Journal of Health Sciences and Medical Development
Vol. 2, No. 03, pp. 147-158
journal.iistr.org/index.php/HESMED
DOI: 10.56741/hesmed.v2i03.426

The Effect of Neck Exercises on Headaches of Adolescent

A Case Study of College Students in Kudus, Indonesia

[1]Sukarmin*, [1]Sri Siska Mardiana
Corresponding Author: *sukarmin@umkudus.ac.id
[1] Universitas Muhammadiyah Kudus, Indonesia

ARTICLE INFO

Article history
Received 20 September 2023
Revised 17 October 2023
Accepted 20 October 2023

ABSTRACT

Headache is a symptom that widely happen by all age groups including adolescents. According to the Global Burden of Disease (GBD) study, headache belongs the most common disorder occurring to adolescent. a Systematic Review (SR) study of 357 publications, globally the estimated prevalence of active headaches is about 52.0%. This study is to determine the effect of neck exercises on college students' headaches. This methodology a quasi-experimental study which involve two group including 16 intervention groups and 16 control groups. The intervention group was given neck exercises for 4 weeks, while the control group was given headache education materials. Results of research there was a significant difference in headache before and after neck exercise in the intervention group (p value 0.015) and no significant difference in headache in the control group (p value 0.180). Neck exercises are quite significant in reducing college students' headaches.

Keywords
College Students
Headache
Neck Exercises

This is an open-access article under the CC–BY-SA license.

Introduction

Head pain is a symptom that is widely experienced by all age groups including adolescents. Headache is the most common patient complaint in primary health care worldwide with prevalence reaching more than 60% of the world's population [1]. According to the Global Burden of Disease (GBD) study, headache are the most common disorder. The

study with a Systematic Review (SR) approach of 357 publications, mostly from high-income countries, globally estimated the prevalence of active headache was 52.0% (95% CI 48.9-55.4), migraine 14.0% (12.9-15.2), Tension on Headache (TTH) 26.0% (22.7-29.5) and Headache On ≥15 days/month (H15) + 4.6% (3.9-5.5). It is estimated that headaches and migraines have a comparable prevalence despite the fact that this study found more active headaches [2]. Another study as many as 755 patients complained of headaches, of these 755 patients 80% of patients experienced secondary headaches with a classification of 77.2% degree 1, 3.1% degree 2, 1.2%-degree 3.5% degree 4 [3].

In Indonesia, the incidence of headache prevalence is still quite high. Data from various retrospective studies show that headaches are found in 37-51% of children aged 7 years, and increase to 57-82% of children aged 15 years and over. The most common types of headaches in Indonesia are migraine and Tension Type Headache (TTH) [4]. There are two types of headaches, namely primary and secondary headaches. 90% of headaches fall into the category of primary headaches, the remaining 10% fall into the category of secondary headaches. Primary headache is based on a condition when there is no underlying structural or metabolic damage to the headache. While secondary headaches are headaches caused by various underlying factors and others: trauma, vascular disorders, infections, substance use, metabolic disorders, innervation disorders and facial structure abnormalities. Primary headaches include feelings of tension, migraines and cluster headaches. This type of primary headache is experienced by many adolescents, including students [5].

Students are one of the groups that are partly entered in adolescence. The age of the teenager is in the range of 10-24 years and is not married. Headache problems are also commonly found in students. Primary headaches that occur in college students are triggered by various stressful conditions such as when using a computer too much, using smartphones and doing many and heavy tasks and other conditions that involve strain on the muscles of the face, head and neck. Research conducted by Ref. [6] involving 50 students who were using computers to play games found that 44 students (88%) experienced headaches during or shortly after playing computer games. The degree of mild pain was the most experienced, which was experienced by 28 students (56%). Other headache features and symptoms are grouped and lead to tension type headaches as much as 60%, migraine type 28%, and the remaining 12% no headache. Prolonged use of smartphones can also trigger headaches in college students.

Research by Ref. [7] on 141 students found that 77 people (54.6%) experienced TTH, 135 people (95.7%) used smartphones with a duration of more than 3 hours, and 103 people (73%) used smartphones in a lying position. Another cause of headaches experienced by students is triggered by stress. Headaches that are not treated properly among students can

result in blurring of pain triggers and reduce productivity, quality of life, performance and increase health care costs for both individuals and families [1]. One of the things that arise due to the impact of pain is the emergence of sleep disorders which are one component of quality of life. Research conducted by Ref. [8] from 2,695 respondents the prevalence of sleep deprivation was significantly higher in respondents with headaches compared to those without headaches with a ratio of 28.8%: 20.4%.

Various efforts are made to reduce headaches. The provision of anti-pain drugs combined with history tracing, cognitive behavioral therapy and movement exercises is an important pillar in pain management [1]. Giving analgesic drugs to reduce headaches can cause side effects including: hypersensitivity reactions, stomach and intestinal disorders, damage to the kidneys, and can cause liver damage if consumed with excessive doses. Given the many risks posed by analgesic drugs so that the therapy must be really as needed and use the right dose. The use of analgesic drugs should also be reduced. One of them is to increase the use of non-pharmacological drugs [9]. According to Ref. [10], there are 5 best techniques to reduce headaches, namely deep breathing exercises, neck and head movements towards the scapula, moving the neck trapezius muscles, stretching exercises on both arms, and stretching the scapula. The exercise is believed to reduce muscle tension, improve head blood flow and improve cell metabolism.

Research conducted by Ref. [11] on the effect of neck exercise on reducing headache pain on 180 respondents showed neck exercise had an effect on reducing headache pain (p value 0.001). A trial of neck exercises combined with arm exercises on 42 respondents aged 18-55 years for 3 months was randomized. The intervention group got neck exercises and arm exercises, the control group got ultrasound therapy in the upper trapezius muscle. The results showed a significant difference in headache between the control group and the intervention (p value 0.025) [12].

The results of an initial study conducted by researchers on 15 nursing students of the Kudus in Pebruary 2023 using directed questions related to headache complaints for the past 1 month have complaints of headaches at least 1 time a month, at most 7 times a month, most often 3 times a month with variations in complaints: throbbing, like being pricked, kunty and pain like spinning. Actions that have been taken if the headache also varies from lying down, massaging the temples to taking medicine from pharmacies or stores. The action taken does not help much in reducing headaches. Headaches will appear again after massage and after a few minutes of taking medication. Neck exercises have never been done by the 15 students to reduce headaches. Complementary therapies such as neck exercises performed on headache patients for students have advantages in their implementation, including: can be done at any

time, does not require a special time and place, does not require high financing and increases independent ability in managing health problems. These advantages strongly support the use of neck exercises as therapy to reduce headaches in college students [13].

Material and Methods

A. Participant characteristics and research design

This is a quasi-experiment study with pre and post control group design approach, which is a design that provides intervention to research subjects and measurements are carried out before and after the intervention. All samples have the same opportunity to become a perpetrator group or a control group [14]. This design was used to compare the results of the intervention of two groups, namely the intervention group and the control group which were both measured before and after the intervention. This study examines the difference in changes in the dependent variable between the intervention group and the control group. The values seen were before- and post-pain scales in both the control and intervention groups.

B. Sampling procedures

The population of this study were nursing students in Kudus including 250 participants. The total samples of this study were total sample of 32 people was divided into 16 intervention groups and 16 control groups. Those samples were later on chosen using purposive sampling. In this implementation, samples selected from the population based on criteria and will be suspended until the desired number is reached. The inclusion criteria in this study are: Willing to be the subject of research, Having headaches, Never done neck exercises, and Willing to adhere to a neck exercise program under the observation of the researcher. Meanwhile the exclusion criteria in this study is participant who is resigned.

C. Sample size, power, and precision

The sample size was determined by estimation based on changes in average headache. The calculation of the paired sampel formula was obtained from each group sample of 14 respondents plus an estimated drop out of 10% to 16 respondents in each group. The intervention group was given an explanation for not relaying the exercises given to the control group.

D. Measures and covariates

This research was conducted on Nursing students in Kudus. The students involved in this research are students who completed the final thesis project. This study took 1.5 months because not all respondents immediately respected the exercises programmed. Many respondents need an intensive approach to be willing to be respondents. Neck exercises performed by the intervention group were monitored through group WA reports, as well as the control group also received health education through different WA groups. Discussions on matters related to research are carried out through direct meetings, group WA and WA private.

Headache data were collected using a numerical pain scale consisting of a scale of 0 to 10 with an explanation of each scale. Measurements were taken directly to respondents before and after neck exercises. The measurement was carried out in the condition of the respondent's relaxed sitting position.

E. Data analysis

The data in this study were tested for homogeneity using the one way anova test and normality test using the spiro wilk test and then the data was tested using the t test or parametric test . The homogeneity test was carried out for data on sex, age and type of disease experienced by respondents.

Results

A. Characteristics of respondents

Table 1 shows the distribution of respondents based on gender and disease experienced by respondents in the last 1 month.

Table 1. Distribution of Respondents Based on Gender and Disease Experienced in the Last 1 Month (n= 16)

Variable	Intervention		Control	
	n	%	n	%
Gender:				
• Men	1	6.25%	2	12.50%
• Women	15	93.75%	14	87.50%
Types of disease:				
• Gastric pain	5	31.25%	6	37.50%
• Typus	3	18.75%	4	25.00%
• Headache	1	6.25%	1	6.25%
• Flu	2	12.50%	2	12.50%
• Asthma	1	6.25%	1	6.25%
• Tonsillitis	1	6.25%	1	6.25%
• None	3	18.75%	1	6.25%

The results of the analysis of Table 1 showed that respondents with female sex were more than men, namely 15 people (93.75%) for the intervention group and 14 people (87.5%) for the control group. Most respondents in the last 1 month experienced gastric pain, for the intervention group 5 respondents (31.25%) while the control group 6 respondents (37.5%).

B. Distribution of respondents by age

Table 2. Distribution of Respondents Based on Age (n= 16)

Group	n	Mean	Median	SD	Min-Max
Intervention	16	21.63	22.0	0.806	20-23
Control	16	21.88	22.0	0.806	20-23

The results of Table 2 analysis showed that the average age of intervention group respondents was 21.63 years, while the average age of control group respondents was 21.88 years with a minimum age of 20 years and a maximum age of 23 years in both the control group and intervention group.

C. Bivariate Analysis

The bivariate analysis would outline whether there was a difference in average headaches before and after the intervention in the intervention group and the control group. Bivariate analysis is performed to prove the research hypothesis that has been formulated. Moreover, univariate analysis was carried out to determine the homogeneity or equivalence of data between the intervention group and the control group. This test aims to determine that the average change in headache that occurs is not due to variations in respondents, but due to the influence of neck exercises. For homogeneity test using one way anova. If the value is p>0.05, then the data is homogeneous. Table 3 is the results of test homogeneity of each variable/

Table 3. Respondent Homogeneity Test Analysis

Variable	Value	P value
Age	0.769	0.387
Gender	0.349	0.559
Disease	0.803	0.377

The results of Table 3 analysis showed the results of homogeneity tests using One Way Anova on the age, sex of respondents and the type of disease experienced in the last 1 month in both groups showed a p value of age 0.387, sex 0.559 and disease in the last 1 month 0.377. The p value > from α: 0.05 means there are no significant differences in age, sex and type of disease between the intervention group and the control group which means homogeneous.

Table 4. Normality Analysis of Headache Data of Respondents (n=16)

Group	Value		P value	
	Intervention	Control	Intervention	Control
Headache (Before)	0.858	0.862	0.018	0.021
Headache (After)	0.863	0.897	0.021	0.073

The results of Table 4 analysis based on the results of normality data using spiro wilk show that the majority of the variables to be tested are abnormal data, there is only 1 data whose value is normal, namely the control group's headaches after neck exercise. These data will be continued with tests using non-parametric tests, namely the wilcoxon test because they do not meet the normal data requirements if a t test is carried out. After knowing the distribution of normality data, it was continued with an analysis of the effect of neck exercises on college students' headaches. Here is a Table of the effect of neck exercises on headaches in college students.

Table 5. Headache Differences Before and After the Neck Exercise Intervention

Group	Mean	SD	Value	p Value	n	95% CI
Intenvention						
Before	2.38	1.147	-2.444	0.015*	16	1.76-1.94
After	1.25	1.291				
Difference	1.13	-0.144				
Control						
Before	2.13	1.025	-1.342	0.180	16	1.58-1.94
After	1.94	1.124				
Difference	0.19	-0.099				

From Table 5 it can be concluded that the results of Wilcoxon's non-parametric test there was a significant difference between the average headache before and after neck exercise in the intervention group. This conclusion was based on the mean difference between mean headache before and after the neck exercise intervention in the intervention group of 1.13, with a standard deviation of -0.144, with statistically meaningful tests (p; 0.015 α; 0.05). It is believed by 95% that if measurements were taken in the population, then the average difference in headache before and after the neck exercise intervention was between 1.76 and 1.94. While the mean difference between mean headaches before and after without neck exercise intervention in the control group was 0.19, with a standard deviation of -0.099, with a statistically meaningless test (p; 0.180 α; 0.05). It is believed by 95% that if measurements were taken in the population, then the average difference in headache before and after without neck exercise intervention would be between 1.58 and 1.94.

Table 6. Average Headache Difference after Neck Exercises

Group (Headache)	Mean	SD	t	P Value	Mean Difference 95% CI
Intervention	1,13	-0,144	-1.669	0,095	1,76-2,54
Control	0,19	-0,099			

The results of Table 6 analysis can be concluded that there is no significant difference in the mean difference in headache between the intervention group and the control group before and after the neck exercise intervention. Statistical tests showed the difference in the mean of the intervention group was 1.13 with a standard deviation of -0.144. The mean difference in headache before and after the intervention in the control group was 0.19 with a standard deviation of -0.099. The results of the non-parametric mann whitney test obtained insignificant results (p; 0.095 α; 0.05). It is believed by 95% that if the measurement is carried out in the population, then the difference in the mean of headaches between the intervention group and the control group is between 1.76 and 2.54.

Discussion

The results showed the average age of respondents in the control group was 21.63 years for the control group and 21.88 for the intervention group. The age of the results of the study according to WHO is still in the category of adolescents. The age that begins at the age of 10-13 years and ends at the age of 18-22 years as a transition period from children to adults which will gradually experience physical changes, mental changes, changes in social and economic conditions. Various changes that occur in these adolescents can trigger various health problems, one of which is headaches [15]. Various research results also show that the incidence of headaches in adolescents, especially in college students, is still quite a lot. Research conducted by Ref. [16] on 244 adolescent students found 104 (42.6%) experienced headaches. Research conducted on 137 students who experienced headaches found that the most headaches experienced by students were migraines as many as 71 students (51.8%) [17].

The data is still high incidence of headaches in adolescent college students with various causes that differ from one place to another. The results of the researchers' interview with 5 students of the College in Kudus showed the tendency of the cause of headaches experienced was stress with various causes. Research conducted on students at Malahayati University in 2021 from 180 people found that 114 respondents (63.3%) had migraines and there was a significant relationship between stress and headaches (p value 0.000, α: 0.05).

The results showed 15 students (93.75%) in the control group and 14 people (87.5%) were female. The data shows the chances of women experiencing more headaches than men. Research conducted by Ref. [16] found that the majority of students who experienced headaches were women as many as 169 people (69.3%). Indeed, there is no clear correlation between sex and headache. The results of Ref. [18] found that factors that correlated with headaches were breakfast, unfair treatment, family conflicts, parental demands, lesson load, eating regularities, gadget use and sleep patterns. The study also did not link gender to headaches. Research conducted by Ref. [19] at least proves migraine is known to have a meaningful relationship with sex, women risk 1.65 times compared to men ($p < 0.0001$). The reason in theory why women experience more headaches is not very clear, it is thought to have something to do with other factors such as family conflicts, life burden, nutritional consumption and sleep patterns. So the chances between men and women of having equal chances depend on other accompanying factors.

The results showed that the majority of respondents had a background of gastric disorders, namely 5 people (31.25%) for the intervention group and 6 people (37.5%) for the control group. Indeed, various studies get different results related to factors that contribute to the incidence of headaches. The possible relationship between gastric disease and headache is related to the ability of respondents to process nutrients in the body such as research

conducted by Ref. [18] which found the breakfast factor as the main factor causing headaches. Nutritional problems are a major problem in patients with gastric disease disorders so that this nutritional problem gets priority in patients with gastric disorders [20]. Nutrition is also closely related to the incidence of gastritis as the results of research on the relationship between frequency, type and portion of food with the incidence of gastritis in adolescents who found a close relationship between diet and gastritis [21].

The results of this study showed a significant effect of neck exercise on student headaches in the intervention group (p value 0.015). Stretching and neck exercises are helpful to maintain better mobility specially to help support the head. A strong and flexible neck has better function and tends not to feel pain complaints and can reduce the risk of headaches [22]. Neck exercises performed for 12 months were shown to reduce headaches in 180 respondents (p value 0.002) [11]. The results of a study of 32 respondents who experienced headaches showed that independent neck exercises had lower Dizziness Handicap Inventory (DHI) scores when compared to the control group (mean difference 25.92 points, 95% CI 4.21-47.63, p = 0.021) [23].

Neck exercises are very useful to increase blood supply to the brain thereby reducing the risk of headaches triggered by reduced oxygen supply to the brain. Exercise that is done regularly within a period of 8 weeks can increase blood flow in the cerebral area significantly. A study conducted on 17 respondents who applied exercise showed an increase in frontal lobe blood flow by 27% and can improve basic brain function [24]. Exercise can also increase the lumen in blood vessels. A study conducted on 93 participants from 135 selected participants proved an increase in cerebral blood vessel lumen after exercise for 16 weeks (p value 0.03) [25].

The reduction of headaches through exercise can also be through the mechanism of decreasing muscle soreness after exercise. Stiff muscles can stimulate pain in the head. Exercise the muscles are proven to increase relaxation of the body and decrease pain sensations. Research on 60 school students who applied progressive muscle exercise was proven to increase muscle relaxation and reduce psychological stress that can trigger headaches [26].

Limitation of the Study

This study did not conduct continuous direct monitoring of neck exercise implementation monitored through respondent reports through social media groups. Later on, this study could not control for all confounding variables that could affect hemodynamic results, the only controlled factors were age, sex and disease that had been experienced in the last 1

month and did not identify stress levels as one of the most common trigger factors for headaches.

Conclusions and Suggestions

The majority of respondents were female 15 (93.75%) in the intervention group and 14 (87.5%) in the control group, the majority of diseases experienced in the last 1 month were gastric disorders, namely 5 people (31.25%) for the intervention group and 6 people (37.5%) for the control group. The mean age of respondents in the control group was 21.63 years for the control group and 21.88 for the intervention group. There was a significant difference in head pain before and after neck pain in the intervention group (p value 0.015) and no significant difference in headache before and after in the control group (p value 0.180). There was no significant difference in headache between the intervention group and the control group (p value 0.095). This research still uses a relatively small sample so it is necessary to develop research with a large sample and a more rigorous experimental approach using randomization.

Ethical Considerations

This research applies ethical principles by providing research explanations, maintaining fairness between respondents and groups, maintaining respondent confidentiality and upholding human values. This research has received approval from the Ethics Committee of the Faculty of Nursing, University of Indonesia with Number: KET-062/UN2.F12.D1.2.1/ PPM.00.02/2023.

Conflict of Interest

This study had no conflict of interest. The publication of the results of this research aims to fulfill the task of research as a doctoral student as well as to fulfill the duties of the Tri Dharma of Higher Education. This research is expected to also contribute to the advancement of nursing science.

References

[1] Haryani, S. (2018). Penatalaksanaan Nyeri Kepala pada Layanan Primer. *Callosum Neurology, 1*(3), 83–90. https://doi.org/10.29342/cnj.v1i3.16
[2] Stovner, L. J., Hagen, K., Linde, M., & Steiner, T. J. (2022). The global prevalence of headache: an update, with analysis of the influences of methodological factors on prevalence estimates. *The Journal of Headache and Pain, 23*(1), 1–17. https://doi.org/10.1186/s10194-022-01402-2
[3] Hueso, P. M. I., Ruíz Piñero, M., Martínez Velasco, E., Juanatey García, A., & Guerrero Peral, A. L. (2019). Headache in young patients: Clinical characteristics of a series of 651 cases. *Neurologia, 34*(1), 22–26. https://doi.org/10.1016/j.nrl.2016.10.012
[4] Ikatan Dokter Anak Indonesia. (2013). *Nyeri Kepala pada Anak dan Remaja. Ikatan Dokter Anak Indonesia*. Retrieve from: https://www.idai.or.id/
[5] Hidayati, A. N. (2020). *Gawat Darurat Medis dan Bedah*. Airlangga University Press. https://books.google.co.id/books?id=4KmwDwAAQBAJ

[6] Rori, A. A., Tumboimbela, M. J., & Kembuan, M. A. H. . (2016). Gambaran nyeri kepala pada mahasiswa pemain game komputer di Fakultas Kedokteran Universitas Sam Ratulangi angkatan 2012. *E-CliniC, 4*(1). https://doi.org/10.35790/ecl.4.1.2016.12103
[7] Rabbani, A., Ibrahim, A., & Iskandar, A. (2021). Hubungan Penggunaan Smartphone dengan Keluhan Tension Type Headache pada Mahasiswa Fakultas Kedokteran Universitas Mulawarman. *Jurnal Sains Dan Kesehatan, 3*(4), 411–416. https://doi.org/10.25026/jsk.v3i4.338
[8] Oh, J. H., Cho, S. J., Kim, W. J., Yang, K. I., Yun, C. H., & Chu, M. K. (2018). Insufficient sleep in tension-type headache: A population study. *Journal of Clinical Neurology (Korea), 14*(4), 566–573. https://doi.org/10.3988/jcn.2018.14.4.566
[9] Wardoyo, A. V., & Zakiah Oktarlina, R. (2019). Literature Review Tingkat Pengetahuan Masyarakat Terhadap Obat Analgesik Pada Swamedikasi Untuk Mengatasi Nyeri Akut. *Association Between the Level of Public Knowledge Regarding Analgesic Drugs And Self-Medication in Acute Pain, 10*(2), 156–160. https://doi.org/10.35816/jiskh.v10i2.138
[10] Nguyen, P. (2022). *5 Best Exercises for Headache and Neck Pain Per a Physical Therapist*. MigraineAgain. https://www.migraineagain.com/exercises-headache-neck-pain/
[11] Ylinen, J., Nikander, R., Nykänen, M., Kautiainen, H., & Häkkinen, A. (2010). Effect of neck exercises on cervicogenic headache: A randomized controlled trial. *Journal of Rehabilitation Medicine, 42*(4), 344–349. https://doi.org/10.2340/16501977-0527
[12] Benatto, M. T., Florencio, L. L., Bragatto, M. M., Dach, F., Fernández-de-las-Peñas, C., & Bevilaqua-Grossi, D. (2020). Neck-specific strengthening exercise compared with sham ultrasound when added to home-stretching exercise in patients with migraine: study protocol of a two-armed, parallel-groups randomized controlled trial. *Chiropractic & Manual Therapies, 28*(1), 22. https://doi.org/10.1186/s12998-020-00313-w
[13] Aryunani, Ainiyah, N. H., & Abdullah, K. (2022). *Dasar-dasar Komplementer*. Rena Cipta Mandiri. https://books.google.co.id/books?id=JYWfEAAAQBAJ
[14] Rodhi, N. N. (2022). *Metodologi Penelitian*. Media Sains Indonesia.
[15] Kementerian Kesehatan RI. (2018). *Menkes: Remaja Indonesia Harus Sehat. Kementrian Kesehatan RI*, 1. Retrieved from: https://sehatnegeriku.kemkes.go.id/baca/rilis-media/20180515/4625896/menkes-remaja-indonesia-harus-sehat/
[16] Wijaya, A. A., Sugiharto, H., & Zulkarnain, M. (2019). Hubungan Kecemasan dengan Nyeri Kepala Tipe Tegang pada Mahasiswa Program Studi Pendidikan Dokter Fakultas Kedokteran Universitas Sriwijaya Angkatan 2013. *Sriwijaya Journal of Medicine, 2*(1), 223–229. https://doi.org/10.32539/sjm.v2i1.46
[17] Pattynama, P. P., Huwae, L. B. S., & Kailola, N. E. (2022). Hubungan Durasi Belajar Daring Selama Pandemi Covid-19 dengan Jenis Nyeri Kepala Primer pada Mahasiswa Preklinik Fakultas Kedokteran Universitas Pattimura Ambon. *Molucca Medica, 15.* https://ojs3.unpatti.ac.id/index.php/moluccamedica/article/view/5841/4126
[18] Setyawan, F. E. B., & Hussin, K. A. (2018). Analisis Faktor Risiko Perilaku Dan Lingkungan Terhadap Keluhan Nyeri Kepala Pada Pelajar Sekolah Menengah Atas (Sma) Di Kota Malang (Studi Kasus Di Sman 2 Kota Malang). *Saintika Medika, 14*(2), 70–76. https://doi.org/10.22219/sm.vol14.smumm2.7163
[19] Riyadina, W., & Turana, Y. (2014). Faktor Risiko Dan Komorbiditas Migrain. *Buletin Penelitian Sistem Kesehatan, 17*(4), 371–378.
[20] Saini, S., Awaluddin, S. W., Sain, I., & Novita, T. A. (2020). Asuhan Keperawatan Pemenuhan Kebutuhan Nutrisi pada Pasien Gastritis di RSUD Syekh Yusuf Kabupaten Gowa. *Media Keperawatan: Politeknik Kesehatan Makassar, 11*(1), 120. https://doi.org/10.32382/jmk.v11i1.1614
[21] Handayani, M., & Thomy, T. A. (2018). Hubungan Frekuensi, Jenis Dan Porsi Makan Dengan Kejadian Gastritis Pada Remaja. *Jurnal Kesehatan Saelmakers PERDANA, 1*(2), 40. https://doi.org/10.32524/jksp.v1i2.379
[22] Chakravarty, A. (2019). *Vertigo and Dizziness: A Case-based Study*. Jaypee Brothers Medical Publishers Pvt. Limited. https://books.google.co.id/books?id=3kp-EAAAQBAJ
[23] Piromchai, P., Toumjaidee, N., Srirompotong, S., & Yimtae, K. (2023). The efficacy of self-exercise in a patient with cervicogenic dizziness: A randomized controlled trial. *Frontiers in Neurology, 14.* https://doi.org/10.3389/fneur.2023.1121101
[24] Joris, P. J. (2019). Aerobic Exercise Training Improves Cerebral Blood Flow and Executive Function: A Randomized, Controlled Cross-Over Trial in Sedentary Older Men. 11(December), 1–11. https://doi.org/10.3389/fnagi.2019.00333

[25] Lapidaire, W., Forkert, N. D., Williamson, W., Huckstep, O., Tan, C. M., Alsharqi, M., Mohamed, A., Kitt, J., Burchert, H., Mouches, P., Dawes, H., Foster, C., Okell, T. W., Lewandowski, A. J., & Leeson, P. (2023). Aerobic exercise increases brain vessel lumen size and blood flow in young adults with elevated blood pressure. Secondary analysis of the TEPHRA randomized clinical trial. *NeuroImage Clinical, 37*, 103337. https://doi.org/10.1016/j.nicl.2023.103337

[26] Toussaint, L., Nguyen, Q. A., Roettger, C., Dixon, K., Offenbächer, M., Kohls, N., Hirsch, J., & Sirois, F. (2021). Effectiveness of Progressive Muscle Relaxation, Deep Breathing, and Guided Imagery in Promoting Psychological and Physiological States of Relaxation. *Evidence-Based Complementary and Alternative Medicine: ECAM*, 2021, 5924040. https://doi.org/10.1155/2021/5924040

Authors



Sukarmin, M.Kep, Ns., Sp. Kep. MB is affiliated with the Department of Nursing, Faculty of Health Sciences, Universitas Muhammadiyah Kudus located at Jl. Ganesha 1 Purwosari Kudus, Jawa Tengah. He is actively involved in the academic community and contributes to the field of nursing. As an expert in the field, he has made significant contributions to scholarly discussions and research in nursing. With a dedicated focus on enhancing healthcare education, he is committed to advancing the understanding and practice of nursing. (email: sukarmin@umkudus.ac.id).



Sri Siska Mardiana, Ns., M.Kep is associated with the Department of Nursing, Faculty of Health Sciences, at Universitas Muhammadiyah Kudus, Jawa Tengah, Indonesia. Actively engaged in the academic community, she makes valuable contributions to the field of nursing. She got Bachelor's degree (2009) and Nursing degree (2010) from Universitas Muhammadiyah Yogyakarta; Master's degree (2018) from Universitas Diponegoro Semarang in 2018. Dedicated to the improvement of healthcare education, she continues to contribute significantly to the understanding and practice of nursing. (email: srisiska@umkudus.ac.id).