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Original Article

The effect of Jacobson's progressive muscular relaxation on the sleep quality of final-year medical students at Universitas Nusa Cendana, Indonesia

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ABSTRACT

Medical students are among the adults who have poor sleep quality. The causative factor is the different academic activities of medical students from other students. The curriculum load, especially the final assignment (the undergraduate thesis), led to increased student responsibilities and learning activities that may affect their sleep time. Improvement of poor sleep quality can be done through non-pharmacological therapies, one of which is Jacobson's Progressive Muscular Relaxation (JPMR). This study aims to testify to the effect of Jacobson's Progressive Muscular Relaxation on the sleep quality of final-year medical students. This study used a quasi-experimental with a pre-test–post-test control group design. The samples were chosen using a purposive sampling technique with a total sample of 30 people divided into two groups: the intervention group and the control group. Sleep quality was measured using Pittsburgh Sleep Quality Index questionnaire. The data were analyzed using McNemar test (pre- and post-test in the same group) and Chi-square test (between the intervention and control groups' scores). Based on the results of the McNemar test in the intervention group, there was a significant difference on the sleep quality pre-test and post-test ($P = 0.002$). On the other hand, there was no significant difference in the control group's pre-test and post-test scores ($P = 1.000$). Based on the result of the Chi-square test, there was a significant difference on the sleep quality post-test results in the intervention group compared with the control group ($P = 0.002$). Hence, it can be concluded that JPMR has a significant effect on improving the sleep quality of final-year medical students of Universitas Nusa Cendana.

Keywords: Jacobson's progressive muscular relaxation, medical students, Pittsburgh sleep quality index, Sleep quality

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INTRODUCTION

One of the basic human needs that have an important function is sleep.[1] The condition of fatigue due to limited activity causes the human body to automatically send signals to rest. Humans must sleep to return the body to its optimal activities in the next day. The American Academy of Sleep Medicine and the Sleep Research Society recommend that sleep duration for the adult age group (age 18–60 years) is ≥7 h.[2] Based on the results of a report by the Center for Disease Control which analyzed, data from the Behavioral Risk Factor Surveillance System in 2014 found that the prevalence of sleep in adults is very low. Poor sleep quality can result in physiological and psychological balance disorders.[3]

Medical students are among the adults who have poor sleep quality. The prevalence of poor sleep quality among medical students is reported to be higher than that of non-medical students.[4] The causative factor is the different academic activities of medical students.[5] The block system curriculum

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in lectures requires medical students to be more active in learning and present every day. Medical students are also required to balance their time, while their class schedule is busy and there is a lot of workloads and other work that needs to be done so it is difficult for them to arrange a healthy sleep schedule.[6] The results of several studies show poor sleep quality in medical students by 87.1% in Brazil and 62% in Ethiopia, as well as in the Asian region of 27.38% in China, 38.2% in Nepal, and 59.4% in Malaysia.[5,7-10] Bianca *et al*. (2020), in their research, stated that the results of calculating the global Pittsburgh Sleep Quality Index (PSQI) score were obtained from a total of 103 students of the Udayana University Medical Education Study Program, the proportion of preclinical stage students who had good sleep quality was 43 people (41.7%) and poor sleep quality was 60 people (58.3%).[11] A similar study of medical faculty students at Universitas Nusa Cendana (UNDANA) with a total of 131 students as respondents, only nine of them had the qualifications sleep quality which is good.[12]

The curriculum load is added to the final assignment, namely, the undergraduate thesis led to increased student responsibilities and activities that affected their sleep time. This is supported by research conducted on final-year students at the Faculty of Medicine and Health Sciences, Jambi University, where 84 out of 92 respondents had poor sleep quality.[13]

Improvement of poor sleep quality can be done through non-pharmacological therapies, one of which is Jacobson's Progressive Muscular Relaxation (JPMR). JPMR is a progressive muscle relaxation that includes a combination of muscle relaxation and breathing. JPMR does not only focus on one part of the body but the whole body from head to toe. This relaxation technique was discovered by Dr. Edmund Jacobson in 1920 at Harvard University. Focuses on toning and relaxing certain muscle groups sequentially which help to relieve stress, anxiety, tension, fatigue, and depression.[14]

Muhith *et al*. (2020) found that progressive muscle relaxation affected the sleep quality of the elderly with $P = 0.000$ ($P < 0.05$).[15] Similar research by Kareri *et al*. (2020), giving JPMR therapy to the elderly at Budi Agung Social Institution, is effective in improving sleep quality.[16] This result is contrary to the previous studies conducted by Hauri *et al*. who stated that deterioration in sleep quality in insomnia patients after performing relaxation therapy.[17] Meanwhile, research conducted on health students in 2019 showed that there was a significant difference in sleep quality before and after progressive muscle relaxation ($P = 0.000$).[18] However, research on JPMR conducted on students, especially medical students, has not been studied much. The purpose of this study is to testify to the effect of JPMR on the sleep quality of final-year medical students.

MATERIALS AND METHODS

Study Design

The design of this study was a quasi-experimental with pre-test–post-test control group design. This study was conducted in September 2022 in the PSPD Clinical Skill Laboratory at Universitas Nusa Cendana which is located in Jalan Adisucipto Penfui, Lasiana Village, Kelapa Lima District, Kupang City, NTT province, Indonesia.

Sample

The sample in this study was PSPD UNDANA final-year students. The sample selection used a non-probability sampling method with a purposive sampling technique. The inclusion criteria were as follows: final-year PSPD UNDANA students class of 2019 who are currently working on their final project have poor sleep quality (PSQI score >5), are willing to be a sample by signing g the informed consent, not smoking, not currently taking beta-blocker and sedative-hypnotic drugs (sleeping pills), and not currently consuming coffee (≥3 cups per day) and alcohol.

Students who are excluded are those who have a history of muscle disorders (stroke, Parkinson's disease, and epilepsy), a history of cardiopulmonary disorders (heart and lung disease), a history of fracture, dislocation of the limbs ≤6 months, and who are undergoing regular aerobic exercise and relaxation (3–5× a week) for the past 2 weeks, having severe and very severe depression, anxiety, and stress disorders 21, experiencing chronic pain (≥6 months), and who are on a diet. From the total population of 58 final-year students, the number of samples obtained in this study was 30 people randomly divided into two groups, namely, the intervention group and control group (15 people per group). The dropout criteria in this study was students who had signed the informed consent but could not be contacted or not completed the training sessions (<80% session).

Instrument

The PSQI was an instrument used as a questionnaire to measure sleep quality. This questionnaire consisted of seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction. The score for each component has a value range of zero to three with a different calculation method for each question. The results of the sum of the seven components or what is called the global score range from 0 to 21 and are classified into two groups. A global score of less than equal to five (≤5) is classified as good sleep quality and a score of more than five (>5) is classified as poor sleep quality.

Intervention

Samples filled out a pre-test which is the PSQI questionnaire in last August 2022 and then divided into two groups. The intervention group received JPMR training from the researcher

at the beginning of the study. Then, they practiced the JPMR guided by an audio recording of JPMR instructions and relaxing music of water sound meditation once a day for 7 days (12–18 September 2022). The duration of each practice session was 25–30 min. The exercise was conducted offline at the Medical School Clinical Skill Laboratory. The JPMR guide can be accessed at: http://bit.ly/3XU4QRl. Meanwhile, the control group was not practicing JPMR. A day after the intervention group had finished their sessions; both groups were given the same post-test using the same PSQI questionnaire. None of the samples dropped out during this study [Figure 1].

Data Analysis

Data analysis was carried out in two stages. First, the univariate analysis aims to get an overview of the characteristics of the respondents which include age, sex, body mass index (BMI), and distribution of sleep quality in the intervention group and control group. Second, the bivariate analysis used the McNemar test for paired samples and the Chi-Square test for independent samples (unpaired).

Ethics Approval

This study has been approved by the Ethical Committee UNDANA, Indonesia (73/UNI15.16/KEPK/2022).

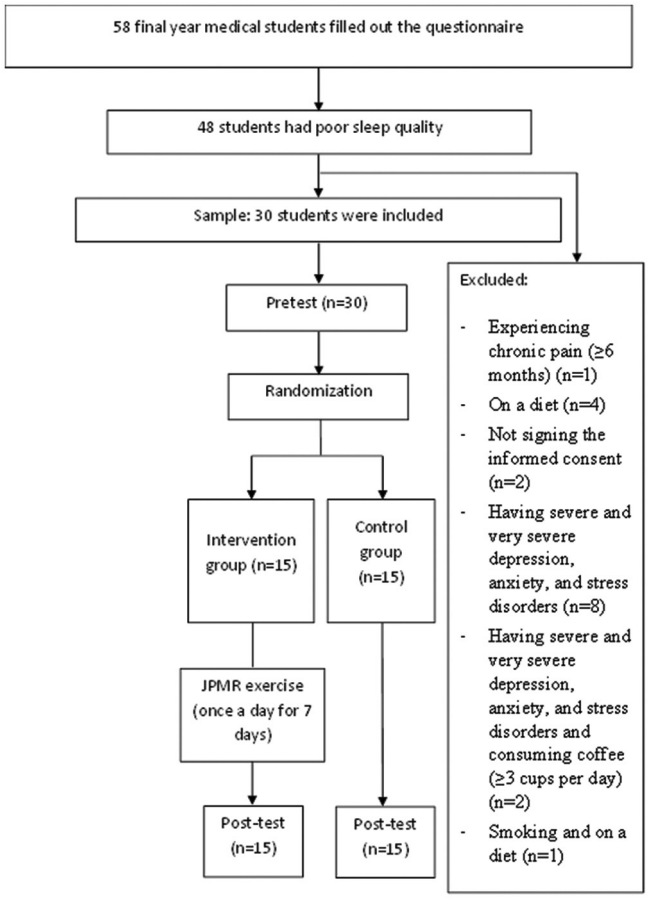

Figure 1: Sampling process and intervention procedures

RESULTS

Based on the data in Table 1, it is known that in the intervention group, the gender distribution of the female sample (60%) is greater than the number of male samples (40%), the largest sample age is 20 years (60%), and the least is 18 years (6.7%). Based on BMI, eight people had normal BMI (53.3%), while four people were considered underweight (26.7%) and three others were considered overweight (20%).

In the control group, the gender distribution of the female sample (86.7%) was greater than that of the male sample (13.3%), the age of the largest sample participating in the study was 21 years (53.3%), and the least was 19 years (6.7%). Based on BMI, nine people had normal BMI (60%), four people were underweight (26.7%), and two other people were overweight (13.3%).

Table 2 shows that in the intervention group that received JPMR exercise, it was found that 15 people had poor sleep quality during the pretest (100%) changed to only five people who had poor sleep quality during the post-test (66.7%). In the control group that did not receive the JPMR exercise, it was found that 15 people had poor sleep quality during the pre-test (100%) changed to only one person experienced a change from poor sleep quality to good sleep quality (6.7%).

Based on the results in Table 2, it can be concluded that there was a significant difference in sleep quality in the intervention group between before (pre-test) and after being given the JPMR exercise (post-test) ($P = 0.002$). Meanwhile, in the control group, the results showed that there was no significant difference in sleep quality between the pre-test and post-test ($P = 1.000$).

Table 3 shows that there was a significant difference in the quality of sleep in the intervention group compared to the control group with a significance value of $P = 0.002$ ($P < 0.05$), so it can be concluded that JPMR has a significant effect on the sleep quality of PSPD UNDANA final-year students. The odds ratio value was 28. It means that the intervention group experienced 28 times better sleep quality compared to the control group.

DISCUSSION

The results showed that the intervention group showed significant differences in sleep quality between the pre-test and post-test ($P = 0.002$). It happened because the intervention group was given treatment in the form of JPMR once per day for 7 days in a row with a duration of 25–30 min which will help improve the sleep quality.[21] The results of this study are

Table 1: Characteristics of sample

Characteristics	Intervention Group		Control Group	
	Frequency (*n*=15)	Percentage	Frequency (*n*=15)	Percentage
Sex				
Male	6	40	2	13.3
Female	9	60	13	86.7
Age				
18 year	1	6,7	0	0
19 year	0	0	1	6.7
20 year	9	60	6	40
21 year	3	20	8	53.3
22 year	2	13.3	0	0
IMT				
Underweight (<18.5)	4	26.7	4	26.7
Normal (18.5–24.99)	8	53.3	9	60
Overweight (25–29.99)	3	20	2	13.3

Table 2: McNemar pre-test versus post-test result on intervention and control groups

Group	Sleep quality	Pretest	Post-test	*P*-value
Intervention	Poor	15 (100%)	5 (33.3%)	0.002
	Good	0 (0%)	10 (66.7%)	
Control	Poor	15 (100%)	14 (93.3%)	1.000
	Good	0 (0%)	1 (6.7%)	

*P<0.05: McNemar test

in line with research conducted by Manitu *et al*. (2019) on Stikes Husada Mandiri Poso students by doing JPMR exercises for four consecutive days, respectively, showed a significant difference in sleep quality before and after the intervention ($P = 0.000$).[18]

On the other hand, there was no significant difference in the sleep quality of the control group between the pre-test and post-test scores ($P = 1.000$). The absence of JPMR exercise in the control group left the factors affecting the sleep quality remained disturbing. Those factors were the academic workloads of the final-year medical students, such as the undergraduate thesis. This workload may trigger fatigue and emotional distress.[19,20] In addition, students' environmental factors may also affect the quality of their sleep, such as light, noise, temperature, and electronic distractions. Therefore, the results showed no significant changes in the control group during the post-test.

Based on the results of a comparative analysis of the sleep quality of the control group versus the intervention group using the Chi-square test, there were significant differences in the sleep quality of the intervention group compared to the control group. It can be concluded that there was a significant effect of JPMR on the sleep quality of final-year students with a significance value of $P = 0.002$ ($P < 0.05$).

The action mechanism of JPMR in improving sleep quality is by decreasing the stimulation of the sympathetic nervous system and increasing the stimulation of the parasympathetic nerves.[23] The activity of the parasympathetic nervous system (trophotropic) causes a relaxation response by stimulating the nerves in a relaxed state and will be passed on to the hypothalamus which then produces Corticotropin Releasing Factor (CRF). Furthermore, CRF stimulates the pituitary gland to increase several hormones, such as β-endorphins, enkephalins, and serotonin. Endorphins can suppress the production of cortisol which is known as the stress hormone and activates the pain control system in order that the body relaxes and falls asleep easily. Increased serotonin secretion also helps regulate mood and regulate sleep. Physiologically, the fulfillment of this need for sleep occurs due to decreased activity of the Reticular Activating System and norepinephrine as a result of decreased activity of the brain stem system. These components handle and control mood, stress, and anxiety which can affect the quality of a person's sleep.[18,22,23,26-28]

The results of this study are in line with the results of a study by Manitu *et al*. (2019) which showed that progressive muscle relaxation can overcome poor sleep quality.[18] This is also supported by research results from Margi *et al*. (2020) that JPMR is effective in reducing poor sleep quality.[14]

Table 3: Chi-square post-test result of control versus intervention groups

JPMR	Sleep Quality		Total	OR 95% CI	*P*-value
	Poor	Good			
Control Group	14 (93.3%)	1 (6.7%)	15 (100%)	28 (2.82–277.96)	0.002
Intervention Group	5 (33.3%)	10 (66.7%)	15 (100%)		
Total	15 (63.3%)	15 (36.7%)	30 (100%)		

*$P<0.05$: Chi-square test

CONCLUSION

JPMR has a significant effect on improving the sleep quality of final-year students of Universitas Nusa Cendana Medical Education Study Program (PSPD UNDANA).

Limitation

The sample size of this study was small but included all of the final-year medical students in a university. Thus, the generalizability of this study may be limited to students with similar characteristics.

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