.⁷ Furthermore, it reduces the amount of blood pumped by the heart and overall blood circulation throughout the body while stimulating the sympathetic nervous system. This ultimately leads to losing the body's ability to respond to insulin and impairs vascular function. Blood pressure is highly correlated with individuals of all age groups.⁸ In adults, normal blood pressure is around 120/80 mmHg, as the World Health Organization (WHO) determined. From this figure, it can be understood that 120 mmHg is the number of systolic blood pressure, which is the amount of pressure exerted by the heart when pumping blood, which flows throughout the body. In contrast, the number 80 mmHg is the number for diastolic blood pressure, which is the number of numbers that indicate relaxation pressure and when the heart receives blood from the whole body.⁹

The World Health Organization states that blood pressure can be classified based on height, with the first being considered normal at 120/80 mmHg. However, not all blood pressure in humans is at a normal level, so it can trigger a person's condition to have indications of hypertension and hypotension. Blood pressure above 120/80 mmHg to 139/89 mmHg is prehypertension.¹⁰ Hypertension is the number one cause of death in patients with cardiovascular disease.¹¹ More than 63 million people in Indonesia suffer from hypertension, and more than 400 thousand people die. An inactive lifestyle is often a major risk factor in the development of hypertension, leading to heart failure, heart attack, and stroke.¹²

According to blood pressure measurements in 2017, Jembrana Regency had the highest prevalence of hypertension, with 144,371 cases or 77.33% of the total population of 186,700.¹³ The prevalence of hypertension in Denpasar City in 2017 was 20.51%, with 113,416 cases out of 552,992 people. The increasing prevalence of sedentary lifestyles in society has been shown to contribute to a variety of health problems, including decreased neck muscle strength, increased risk of injury, and impaired posture, which can trigger the development of significant neck

disability.¹⁴

Neck disability is a musculoskeletal disorder that leads to significant adverse physical, psychological, and social activity impacts among office workers.¹⁵ Neck pain is an uncomfortable sensation in the upper spinal region. In the human body, the neck is one part of the body in which there is a very complex arrangement, but it is also one of the parts that are very vulnerable to irritation; studies show that neck pain is felt at least once per month by about 10% of the population.¹⁶

Neck disability can impact overall health and well-being. While there is not a direct link between neck disability and blood pressure, chronic pain or discomfort from neck issues may indirectly affect blood pressure. For example, stress, pain, and reduced physical activity due to neck problems could contribute to elevated blood pressure. Bankers often have sedentary jobs that involve prolonged sitting, especially in front of computers. Long hours of sitting can lead to a sedentary lifestyle, which may increase the risk of high blood pressure. Regular breaks, stretching, and maintaining good posture can help mitigate the effects of prolonged sitting. This study aimed to determine the relationship between a sedentary lifestyle, neck disability, and high blood pressure in bank employees.

METHODS

The research method used in this study was an analytical observational research design with a cross-sectional study approach. The research was conducted at BNI Bank in Denpasar City from June to October 2023. The inclusion criteria for this study were people working as BNI Bank employees range of 18 - 55 years, having status as a BNI bank employee in Denpasar in 2023, the research subject was willing to be part of this study as evidenced by the willingness of the subject to sign the informed consent provided by the researcher during data collection. The exclusion criteria include subjects do not complete the questionnaire and people with sensory disabilities (blind).

The sample size was calculated using the G*power application using the chi-square test family test variance: difference from constant (one sample case) with a ratio of

$\text{var } 1/\text{var } 0 = 1.75$, error probability = 0.05, 1 error probability (power) = 0.90, getting the required number of samples from BNI bank employees as many as 56 samples. It is necessary to add 10% of the total sample needed to avoid samples that do not fill out the questionnaire completely so that the total sample in this study becomes 62 research samples.

The variables used in this study are sedentary lifestyle as the independent variable, high blood pressure, and neck disability as the dependent variable, and age as the control variable. A computer was used as a tool to conduct this study. This study uses several statistical tests of data analysis, namely descriptive tests, univariate analysis, bivariate analysis, and multivariate analysis. The bivariate analysis method in this study, namely Spearman Rho is a non-parametric statistical test where the data to be correlated does not have to be normally distributed, so there is no need to do a normality test. A non-parametric test is performed if the data with a numerical scale has an abnormal data distribution.

The Ethics Commission of the College of Medicine, Udayana University, approved this study with decree 1116/UN14.2.2.VII.14/LT/2023 after a thorough review process. Each participant willingly agreed to participate, providing their voluntary consent. Additionally, respondents signed an informed consent document acknowledging their comprehension of the study's objectives, methodologies, and potential risks.

RESULTS

This study involved BNI Denpasar employees aged 18 to 55 years. Using the purposive sampling technique, 93 research samples met the criteria researchers set, including and excluding. The subject characteristics in this study include age, gender, IPAQ, NDI, and blood pressure. Table 1 shows that the age of the research object is, on average, 35.71 years, and the number of research objects is more male, namely 49 people (52.7%). Meanwhile, 71 (76.3%) of the research subjects had high blood pressure. Other data from this study consisted of the average sedentary lifestyle score on the IPAQ and neck disability on the NDI. In Table 1, it can be seen that

Table 1. Data distribution of subject characteristics

Characteristics	Mean±SD or n (%)
Ages	35.71±10.38
Gender	
Female	49 (52.7)
Male	44 (47.3)
IPAQ	940.8±1663.8
NDI	23.72±8.97
Blood Pressure	
Normal blood pressure	22 (23.7)
High blood pressure	71 (76.3)

IPAQ, international physical activity questionnaires; NDI, neck disability index; SD, standard deviation.

Table 2. Results of univariate logistic regression analysis subject characteristics between neck disability and high blood pressure

Variable	Characteristics	OR (95% CI)	p-value
Neck Disability	Ages	1.03 (0.97-1.09)	0.016
	Gender		
	Female	reference	
	Male	1.69 (1.19-2.41)	0.023
	MET's		
High Blood Pressure	Low	reference	
	High	3.07 (1.03-3.51)	0.001
	Ages	1.08 (0.93-1.27)	0.019
	Gender		
	Female	reference	
	Male	1.42 (0.16-3.12)	0.024
	MET's		
	Low	reference	
	High	3.92 (1.38-4.23)	0.001

CI, confidence interval; OR, odd ratio; MET, metabolic equivalent task.

Table 3. Results of spearman rho analysis between sedentary lifestyle on neck disability and high blood pressure

		NDI	Blood Pressure
IPAQ	Correlation	-0.928	-0.831
	p-value	0.001	0.001

IPAQ, international physical activity questionnaires; NDI, neck disability index

the sedentary lifestyle has an average IPAQ score of 940.8. In addition, it was also found that the average value of neck disability on the NDI score was 23.72.

The analysis used to analyze each subject's characteristics of neck disability was univariate logistic regression analysis. Table 2 shows that the variables of subject characteristics such as age, gender, and sedentary lifestyle are below the threshold of $p < 0.025$, which can be further analyzed in multivariate analysis. The analysis used to analyze each subject's characteristics on high blood pressure is by univariate logistic regression analysis. Table 2 shows

that the variables of subject characteristics such as age, gender, and sedentary lifestyle are below the threshold of $p < 0.025$, which can then be further analyzed in multivariate analysis.

This is used to study Spearman Rho non-parametric analysis. As the research has been done, the results of the analysis test are in Table 3 as follows: The above shows that there is a very significant relationship between a sedentary lifestyle and neck disability in bank employees at the BNI Denpasar office as measured using NDI and evidenced by the p -value = 0.001 ($p < 0.05$) and the relationship coefficient

value of 0.928 and is negative. The negative value shows a relationship with an inverse indication with a strong correlation level due to the value between 0.80 - 1.00.

In the results of the analysis between a sedentary lifestyle and blood pressure, Table 3 shows that there is a significant relationship between a sedentary lifestyle and blood pressure, as evidenced by the p -value = 0.001 ($p < 0.05$) and the correlation coefficient value of 0.831 and negative value. This explains an inversely proportional relationship with a strong correlation level because the value ranges from 0.80 - 1.00.

The analysis used to determine the relationship between a sedentary lifestyle and neck disability after being tested and adjusted for subject characteristics used multivariate logistic regression analysis. Based on the analysis test results in Table 4, it can be seen that there is a very significant and inversely proportional relationship between a sedentary lifestyle and neck disability. Based on Table 4, it can be seen that individuals with a high MET score have a lower probability of experiencing neck disability as evidenced by the $p=0.026$ value and adjusted OR value of 1.26, indicating that every one unit increase in MET's score (which means higher physical activity) is associated with a 1.26-fold decrease in the risk of neck disability.

The study also showed that males had a significant association with neck disability, having a 1.44 times higher chance than females ($p=0.047$), and age had a significant association with neck disability, with each increase in age having a 1.90 times higher chance of neck disability ($p=0.049$). The analysis used multivariate logistic regression analysis to determine the relationship between a sedentary lifestyle and high blood pressure after being tested and adjusted for subject characteristics. Based on the results of the study in Table 4, it can be seen that there is a highly significant and inversely proportional relationship between sedentary lifestyle and high blood pressure. Based on Table 4, it can be seen that individuals with a high MET score are less likely to become high blood pressure sufferers. This is based on the existence of a p -value = 0.019 and an adjusted OR value of 1.32, indicating that

Table 4. Results of logistic regression multivariate analysis subject characteristics between neck disability and high blood pressure

Variable	Characteristics	Adjusted OR (95% CI)	p-value
Neck Disability	Ages	1.90 (1.05-2.26)	0.049
	Gender		
	Female	reference	
	Male	1.4 (1.42-1.86)	0.047
	MET's		
High Blood Pressure	Low	reference	
	High	1.26 (1.13-2.37)	0.026
	Ages	1.04 (0.94-1.16)	0.038
	Gender		
	Female	reference	
	Male	1.86 (1.16-4.73)	0.026
	MET's		
	Low	reference	
	High	1.32 (1.15-1.46)	0.019

CI, confidence interval; OR, odd ratio; MET, metabolic equivalent task.

every one-unit increase in MET's score (which means higher physical activity) is associated with a 1.32-fold decrease in the risk of high blood pressure.

The study also showed that males had a significant relationship with high blood pressure, which was 1.86 times higher than women's ($p=0.026$). Based on the age range, the risk of contracting high blood pressure was different at each age level, which was 1.04 times higher ($p=0.038$).

DISCUSSION

The research took place at Bank BNI Denpasar, targeting employees aged between 18 and 55. The sample selection used a purposive sampling technique; the researcher used 93 people at Bank BNI Denpasar. The people were selected by the researcher directly based on the criteria previously determined by the researcher, namely the inclusion and exclusion criteria, and the objects were willing to become the object of research.

The study results in Table 1 of the 93 research samples obtained with an average age of 35 years. The distribution of sample data on gender shows that the sample is dominated by objects of the male sex, namely 49 people (52.7%), and objects of the female sex, as many as 44 people (47.3%). This is because the number of female and male samples is almost balanced due to real factors in the field, such as the ratio of the number of female bank office employees and male bank

office employees not being too different.

Based on the study's results, the value of a sedentary lifestyle and neck disability has a variety of values. For the value of sedentary lifestyle measured using IPAQ, the value of the research subject was 940.8 in MET's units. Then, the value of neck disability measured using NDI obtained an average score of 23.72, which indicates the NDI score on the research subject is quite high.

In the data test contained in Table 4, the p -value is 0.001 ($p < 0.05$) with a correlation coefficient of -0.928; it can be explained that there is an inversely proportional relationship with a strong correlation level between sedentary lifestyle and neck disability in BNI bank employees in Denpasar. This shows that the lower the MET score obtained, the worse the neck disability score.

Based on data testing with multivariate logistic regression analysis, the p -value is 0.026 ($p < 0.05$) with an adjusted OR value of 1.26. So, it can be seen that there is a very significant relationship between a sedentary lifestyle and neck disability in bank employees at BNI Denpasar. It can be explained that the more sedentary a person will have a chance of about 1.26 times greater for neck disability due to lack of physical activity.

Other research that supports the findings in this study discusses the sedentary lifestyle affecting the level of neck disability in 52 subjects. The research data were analyzed with the Spearman-

Rho correlation test, which stated that there was a significant relationship between a sedentary lifestyle and neck disability with a p -value of < 0.05 .¹⁹ Lack of physical activity causes muscle building to weaken, compressing the muscles and ligaments around the cervical joint. In office workers, neck pain is twice as likely to occur in a sitting position with a less ergonomic posture.²⁰

Based on another study that examined the effect of daily walking steps on neck pain in workers, it was found that 387 subjects who worked such as sitting for a long time or maintaining awkward posture while working increased the physical load on the body, especially on the neck.²¹ Increased physical load increases muscle activity and fatigue, causing musculoskeletal disorders. After analysis using the ANOVA test, it was stated that there was a significant relationship between the effect of daily walking steps on the onset of neck pain.

Another study on the effect of a sedentary lifestyle on physical activity level and musculoskeletal pain in 718 subjects also supports the results of this study, where the subjects complained of neck pain. The research data was analyzed using the Chi-square test, and the results obtained in light physical activity tended to experience neck pain.²² Someone who has low physical activity or is less active in moving tends to complain of neck pain during daily activities, thus affecting work. Movement in the neck joints can decrease if the pain lasts long, resulting in disability in the neck area.²³ In someone who has more physical activity or is actively moving, neck pain is rarely found.²⁴

A sedentary lifestyle involves a lack of physical activity or sufficient movement, which can lead to various physiological changes in the human body, including decreased muscle strength. If left unchecked for a long duration of time, this can result in neck pain.²⁵ This can lead to muscle weakness, which impacts posture and balance. Lack of movement and physical activity can cause the muscles in the neck to stiffen and lose flexibility.¹⁹ This can increase the risk of injury to the neck and increase muscle tension. A sedentary lifestyle is often associated with an unhealthy diet and increased calorie

consumption without sufficient burning. This is particularly worrying as it can lead to an indication of obesity. Obesity can place additional pressure on the neck structures and cause disorders such as narrowing of the spinal canal (stenosis), which can lead to neck disability.²⁶

A sedentary lifestyle is closely related to non-ergonomic sitting postures and long sitting durations. Abnormal or unergonomic work postures can cause muscles to contract and become tense constantly. Repeated tension in the muscles can lead to neck dysfunction. Long sitting durations can also increase the static load on the neck muscles.²⁷

As in the test results contained in Table 5, it can be found that the p -value is 0.001 ($p < 0.05$) with a correlation coefficient value of -0.831. It can be explained that there is an inversely proportional relationship with a strong correlation level between a sedentary lifestyle and high blood pressure in BNI bank employees in Denpasar. This shows that the lower the MET score obtained, the lower the amount of activity performed, which will impact the occurrence of high blood pressure.

Based on data testing with multivariate logistic regression analysis seen in (Table 6), the p -value was 0.019 ($p < 0.05$) with an adjusted OR value of 1.32. This shows a significant correlation between a sedentary lifestyle and high blood pressure in bank employees at BNI Denpasar. It can be explained that the more sedentary a person will have a chance of about 1.32 higher to become a sufferer of high blood pressure due to a lack of physical activity.

Another study supports this research, which examines the relationship between a sedentary lifestyle and the incidence of hypertension among garment workers.²⁸ In the study, 36 respondents, the majority of whom had a high sedentary lifestyle, tended to experience hypertension. After being analyzed using the Chi-square test, the p -value = 0.000 ($p < 0.05$) was obtained, which shows that there is a significant relationship between a sedentary lifestyle and the incidence of hypertension with an odd ratio (OR) = 8.7, indicating that someone with a sedentary lifestyle will have an 8.7 times greater risk of becoming a sufferer of high blood pressure.

The research results that the researchers

have found are also supported by previous research which examines the relationship between lifestyle and the level of occurrence of high blood pressure spikes in people in middle adulthood, namely 182 subjects. The research data were analyzed using the Chi-square test, and the results were obtained with a value of $p = 0.048$ ($p < 0.05$), indicating a relationship between physical activity and the incidence of hypertension.²⁹ These things occur due to a lack of physical activity, thus making the frequency of heartbeats faster and impacting the heart, which will contract higher; the end of this habit will cause an abnormal increase in blood pressure.³⁰

Other studies also support that sedentary lifestyles can increase the risk of various diseases, including hypertension.³¹ This study examined the relationship between a sedentary lifestyle and the occurrence of high blood pressure problems affecting workers at PT Pupuk Kaltim involving 50 subjects. Lifestyle has a significant role in determining public health.³²

A sedentary lifestyle means a person does little physical activity, mainly sitting and lying down, which is dominant in daily activities such as working at a computer, reading, watching TV, playing games, and so on, but does not include sleep.³³ A person who is less physically active.³⁴

A sedentary lifestyle that includes a lack of physical activity can lead to decreased cardiovascular fitness, meaning that the heart and blood vessels are not functioning as efficiently as they could. This can lead to increased blood pressure due to the heart working harder. Aside from this, a sedentary lifestyle will also cause a person to have higher stress hormones such as cortisol. The hormone will cause the heart to work harder, resulting in narrow blood vessels.³⁵

When a person has a sedentary lifestyle, the body's calorie burn is lower, which can lead to weight gain.³⁶ In contrast, regular physical activities can help the heart and its smooth muscles strengthen to produce a regular and strong heartbeat. In addition, regular exercise can improve the elasticity of blood vessels through relaxation and vasodilation. This reduces fat accumulation and strengthens the muscles of the blood vessel walls.³⁷

This study has several limitations. The study design was only a cross-sectional study cannot establish causality, only associations. It's unclear whether a sedentary lifestyle causes high blood pressure and neck disability or if individuals with these conditions are more likely to lead sedentary lives, the data collected at one point in time may not accurately represent long-term behaviors or health outcomes. Data on physical activity levels, neck pain, and lifestyle factors often rely on self-reported questionnaires, which can be subject to recall bias and social desirability bias.

CONCLUSION

Based on the study's results, it can be concluded that there is a negative relationship between a sedentary lifestyle and neck disability and high blood pressure in bank employees. It can be concluded that when a sedentary lifestyle shows low measurement results, it will indicate that the individual has a neck disability and high blood pressure.

ETHICAL CLEARANCE

The Research Ethics Commission, College of Medicine, Universitas Udayana, stated that this research is ethically feasible with number 1116/UN14.2.2.VII.14/LT/2023. Informed agreement from the respondents to the survey was also provided, which approved the use of sampling.

CONFLICT OF INTEREST

This study has no conflicts of interest.

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AUTHOR CONTRIBUTIONS

IAIP prepares study designs, collects data, processes data, and writes manuscripts. AW, IPGSA, and AAGAPN direct data collection and revise the manuscript.

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REFERENCES

1. Park JH, Moon JH, Kim HJ, Kong MH, Oh YH. Sedentary lifestyle: overview of updated evidence of potential health risks. *Korean J Fam Med.* 2020;4(1):365–373.
2. Laksono B, Hidayat T. Hubungan antara aktivitas sedentari dengan kebugaran jasmani (studi pada peserta kelas vii didik smp negeri 1 ngimbang) *Jurnal Pendidikan Olahraga dan Kesehatan.* 2019;7(2):445–449.
3. Badr HE, Rao S, Manee F. Gender differences in quality of life, physical activity, and risk of hypertension among sedentary occupation workers. *Quality of Life Research.* 2021;3(1):1365–1377.
4. Dharmansyah D, Budiana D. Indonesian adaptation of the international physical activity questionnaire (ipaq). *Psychometric Properties.* 2019;2(3):30–45.
5. World Health Organization. *Musculoskeletal health.* United States: World Health Organization. 2022;2(4):24–28.
6. Sania G. Hubungan perilaku sedenter dengan kejadian depresi pada siswa madrasah aliyah pembangunan UIN Syarif Hidayatullah Jakarta. 2022;2(2):20–26.
7. Thyfault JP, Du M, Kraus WE, Levine JA, Booth FW. Physiology of sedentary behavior and its relationship to health outcomes. *In Medicine and Science in Sports and Exercise.* 2015;7(3):1301–1305.
8. Hayes P, Ferrara A, Keating A, McKnight K, O'Regan A. Physical activity and hypertension. *Reviews in Cardiovascular Medicine.* 2022;23(1):280–286.
9. Flack JM, Adekola B. Blood pressure, and the new ACC/AHA hypertension guidelines. *Trends in Cardiovascular Medicine.* 2020;3(1):390–401.
10. Wahyudi A. Gambaran Tekanan darah berdasarkan faktor pembeda hipertensi pada pasien hipertensi perokok di wilayah kerja puskesmas ciputat kota tangerang selatan. *Journal of Health Science and Prevention.* 2014;3(2):40–45.
11. Oparil S. Hypertension. *Nature Reviews Disease Primers.* 2018;4(1):39–46.
12. Nuraini B. Risk factors of hypertension. *J MAJORITY.* 2015;4(5):38–60.
13. Delacroix S, Chokka RG. Hypertension: pathophysiology and treatment. *J Neurol Neurophysiol.* 2014;5(1):56–66.
14. Santoso I, Satriyasa KB, Munawaroh M, Sandi IN, Muliarta M. Kombinasi ultrasound dan dry needling lebih menurunkan disabilitas leher daripada kombinasi ultrasound dan hold relax pada myofascial pain syndrom otot upper trapeziu. *Journal of Health Science and Prevention.* 2018;6(1):280–290.
15. Mirawati KS, Dewi AANTN, Sutadarma IWD. Kombinasi infrared dan contract relax stretching sama baik dengan kombinasi infrared dan deep transverse friction terhadap penurunan disabilitas leher kondisi tensiotype headache pada aparaturn sipil negara di kantor gubernur bali. *Majalah ilmiah fisioterapi Indonesia.* 2017;2(1):25–36.
16. Sihombing AP, Kalsum, Sinaga MM. Hubungan sikap kerja dengan musculoskeletal disorders pada penjahit di pusat industri kecil menteng medan 2015. *Jurnal. Medan : Departemen Keselamatan dan Kesehatan Kerja.* 2015;4(1):15–20.
17. Campbell S. Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing.* 2020;25(1): 652–661.
18. Adhitya IPGS, Manuaba IBAP, Suprawesta L, Mauludina YS, Marufa SA. Patient characteristics of non-operative anterior cruciate ligament injury associated with poor knee functions on activities of daily living: A cross-sectional study. *Bali Medical Journal.* 2020;9(1): 608–613.
19. Kartawijaya ED, Utama AAGES, Nugraha MHS, Indrayani AW. Screen-based sedentary lifestyle memengaruhi tingkat disabilitas leher pada mahasiswa tingkat akhir fakultas kedokteran universitas udayana. *Majalah Ilmiah Fisioterapi Indonesia.* 2023;11(2):260–227.
20. Younus MM, Sutan R. Work related neck pain and its associated factors among registered female nurses who are computer users in universiti kebangsaan malaysia Medical Centre. 2013;4(1):309–310.
21. Sitthipornvorakul E, Janwantanakul P, Lohsoonthorn V. The effect of daily walking steps on preventing neck and low back pain in sedentary workers: a 1-year prospective cohort study. *European Spine Journal.* 2015;24(1):417–424.
22. Roggio F. One year of covid-19 pandemic in italy: effect of sedentary behavior on physical activity levels and musculoskeletal pain among university students. *Int J Environ Res Public Health.* 2021;18(1):250–255.
23. Bagaswara DG, Antari NKAJ, Widnyana M, Wibawa A. Pengaruh durasi kerja terhadap disabilitas leher pada sopir taksi online di denpasar. *Majalah Ilmiah Fisioterapi Indonesia.* 2021;9(1):56–62.
24. Cohen SP. Epidemiology, diagnosis, and treatment of neck pain. in *Mayo Clinic Proceedings. Journal of Vocational Health Studies.* 2015;2(3):284–299.
25. Wahyuni N, Wijaya T, Adeel M, Adhitya IPGS. Higher duration of laptop usage associated with the occurrence of neck disability in undergraduate physical therapy students during the covid-19 pandemic. *Physical Therapy Journal of Indonesia.* 2022;3(1): 6–10.
26. Waromi SL, Antari NKAJ, Saraswati PAS, Tianing NW. Perilaku sedentari terhadap kemampuan fungsional pada lansia di desa kukuh, kerambitan, tabanan, bali. *Majalah Ilmiah Fisioterapi Indonesia.* 2022;10(1):15–20.
27. Putri NPN, Dewi AANTN, Juhanna IV, Sutadarma IWG. Hubungan postur dan durasi posisi kerja duduk terhadap risiko terjadinya disabilitas leher pada pekerja di kota denpasar. *Majalah ilmiah fisioterapi Indonesia.* 2019;7(1):20–24.
28. Luhi N. Hubungan aktifitas kurang gerak (sedentary) dengan kejadian hipertensi pada pekerja pabrik garment di kelurahan candirejo ungaran barat. *Jurnal. Medan.* 2020;2(1):38–42..
29. Yulandari NY, Sandra L, Saputra B. Hubungan life style dengan kejadian hipertensi pada dewasa pertengahan. *Jurnal Keperawatan dan Kesehatan.* 2022;10(1): 363–375.
30. Ladyani F, Febriyani A, Prasetya T, Berliana I. Hubungan antara olahraga dan stres dengan tingkat hipertensi pada lansia. *Jurnal Ilmiah Kesehatan Sandi Husada.* 2021;10(1):82–87.
31. Prasetyo RW. Hubungan Antara Sedentary Lifestyle dengan Kejadian Hipertensi pada Pekerja PT. Pupuk Kalimantan Timur Selama Masa Pandemi COVID-19 di Kota Surabaya. *The Indonesian Journal of Health Promotion MPPKI Media Publikasi.* 2022;5(2):38–42.
32. Zulfitri R, Deli H. Hubungan gaya hidup dan riwayat kontrol dengan derajat hipertensi pada lansia. *JOM Fkp.* 2019;3(2):46–55.
33. Tremblay MS. Sedentary behavior research network (sbrn) - terminology consensus project process and outcome. *International Journal of Behavioral Nutrition and Physical Activity.* 2017;14(1):376–380.
34. Ferencia C, Rahayu NS, Purwaningtyas DR. Hubungan konsumsi gula, garam, lemak dan sedentary lifestyle terhadap tekanan darah pada usia dewasa. *Muhammadiyah journal of geriatric.* 2023;4(1):117–128.
35. Makawekes E. Pengaruh aktivitas fisik terhadap tekanan darah pada usia lanjut 60-74 tahun. *Jurnal Keperawatan (JKp).* 2020; 8,(1): 83–90.
36. Sugeha L, Mahmudiono T, Rochmania B. Hubungan status gizi, pola makan, kebiasaan minum kopi dan tekanan darah pada mahasiswa universitas airlangga. *Amerta Nutrition.* 2023; 7(1):267–273.
37. Afni N. Hubungan aktivitas fisik dengan derajat hipertensi pada pasien rawat jalan di wilayah kerja puskesmas tagulandang kabupaten sitaro. *Journal of Health Science and Prevention.* 2018;6(1):20–22.



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