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The Relationship between Sleep Quality and Stress Level in Biology Education Students

Apreza Eka Yuliani[1)], Erna Wijayanti[2*)], Sefa Bulut[3)]
[1,2] Biology Education, Universitas Islam Negeri Walisongo, Semarang, Indonesia
[3]Ibn Haldun University, Istanbul, Turkey
e-mail: [*)] wijayantierna@walisongo.ac.id

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ABSTRACT

Sleep is a fundamental physiological process essential for maintaining mental and physical health. University students, particularly those in demanding academic programs, often experience sleep disturbances that may influence their stress levels. This study aimed to determine the relationship between sleep quality and stress levels among Biology Education students at UIN Walisongo Semarang. A descriptive–analytic study with a cross-sectional design was conducted involving 36 students selected through proportional random sampling from the 2020–2022 cohorts. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI), while stress levels were assessed using the Perceived Stress Scale (PSS). Data were analyzed using the Chi-square test at a 95% confidence level ($\alpha = 0.05$). The findings indicated that most respondents (97.2%) experienced poor sleep quality and moderate stress levels (86.1%). Statistical analysis showed no significant relationship between sleep quality and stress levels ($\chi^2 = 0.165$, $p = 0.920$). Although most students experienced poor sleep quality and moderate stress, no significant association was found between these two variables. Further research with a larger and more diverse sample is recommended to confirm these findings and explore additional factors affecting students' sleep and stress patterns.

Keywords: sleep quality, stress level, biology education, students, university

INTRODUCTION

Sleep is a fundamental physiological process that supports physical recovery, mental stability, and emotional regulation. It allows the body to restore energy, consolidate memory, and maintain hormonal balance (Utomo & Alya, 2022). Inadequate or poor-quality sleep can lead to decreased cognitive function, impaired concentration, and emotional instability, which in the long term may affect daily performance and overall well-being (Mutaqin et al., 2021; Walker, 2017). Adults are generally recommended to sleep for seven to eight hours each night to achieve optimal functioning (Stores, 2009). However, many individuals, particularly university students, fail to meet this need due to irregular schedules, academic workload, and lifestyle habits (Lemma et al., 2020; Simonelli et al., 2018).

Sleep quality encompasses both quantitative and qualitative dimensions, including sleep duration, latency, depth, and perceived restfulness (Kiki & Sinta, 2019). Good sleep quality is indicated by continuous and refreshing sleep, while poor sleep quality is characterized by short duration, frequent awakenings, and non-restorative rest (Sadock et al., 2015). Poor sleep quality has been associated with various psychological and physical problems such as stress, anxiety, and depression (Budyawati, 2019). Recent findings highlight that the prevalence of poor sleep among students has increased following the COVID-19 pandemic, partly

due to extended screen exposure and disrupted learning patterns (Putri & Priyono, 2024; Effects of Perceived Stress on College Students' Sleep Quality, 2024). This condition demonstrates how lifestyle adaptation and technological dependence can exacerbate students' vulnerability to mental and sleep disorders.

University students represent a population that is particularly vulnerable to stress and sleep disturbances. Academic demands, such as examinations, project deadlines, and high performance expectations, often trigger psychological pressure that interferes with normal sleep cycles (Ratnaningtyas & Fitriani, 2019; Kartika, 2021). Physiologically, stress triggers the release of cortisol, epinephrine, and norepinephrine, activating the sympathetic nervous system and disrupting sleep regulation (Setiawati et al., 2016). When this stress response persists, it may increase alertness and delay sleep onset, resulting in poor sleep quality (Effects of Physical Activity on Sleep Quality, 2025). Prolonged academic stress combined with irregular routines, caffeine consumption, and excessive digital engagement further exacerbates this condition (Dewi Trihandayani & Shofia, 2023).

Previous studies have shown varied results regarding the relationship between stress and sleep quality among students. Mutaqin et al. (2021) and Alotaibi et al. (2020) found a significant relationship between higher stress levels and poorer sleep quality, suggesting that stress is a key determinant of sleep disturbance. Conversely, Mardayanti and Wahyuni (2019) reported no significant relationship, implying that other factors such as personal coping strategies, physical activity, and social support may moderate this association. Similar findings were observed in more recent studies that identified physical exercise, rumination, and depressive symptoms as mediating factors between stress and sleep quality (Effects of Physical Activity on Sleep Quality, 2025). These inconsistencies highlight the complex, multifactorial nature of the stress–sleep relationship that warrants further exploration in different student populations.

Students in science-related programs are particularly susceptible to stress due to the analytical and conceptual demands of their coursework. Thawabieh and Qaisy (2012) reported that science students tend to experience higher academic stress than students in other disciplines. Biology, as one of the sciences with a broad and complex scope, requires extensive understanding of theoretical and practical materials, which can increase mental fatigue and potentially affect sleep quality. In line with this, Priya et al. (2017) found that academic stress is a significant predictor of poor sleep quality among students. Furthermore, a recent study emphasized that post-pandemic learning challenges have intensified academic stress and irregular sleep behavior across various student populations (Sleep Quality among University Students in Lebanon during War Conflicts, 2025).

Research by Thawabieh and Qaisy (2012) states that students who study science tend to experience high academic stress. Biology is one of the sciences that studies nature which has a fairly broad scope, so more understanding is needed related to the material studied, this can make Biology Education students experience stress and reduce sleep quality. Research by Priya et al (2017) found that stress is a factor in decreasing sleep quality. This study aims to determine the relationship between sleep quality and stress levels in Biology Education students at UIN Walisongo Semarang.

RESEARCH METHODS

This study employed a descriptive–analytic design with a cross-sectional approach, aimed at identifying the relationship between sleep quality and stress levels among students. This

approach was chosen because it allows the researcher to describe the relationship between two variables without manipulating the conditions and is widely used in behavioral and health studies (Creswell & Creswell, 2023).

The population of this study consisted of undergraduate students from three academic cohorts (2020, 2021, and 2022), with a total of 375 students. The sampling technique referred to Arikunto's (2012) guideline, which suggests that when the population exceeds 100 individuals, 10% may be used as the sample. Therefore, 36 students were selected proportionally from each cohort. The inclusion criteria included active student status, willingness to participate voluntarily, and completion of the online questionnaire. Exclusion criteria were incomplete responses and students with chronic sleep disorders diagnosed by a physician. Such criteria were applied to improve the validity and representativeness of the data (Etikan & Bala, 2017).

Two standardized instruments were used to collect data such as Pittsburgh Sleep Quality Index (PSQI) and Perceived Stress Scale (PSS). PSQI is used to measure students' sleep quality over the previous month. This instrument consists of seven components, including sleep duration, latency, efficiency, disturbances, and daytime dysfunction. A global PSQI score of ≤5 indicates good sleep quality, while >5 indicates poor sleep quality (Setiawati et al., 2016). The PSQI has been widely validated in various cultural contexts, including Indonesian university populations, showing high reliability with Cronbach's $\alpha > 0.70$ (Putri & Priyono, 2024).

PSS is a 10-item scale used to assess the degree to which respondents perceive life situations as stressful. Scores range from 0–13 (mild stress), 14–26 (moderate stress), and 27–40 (high stress). The PSS is recognized as one of the most widely used tools to measure stress perception globally, and recent adaptations have confirmed its reliability in assessing student populations (Effects of Perceived Stress on College Students' Sleep Quality, 2024).

Data collection was carried out online using a Google Form platform distributed via official student communication channels. Respondents were first presented with an informed consent statement, followed by demographic questions and the two research instruments. The online data collection procedure was selected for its efficiency and accessibility, particularly for student respondents with high digital literacy. To ensure data accuracy, responses were reviewed for completeness before inclusion in analysis.

Data were analyzed using descriptive statistics to present frequency and percentage distributions for each variable, followed by inferential analysis using the Chi-square test to examine the relationship between sleep quality and stress levels. The statistical significance level was set at $p < 0.05$. The data were processed using SPSS version 25.0 for Windows. Additionally, preliminary normality and homogeneity tests were conducted to ensure that the data met the assumptions required for the Chi-square test.

RESULTS AND DISCUSSION

Result

This study was conducted online among students of the Biology Education Study Program at the Faculty of Science and Technology, UIN Walisongo Semarang. Data were collected on respondent characteristics, sleep quality, and stress levels from a sample of 36 students who met the inclusion criteria.

Characteristics of Research Respondents

The demographic profile of the participants is detailed in Table 1. The sample was predominantly female (86.1%), with the largest age group being 19 years old (38.8%). The distribution across the 2020, 2021, and 2022 academic

years was relatively balanced which can be seen in Table 1.

Table 1. Characteristics of Respondents Based on Age, Gender and Generation

No	Characteristic	Frequency	Presntasi (%)
1.	Age		
	18 years old	3	8,3%
	19 years old	14	38,8%
	20 years	13	36,1%
	21 years old	6	16,6%
2.	Gender		
	Man	5	13,8%
	Woman	31	86,1%
3.	Force		
	2020	9	33,3%
	2021	15	33,3%
	2022	12	33,3%

Based on Table 1, it is known that of the 36 respondents, most of the 14 respondents (38.8%) were students aged 19 years. Most of the 31 respondents (86.1%) were female students and as many as 15 respondents (33.3%) were students from the 2021 batch.

The results of this study include data on sleep quality and stress levels among students. The sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI), while the stress level was assessed using the Perceived Stress Scale (PSS). Univariate analysis is an analysis that uses frequency distributions in each variable. The results of the univariate analysis of the study are presented in Table 2.

Table 2. Distribution of respondents based on sleep quality

Sleep Quality	Frequency	Percentage (%)
Good Sleep Quality	1	2,8%
Poor Sleep Quality	35	97,2%
Total	36	100%

Based on Table 2, the majority of students (97.2%) experienced poor sleep quality, while only 2.8% reported good sleep quality. This result indicates that nearly all respondents had sleep patterns that did not meet the criteria for restorative rest. The distribution of respondents based on stress level is presented in Table 3 as follows.

Table 3. Distribution of Respondents Based on Stress Level

Stress Level	Frequency	Percentage (%)
Mild Stress	4	11,1%
Moderate stress	31	86,1%
Severe stress	1	2,8%
Total	36	100%

Based on Table 3, it is known that out of 36 respondents, as many as 31 respondents (86.1%) experienced moderate stress.

The Relationship between Sleep Quality and Stress Levels

To test the association between sleep quality and stress levels, a Chi-square statistical test was conducted. As detailed in Table 4, among the 35 students with poor sleep quality, 30 (85.7%) also reported moderate stress. Despite this trend, the statistical test yielded a p-value of 0.920. As this value is substantially greater than the significance threshold ($p > 0.05$), it is concluded that there is no statistically significant relationship between sleep quality and stress levels among the Biology Education students in this study. The results of the analysis are presented in Table 4 as follows.

Table 4. The Relationship between Sleep Quality and Stress Levels

Sleep Quality	Stress Level						Sum	P Value
	Severe stress		Moderate stress		Mild Stress			
	N	%	N	%	N	%		
Good	0	0%	1	10%	0	0%	1	0,920
Bad	4	11,4%	30	85,7%	1	2,9%	35	
Total	4	11,4%	31	95,7%	1	2,9%	36	

Discussion

This study investigated the intricate relationship between sleep quality and stress levels among Biology Education students. This discussion explores these findings by examining each core component—sleep quality, stress levels, and their interrelationship. Based on the results, data were obtained from 36 student respondents, of whom 31 (86.1%) were female. Women are generally more prone to stress, which can lead to disruptions in sleep quality. Research by Aggola and Ongori (2019), Walker (2002), and Goff A.M. (2011) in Fradisa (2022) states that women tend to have higher stress levels than men. Women more often use task-oriented defense mechanisms, which make them more likely to show signs of stress. Meanwhile, men tend to use coping mechanisms—strategies individuals employ to deal cognitively and behaviorally with threatening or demanding situations. These mechanisms are often self-oriented, making men appear more relaxed in facing academic life.

In addition, 14 respondents (38.8%) were 19 years old. According to research by Sastrawan and Griadhi (2017), 77.6% of individuals aged 18–19 experience poor sleep quality. Early adulthood is often associated with irregular sleeping habits, late bedtime, and emotionally unstable mental conditions, all of which can contribute to poor sleep quality.

Sleep Quality

Respondents' data collected through the PSQI questionnaire showed that the lowest score was 0 and the highest was 21. The scores were categorized into two groups: good sleep quality (≤5) and poor sleep quality (>5). Based on Table 2, many Biology Education students at UIN Walisongo Semarang had poor sleep quality—35 students (92.7%)—while only one student (2.8%) reported good sleep quality. This finding aligns with Ramadhani's (2021) research, which found that among 281 respondents, 210 students (74.8%) experienced poor sleep quality and 71 students (25.2%) had good sleep quality. Most of the 210 respondents reported moderate fatigue levels because they had to complete numerous assignments and often sacrificed nighttime sleep. Research by Hutagalung et al. (2021) also showed that 27 respondents (72.3%) experienced poor sleep quality, while 9 respondents (25.7%) had good sleep quality.

These findings are consistent with a growing body of evidence identifying university students as a population at high risk for sleep disturbances due to overlapping academic, social, and lifestyle pressures (Zhang et al., 2021). The demographic profile of this study—predominantly female (86.1%) and aged between 18 and 21 years—further reinforces this vulnerability. Previous research has consistently shown that female students report higher rates of sleep problems, often related to a greater tendency to internalize stress (Asif et al., 2020; Purwaningtyas & Rois, 2021).

Symptoms of poor sleep quality include impaired emotional control, mood changes, depression, confusion, reduced motor performance, obesity, cardiovascular disease, and weakened immune function (Vaughans, 2013). Behaviors that can help improve sleep

quality are referred to as universal sleep hygiene. These behaviors include maintaining consistent sleep and wake times, engaging in regular exercise, keeping the bedroom environment cool and quiet, avoiding daytime naps, limiting mobile phone use in bed, avoiding looking at the clock when having trouble sleeping, refraining from drinking coffee in the afternoon or evening, and avoiding strenuous physical activity before bedtime to promote easier sleep onset (Sadock et al., 2015).

Stress Level

Stress is one of the major causes of sleep disorders, as it increases the secretion of epinephrine, norepinephrine, and cortisol—hormones that heighten alertness and disrupt sleep patterns. Stress can therefore significantly affect individual sleep quality (Ratnaningtyas, 2019). Data on stress levels collected using the PSS questionnaire showed scores ranging from 0 to 40. These were categorized into three levels: mild stress (0–13), moderate stress (14–26), and severe stress (27–40). Based on Table 3, most Biology Education students at UIN Walisongo Semarang experienced moderate stress, with 31 students (86.1%) falling in this category. Simbolon's (2012) research found similar results, with 137 respondents (60.8%) experiencing moderate stress, 3 respondents (1.5%) severe stress, and 62 respondents (30.7%) mild stress. Research by Ambarwati et al. (2017) also showed that 58 respondents (57.4%) experienced moderate stress and 7 respondents (7.0%) experienced severe stress.

Stress levels may be influenced by many factors, one of which is academic stress. Academic stress arises from internal and external pressures that shape individuals' subjective perceptions of their academic environment (Barseli et al., 2017). Sources of academic stress include the number of assignments, competition among peers for high grades, heavy curricula, and extensive material that must be mastered (Yilmaz et al., 2017). Biology Education students, in particular, may experience higher academic stress because biology as a discipline has a broad scope and requires deep understanding of complex material (Thawabieh & Qaisy, 2012). Effective stress management strategies include engaging in regular exercise, maintaining sufficient sleep (7–8 hours per day), practicing relaxation techniques, expressing emotions positively, avoiding emotional suppression, and reflecting on stressful situations to gain perspective and find appropriate solutions (Gaskill, 2015).

The Relationship Between Sleep Quality and Stress Levels

Based on Table 4, one respondent experienced moderate stress and good sleep quality. Meanwhile, four respondents experienced mild stress and poor sleep quality, thirty respondents experienced moderate stress and poor sleep quality, and one respondent experienced mild stress and poor sleep quality. After statistical testing using the Chi-square test, there was no significant relationship between stress levels and sleep quality, as indicated by a p-value > 0.05 (0.920) among Biology Education students at UIN Walisongo Semarang.

Research by Mardayanti and Wahyuni (2019) found similar results, reporting no relationship between sleep quality and stress levels ($p > 0.05$, $p = 0.286$). However, this finding contrasts with Mutaqin et al. (2021), who reported a significant relationship between the two variables. According to the researchers' assumptions, the absence of a relationship in this study may be due to the uniformity of data and the small sample size, which limited variation in the results.

Poor sleep quality is known to have negative psychological impacts such as depression, anxiety, stress, and reduced concentration (Budyawati, 2019).

Although no significant correlation was found, the co-occurrence of moderate stress and poor sleep quality among most respondents suggests a potential interdependence that might become more apparent in a larger or more heterogeneous sample.

CONCLUSION

The results of this study showed that 97.2% of students had poor sleep quality, while 86.1% experienced moderate stress levels. Statistical analysis using the Chi-square test indicated no significant relationship between sleep quality and stress level ($\chi^2 = 0.165$, $p = 0.920$). These findings suggest that although most students experience both poor sleep and moderate stress, the two conditions are not directly correlated. This result implies that other factors, such as lifestyle habits, academic workload, learning duration, or coping strategies, may more strongly influence stress levels among students. The implications of this research are important for educational institutions. For universities, the findings highlight the need to strengthen student well-being and mental health programs through sleep hygiene education, stress management counseling, and balanced academic scheduling.

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