THE RELATIONSHIP BETWEEN INSOMNIA and FITNESS LEVEL in MEDICAL FACULTY STUDENTS of UNIVERSITAS MUHAMMADIYAH PURWOKERTO

Nisa Yulia[1], Dony Ardianto[2], Mustika Ratnaningsih Purbowati[1*], Resa Budi Deskianditya[1]

[1]*Faculty of Medicine, Universitas Muhammadiyah Purwokerto, Indonesia*
[2]*Salatiga City Regional General Hospital*

***) Correspondence Author**

Mustika Ratnaningsih Purbowati
Faculty of Medicine
Universitas Muhammadiyah Purwokerto, Jawa Tengah 53182
Email Address: *mustikaratnaningsih@gmail.com*

Abstract

Background: Physical fitness is a condition in which a person can carry out daily activities in a healthy and fit condition without quickly experiencing fatigue. Several factors can affect fitness level, such as a decrease in the hormone melatonin caused by insomnia. It will affect circadian rhythms and reduce a person's physical activity, thus affecting fitness level.
Objective: To observe the relationship between insomnia and fitness level in Medical Faculty students of Universitas Muhammadiyah Purwokerto.
Methods: This study used a cross-sectional analytic observational study design. Primary data was obtained from the results of the Harvard Step Test and the Insomnia Severity Index (ISI) questionnaire. The subjects were selected through a non-probability sampling technique by purposive sampling. The statistical tests used were Fisher's test and logistic regression.
Results: 42 male students were selected from all Medical Faculty students of Universitas Muhammadiyah Purwokerto. The bivariate analysis showed that the percentage of non-insomnia respondents with poor fitness level was 73.9% and those with good fitness level was 26.1%. While the percentage of insomnia respondents with poor fitness level is 84.2% and those with good fitness level is 15.8%. Fisher's analysis results showed a p-value 0.477 ($p>0.05$).
Conclusion: There is no relationship between insomnia and fitness level in Medical Faculty students of Universitas Muhammadiyah Purwokerto.

Keywords: Insomnia, Fitness Level, Harvard Step Test, Insomnia Severity Index

INTRODUCTION

Sleep is one of the basic human needs that can help to sustain one's physical and psychic state (Ambarwati, 2017). According to Singh and Suni (2022), the recommended bedtime times for 18-25 years old vary from 7-9 hours (Singh and Suni, 2022). If a person complains that s/he has trouble falling asleep, staying asleep, staying awake at night, or waking up early in the morning, it can be assumed that s/he has insomnia (Van Someren, 2021).

Insomnia is one of the most common sleep disorders that can affect many people and have significant public health effects. One effect of insomnia is the changes in neurological systems, such as a decline in the quantity and size of neurons. This can result in a decline in the neurotransmitter's optional action in the pineal gland, affecting the hormone melatonin production, which is crucial for controlling sleep (Djokic et al., 2019; Riris Wahyu Satyaningtyas & Nurul Hidayah, 2020)

Based on studies of Students of the Faculty of Medicines in Baiturrahmah University by Ahmad, Anissa and Triana (2022), it was found that of 71 students, 49 (69%) were affected by insomnia consisting of 35 (71%) light insomnia, 12 (24%) moderate insomnia, and 2 (5%) severe insomnia (Ahmad, Anissa and Triana, 2022). The high incidence of insomnia in medical school students is due to several intrinsic and extrinsic factors. It can be behaviour, lifestyle, academic anxiety, internet use, and physical activity (Manggopa, Kundre and Katuuk, 2019; Anissa, Ashari and Hariyani, 2022; Mashfufa et al., 2022).

The research by Moreno-Vecino et al. (2017), shows that people with sleep disorders such as insomnia have a low fitness level. In that study,

fitness levels were divided into four quartiles: 1, 2, 3, and 4, with quartile 1 representing the lowest fitness level. The findings revealed that, even with typical sleep length, there was a substantial difference between the first quartile and other fitness level quartiles in feelings of exhaustion after waking up. This suggests that sleep disorders like insomnia can affect a person's level of fitness (Moreno-Vecino et al., 2017). The results of the study are consistent with those of Lee, Kang, and Kim (2021), which state that the upper body strength, lower body strength, and durability of cardiorespiratory were significantly lower in groups of people with reduced sleep quality and insomnia (Lee, Kang and Kim, 2021).

This study is essential due to the substantial frequency of insomnia, particularly among students at the Faculty of Medicine, and a need for more research on the relationship between insomnia and fitness level. This allowed us to investigate further and conduct research on the incidence of insomnia and the degree of fitness of students at the Faculty of Medicine, Universitas Muhammadiyah Purwokerto, to determine whether there is a correlation between the two (Sathivel and Lely, 2017; Ahmad, Anissa and Triana, 2022).

Due to previous research suggesting that most university students have insomnia, the study was conducted on young men at the Faculty of Medicine, Universitas Muhammadiyah Purwokerto. Additionally, the restriction of study participants to men is intended to protect insomnia from premenstrual syndrome in women, which can result in insomnia, anxiety, and fatigue while engaging in physical activity due to increased estrogen and progesterone hormones (Sathivel and Lely, 2017; Ahmad, Anissa and Triana, 2022; Tajuddin, Irdianty and Rakhmawati, 2022; Vyas and Suni, 2022).

METHODS

This study uses an analytical cross-sectional research design, in which the examined variables are neither treated nor intervened with, and all readings are taken simultaneously (Masturoh and Anggita, 2018). The data collection was done on the students at the Faculty of Medicine, Universitas Muhammadiyah Purwokerto, for the academic years 2019–2022, and it was put into practice in January–February 2023.

The research data obtained is analyzed using JASP software for statistical data processing. As for the large subjects needed in this study, there were a minimum of 38 subjects, plus a reserve sample of 10% of the total sample of 4 subjects, so the final study subject required was as many as 42 research subjects, with the predetermined inclusion and exclusion criteria. Male students at the Faculty of Medicine, Universitas Muhammadiyah Purwokerto year 2019–2022, age 18–25, active students, and willing to take the Harvard Step Test. This study excludes participants who routinely consume coffee more than three times per week and three hours before bed and those who have respiratory or cardiovascular diseases and take antidepressants, β-Blocker, ACE-Inhibitor, or corticosteroids.

RESULTS

From the entire population, it was found a research subject that met the inclusion and exclusion criteria of 42 people and matched the number of subjects needed. The research subject consists of students of 2019, 2020, 2021, and 2022. The research data used is the primary data derived from the Insomnia Severity Index (ISI) and the Harvard Step Test (HST) results.

Table 1. Respondent characteristics

Variable	N	%
Age		
18	8	19,0
19	13	31,0
20	5	11,9
21	12	28,6
22	4	9,5
Smoking Activity		
No Smoking	31	73,8
Smoking	11	26,2
Physical Exercise		
<3 times/week	25	59,5
≥3 times/week	17	40,5
Body Mass Index (BMI)		
Thin	2	4,8
Normal	18	42,9
Fat	22	52,3
Level of Insomnia		
No Insomnia	23	54,8
Insomnia	19	45,2
Level of Fitness		
Very Poor	30	71,4
Poor	3	7,1
Moderate	3	7,1
Good	6	14,4
Very Good	0	0

UNIVARIATE ANALYSIS

Univariate analysis of age, smoking, physical exercise, body mass index, insomnia, and fitness level is presented in the form of the respondent's frequency distribution table in Table 1. According to Table 1, the respondent's ages ranged from 18 to 22 years old, with 13 (31%) respondents aged 19 years. 31 respondents (73.8%) reported not smoking, a higher percentage than those who did. 25 responses (59.5%) work out three times a week. Twenty-two respondents (52.3%), or a large majority, had an overweight BMI. There are more respondents (up to 23 (54.8%)) without insomnia than respondents who have it. According to fitness level, as many as 30 out of 42 are much less fit (71.4%).

BIVARIATE ANALYSIS

The statistical test for bivariate analysis is Fisher's test. However, because one of the conditions for using the chi-square test is that there are no cells with a value of zero (0) and the cell frequency with an expected count value
(E) 5 does not exceed 20% of the total cell, there are two cells with an expected count (E) of 5 at BMI, and thus the chi-square test cannot be used. As a result, cells based on fitness level and BMI were combined in this bivariate analysis. There are two levels based on fitness level and BMI. The fitness level is divided into poor (very poor) and good (moderate-very good). Meanwhile, BMI is divided into BMI ≤25 and BMI >25 (Desiplia, Indra and Puspaningtyas, 2018; Aprianto and Nurwahyuni, 2021).

The Relationship Between Smoking Activity and Fitness Level

The percentage of non-smokers with poor fitness level was 83.9%, whereas the percentage of those with high fitness level was 16.1%. While the percentage of respondents who smoked and had a poor fitness level was 63.6%, and the percentage with a good fitness level was 36.4%. The Fisher's analysis results showed that the p-value was 0.209. It is concluded from the analysis's findings that smoking behaviour and fitness level are not correlated.

This is incompatible with previous studies claiming that smoking negatively correlates with fitness level, including muscle endurance, cardio-respiration and VO2 Max (American Heart Association, 2020; Yusup and Rochmani, 2021).

Nevertheless, Nyoman's research (2022) has similar results from this study. Nyoman (2022) suggests no significant correlation exists between smoking habits and physical fitness (p=0.3803). This might occur since second-hand smoke contaminated by cigarettes from current smokers can affect non-smokers (Nyoman Ari Purwaningsih and Ketut Sutiari, 2022).

The study of De Borba et al. (2014) states that VO2 Max between active and passive smokers have no significant difference, and neither of them necessarily have significant fitness level. This may lead to the conclusion that there is no significant correlation between smoking activity and fitness level. BMI is another factor that may affect a person's level of fitness (De Borba et al., 2014).

Table 2. The Relationship between Smoking Activity and Fitness Level

Smoking Activity		Fitness Level		Total	p-value
		Poor	Good		
No smoking	N	26	5	31	
	E	24	7	31	
	%	83,9	16,1	100	
Smoking	N	7	4	11	
	E	9	2	11	0,209
	%	63,6	36,4	100	
Total	N	33	9	42	
	E	33	9	42	
	%	78,6	21,4	100	

The Relationship between Physical Exercise and Fitness Level

Based on Table 3, the percentage of respondents who exercised physically less than three times per week and had a lower fitness level was 68.0%. In contrast, the percentage of respondents who had a higher degree of fitness was 32.0%. While 94.1% of respondents reported doing physical activity fewer than three times per week and having a lower level of fitness, 5.9% of respondents reported having a high fitness level. According to Fisher's analysis, there is no correlation between physical activity and fitness level, which generated a p-value of 0.060. The results of this study are incompatible with previous studies, which suggest that physical exercise has a significant correlation with fitness level and can affect fitness level. No journal has found that physical exercise has no relation to the fitness level, but this can happen because other factors can influence fitness level, such as age, sex, BMI, and smoking (Pranata and Kumaat, 2022).

Table 3. The Relationship between Physical Exercise and Fitness Level

Physical Exercise		Fitness Level		Total	p-value
		Poor	Good		
<3 times/week	N	17	8	25	
	E	20	5	25	
	%	68,0	32,0	100	
≥3 times/week	N	16	1	17	
	E	13	4	17	0,060
	%	94,1	5,9	100	
Total	N	33	9	42	
	E	33	9	42	
	%	78,6	21,4	100	

The Relationship between Body Mass Index and Fitness Level

According to the data in Table 4, 65.0% of people with a BMI ≤25 have a lower fitness level, and 35.0% have a good fitness level.

Contrarily, 9.1% of people in the BMI >25 categories have a good fitness level and 90.9% of them have a lower fitness level. Fisher's analysis revealed a p-value of 0.062, indicating no correlation between BMI and fitness level.

Table 4. The Relationship between Body Mass Index (BMI) and Fitness Level

BMI		Fitness Level		Total	p-value
		Poor	Good		
BMI ≤25	N	13	7	20	
	E	16	4	20	
	%	65,0	35,0	100	
BMI >25	N	20	2	22	
	E	17	5	22	0,062
	%	90,9	9,1	100	
Total	N	33	9	42	
	E	33	9	42	
	%	78,6	21,4	100	

This study's results are incompatible with previous studies that suggest that BMI (Body Mass Index) has a significant correlation with fitness level. Aprianto (2021) mention that this may be due to differences in control of factors that can affect fitness such as age, sex, physical activity, and smoking status (Aprianto and Nurwahyuni, 2021).

But there are also some studies that have similar results. This similarity is due to mutual control over such factors as age, gender, and cardiorespiratory disease that can affect level of fitness. Furthermore, the use of the Body Mass Index (BMI) as a measuring instrument cannot explain whether the BMI score comes from muscle mass, bone, liquid or fat (Aprianto and Nurwahyuni, 2021).

The Relationship between Insomnia and Fitness Level

Table 5 shows that 73.9% non- insomniacs have poor fitness level and 26.1% have a better fitness level. While the percentage of insomniacs who have a poor fitness level is 84.2% and 15.8% have a good fitness level. Results from Fisher's analysis resulted in a p- value of 0.477. At any rate, insomnia has nothing to do with fitness level.

Table 5. The Relationship between Insomnia and Fitness Level

Insomnia		Fitness Level		Total	p-value
		Poor	Good		
No Insomnia	N	17	6	23	
	E	18	5	23	
	%	73,9	26,1	100	
Insomnia	N	16	3	19	
	E	15	4	19	0,477
	%	84,2	15,8	100	
Total	N	33	9	42	
	E	33	9	42	
	%	78,6	21,4	100	

No research has stated explicitly that insomnia is related to fitness level. According to Matthew and Wu (2022), insomnia does not directly affect a person's fitness level. Lack of sleep may not affect cardiovascular and respiratory response to sports, aerobic and anaerobic performance capabilities, muscle strength, or electromechanical response. But lack of sleep can increase the risk of many health problems, such as type 2 diabetes mellitus, hypertension, kidney disease, and stroke (Fry and Rehman, 2022; Mateo and Wu, 2022).

Meanwhile, regular exercise can help improve the quality of sleep, which could indirectly affect melatonin level. Exercise can help relieve symptoms of insomnia that can affect a person's performance at work or school, the urge for sex, memory, and judgement. Lack of energy can cause anxiety, depression, or irritability. Insomnia can also shorten one's life expectancy. Therefore, it is important to

overcome and treat insomnia to maintain overall health and well-being (O'Connell and Martinez, 2022).

Although melatonin and exercise may improve sleep quality, there is no evidence to indicate that melatonin can directly affect fitness level. However, adequate sleep is essential for athletic performance, since lack of sleep can increase the risk of medical problems such as type 2 diabetes Mellitus, hypertension, kidney disease, and stroke (Fry and Rehman, 2022).

Based on the theory previously explained, several things could cause this study to indicate insignificant results. These include the possibility of those who do not have insomnia but do physical exercise <3 times a week, those who do not have insomnia have BMI >25, those who do not have insomnia but smoke, those who do have insomnia do physical exercise ≥3 times a week, those with insomnia do have a BMI ≤25, and those with insomnia but do not smoke.

For those without insomnia who perform physical exercise <3 times a week, it can be said that the respondents have been able to adjust sleep patterns and cope with the stressors found but have not taken the time to do physical training ≥3 times a week. This left the respondents without insomnia but with a lower level of fitness (Wulandari, Hadiati and As, 2017).

It can also be due to non-insomniac respondents having BMI >25, where BMI >25 may be caused by such factors as genetic factors, lack of physical exercise, irregular diet, and BMI that come from either excess fat or large bone mass, not from muscle mass. So even if the respondents do not suffer from insomnia, the respondents still have a low level of fitness (Aprianto and Nurwahyuni, 2021; Kuswandi and Rahayu, 2022).

Those who did not have insomnia but smoked. This can cause respondents to have low cardiorespiratory system durability and tire out more quickly. So, the respondents have a lower level of fitness even without insomnia (Arisandi et al., 2018).

It is also possible for those who have insomnia to do physical exercise ≥3 times a week. This may occur because insomnia on the part of respondents is due to anxiety/depression and an environmental factor interfering with a respondent's sleep pattern so that the respondents chose to do physical exercises such as football, badminton, or physical training at the gym at a time that was supposed to be spent sleeping. As a result, respondents had a good level of fitness despite insomnia (Chandra and Makatika, 2022).

For respondents with insomnia who do have a BMI ≤25, this BMI can be affected by factors such as genetics, physical exercise, and diet. These respondents likely had a BMI ≤25 by genetic factor, had a habit of doing regular and well-coordinated physical exercise, and a good diet, so although, with BMI ≤25 and an insomniac, it was still in good fitness level (Kuswandi and Rahayu, 2022).

The last, it was possible for those who suffered from insomnia but did not smoke. In non-smoking respondents, the durability of cardiorespiratory is stronger and less sensitive to fatigue. This would have a good effect on a person's fitness level. Respondents can have a good fitness level despite insomnia (Arisandi et al., 2018).

Some of these possibilities may result in a lack of fitness level for those without insomnia and a good fitness level for those who are insomnia. So, when a bivariate analysis was conducted between insomnia and fitness level, the results comes up with insignificant results.

MULTIVARIATE ANALYSIS

Multivariate analysis is used to know the correlation between multiple variables simultaneously, to predict the value of one variable with another, and to know which of the most dominant or affected the dependent variable. The variables measured chosen from the results of a bivariate analysis which has a p- value <0.25. Thus, multivariate analysis does logistic regression against the smoking variables, physical exercise, and BMI with a p- value of each 0.209; 0.060, and 0.062 (p<0.25).

Table 6. The Results of Logistic Regression Multivariate Analysis

Variable	p-value	OR
Smoking Activity	0,308	2,645
Physical Exercise	**0,027***	0,041
BMI	**0,011***	0,114

Physical and BMI are factors that have a significant correlation with fitness level. This can be seen from multivariate analysis in Table 7, which shows that the final p-value of both is <0.05. Smoking cannot be categorized as a factor that can affecting fitness level because it has the greatest p-value of 0.308 (p>0.05).

Therefore, we controlled for the smoking variable and obtained a change in the OR (Odds Ratio) value on the physical exercise and BMI variables <10%, so the smoking variable was excluded from the modelling and the results were obtained in Table 7.

Table 7. The Results of Logistic Regression Multivariate Analysis After Controlling Smoking

Variable	p-value	OR
Physical Exercise	**0,019***	0,042
BMI	**0,011***	0,109

From the results of multivariate analysis using logistic regression, it was concluded that physical exercise (p=0.019) and BMI (p=0.011) had a significant relationship with fitness level, with OR (Odds Ratio) 0.042 and 0.109, respectively. If interpreted, physical exercise and BMI have a significant relationship with fitness level, but do not have a strong relationship (OR<1). So, the variables of physical exercise and BMI are not strong enough to influence fitness level. The results of this study are in line with the studies of Arifin (2018) and Yusri (2020), which state that physical exercise and BMI are factors that have a relationship with fitness level, although both studies do not explain that physical exercise and BMI are not strong enough to influence fitness level (Arifin, 2018; Yusri, Zulkarnain and Sitorus, 2020).

CONCLUSION

According to the results of the analysis and discussions, it can be concluded that 19 respondents (45.2%) in students of the Faculty of Medicine at Universitas Muhammadiyah Purwokerto having insomnia. As many as 30 respondents (71.4%) from the Faculty of Medicine at Universitas Muhammadiyah Purwokerto have a very low fitness level. According to the results of bivariate analysis, there is no relationship between insomnia and fitness level in students of the Faculty of Medicine at Universitas Muhammadiyah Purwokerto. This may be caused by the possibility that respondents who do not experience insomnia but do physical exercise <3 times a week, respondents who do not have insomnia have BMI >25, respondents who do not experience insomnia but smoke, respondents who experienced insomnia do physical exercise ≥3 times a week, respondents who experienced insomnia but have BMI ≤25, and respondents who experienced insomnia but do not smoke. Meanwhile, from the multivariate analysis, it was found that physical exercise and BMI had significant relationship with fitness level but had a weak relationship (OR<1). Therefore, BMI and physical exercise are not strong enough to influence fitness level.

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