Relationship Between Sleep Quality and Learning Achievement in Junior High School Students in Denpasar

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ABSTRACT

Background: Learning is defined as a process of continuous development in various aspects of a person. Although various literatures have examined the relationship between sleep quality and learning activities, there are still few studies that discuss the relationship between sleep quality and learning achievement in students. Therefore, the authors want to determine the relationship between sleep quality and learning achievement achieved by junior high school students in Denpasar.

Method: This study was an analytical study with a cross-sectional approach. Sampling was done by cluster sampling technique. Sleep quality data was taken using the Pittsburgh Sleep Quality Index (PSQI) questionnaire while learning achievement data was obtained from students' even semester report cards.

Result: The study was conducted on 58 samples of junior high school students in Denpasar City with a median age of 14 years. This study found that the number of samples with good sleep quality was 36 people (62.1%). Among those with good sleep quality, 11 people (30.6%) had very good learning achievement, 25 people (69.4%) with good learning achievement, and there were no subjects with fair or poor learning achievement. The number of students with poor sleep quality was 22 people (37.9%). Among those with poor sleep quality, there were 6 people (27.3%) with very good learning achievement, 16 people (72.7%) with good learning achievement, and there were no samples with fair or poor learning achievement. The bivariate analysis was performed using Fisher Exact test. There is no significant relationship between sleep quality and learning achievement with p value >0,05.

Conclusion: There is no significant relationship between sleep quality and learning achievement in junior high school students in Denpasar.

Keywords: [Sleep Quality, Learning Achievement, Junior High School in Denpasar]

INTRODUCTION

Learning can be defined as a continuous process in which changes occur in knowledge, skills, behavior, and other aspects.[1] The result of the learning achieved by students after going through a series of learning processes is known as learning achievement. Learning achievement is generally given in the form of grades by teachers or teaching staff to the students.[2,3] Factors that affect learning achievement can be classified into two, namely internal factors and external factors. Internal factors consist of physical factors, psychological factors, and individual physical and psychological maturity. Psychological factors can be further divided into two,

namely intellectual factors including intelligence, talent, and achievement, as well as non-intellectual factors including motivation levels, attitudes, habits, interests, and emotions. Meanwhile, external factors that affect learning achievement consist of social factors, cultural factors, and physical environmental factors.[3]

Other than the factors mentioned above, sleep quality is one of the factors that can affect a student's learning performance. Sleep itself is closely linked to cognitive function and plays an important role in memory consolidation. The exact mechanism of how sleep affects human cognitive function is still unknown, although it is generally known to strengthen synaptic connections between neurons, allowing memory consolidation. Therefore, adequate sleep of good quality may have an important role in academic performance.[4] Poor sleep quality not only affects the memory consolidation process, but also affects concentration and cognition. This coupled with fatigue and drowsiness that arise from not getting enough rest will adversely affect students' learning performance.[5]

Sleep consistency is also known to have a relationship with student learning performance. Sleep consistency is defined as the regularity of sleep schedule and duration of sleep from day to day. Poor sleep consistency is commonly observed in adolescents and young adults and generally occurs because they need to stay up late during weekdays and have to wake up early in the morning, resulting in decreased sleep duration. Furthermore, on weekends, they will tend to sleep longer due to the fatigue accumulated during the weekdays. Poor sleep consistency itself may harm student learning achievement.[5] Previous research examining sleep quality and learning achievement finds poor sleep quality negatively impacts both academic performance and achievement. [6–8]

The recommended sleep duration for adolescents according to the American Academy of Sleep Medicine is 8-10 hours per night. Unfortunately, this is often not fulfilled, with more than 30% of adolescents sleeping less than 6 hours each night.[9] A recent study assessing the sleep duration of middle school adolescents aged 12-18 years in Denpasar found an average sleep duration of only 6.5 hours. This low sleep duration is due to various external factors experienced by adolescents such as the amount of schoolwork that must be done, the habit of watching television late at night, and social interaction.[10] Another study that examined the proportion and characteristics of chronic insomnia in Senior High School students in Denpasar found 46.3% of students suffered from chronic insomnia. This poor sleep duration and high incidence of chronic insomnia will result in a decrease in sleep quality.[11]

Based on this description, researchers are interested in conducting a study that further explores the relationship between sleep quality and learning achievement in junior high school students in Denpasar.

MATERIALS & METHODS

This study uses a cross-sectional analytic method. This study was conducted in public junior high schools in Denpasar from February to August 2022. The sample of this study was public junior high school students in Denpasar City who met the inclusion and exclusion criteria. The inclusion criteria were junior high school students between the ages of 12-16 years, willing and getting approval from parents to become research subjects through informed consent. The exclusion criteria for this study were students who did not submit their data completely.

Samples were contacted using the WhatsApp messenger app to request their willingness to become research subjects which is proven by filling out the informed consent. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) questionnaire which was filled in through the google form app. The cut-off point for PSQI score is 5. Meanwhile, learning achievement was obtained through a

semester report card and collected via email. This study has received ethical clearance approval from the research ethics committee of the Faculty of Medicine, Udayana University number 835/UN14.2.2.VII.14/LT/2022.

Statistical Analysis

The master sheet was prepared using SPSS Statistics version 26 and bivariate analysis was performed using R statistical software version 4.2.1. The statistical test chosen for analysis is the Chi-square test or Fisher Exact test if the Chi-square test criteria are not met.

RESULT

The research is conducted from April 28, 2022, to July 14, 2022. From the target population, a total sample of 58 people was obtained who met the inclusion and exclusion criteria. Samples were asked to fill out the Pittsburgh Sleep Quality Index (PSQI) questionnaire to measure sleep quality and semester report cards were collected to assess learning achievement.

Table 1: Sample characteristic

Variable	N	%
Age (year)		
≤14	51	87,9
>14	7	12,1
Median (Min-Max)	14 (13-16)	
Sex		
Male	22	37,9
Female	36	62,1

The age of the sample in this research ranged from 13-16 years old with a median value of 14 years old. The sample age was categorized into ≤14 years and >14 years. Most of the samples (87.9%) were ≤14 years old and the rest were >14 years old (7.3%). Based on gender, 22 samples (37.9%) were male and the remaining 36 (62.1%) were female.

Table 2: PSQI total and internal component score of the sample

Variable	N	%
Subjective sleep quality		
Good	49	84,5
Poor	9	15,5
Sleep latency		
Good	44	75,9
Poor	14	24,1
Sleep duration		
Good (≥6 jam)	44	75,9
Poor (<6 jam)	14	24,1
Habitual sleep efficiency		
Good (≥75%)	58	100
Poor (<75%)	0	0
Sleep disturbance		
No	46	79,3
Yes	12	20,7
Use of sleep medication		
No	57	98,3
Yes	1	1,7
Daytime disfunction		
No	43	74,1
Yes	15	25,9
Sleep quality based on PSQI total score		
Good	36	62,1
Poor	22	37,9

The sample's sleep quality was assessed using the PSQI questionnaire and presented in the table above. The sample's sleep quality was obtained by summing up each component of the sleep quality score. Most of the sample (62.1%) had good sleep quality, while the rest (37.9%) had poor sleep quality.

Based on the subjective sleep quality, 49 samples had good subjective sleep quality, while 9 samples had poor subjective sleep quality. Based on the sleep latency, it was reported that most samples (75.9%) had

good sleep latency. Based on the data obtained, 44 samples had good sleep duration (≥6 hours) and 14 samples had poor sleep duration. The shortest sleep duration found in the sample was 4.5 hours while the longest sleep duration was 9 hours. In the habitual sleep efficiency, it was found that all samples had good sleep efficiency. In the sleep disturbance, 46 samples did not experience nighttime sleep disturbances while 12 samples had complaints of nighttime sleep disturbances. The most common complaint found in this sleep quality component was waking up in the middle of the night which was experienced by 22 samples. Other sleep disturbances found included sleep paralysis, feeling anxious, sad, and disturbed by mosquitoes. In the component of sleep medication use, 1 sample was found to have a history of taking sleep medication. Based on the daytime disfunction, 43 samples did not experience daytime activity disorder.

Table 3: Sleep quality distribution based on sex

	Good		Poor		Total	
	n	%	n	%	n	%
Sex						
Male	19	86,4	3	13,6	22	100
Female	17	47,2	19	52,8	36	100
Total	36	62,1	22	37,9	58	100

Based on the data, more than half (52.8%) of the female sample had poor sleep quality. This contrasted with the male sample where only a small proportion (13.6%) of this group had poor sleep quality.

Table 4: Learning achievement of the sample

Variable	N	%
Learning achievement		
Very good	17	29,3
Good	41	70,7
Fair	0	0
Poor	0	0

Based on learning achievement, most of the samples (70.7%) had good learning achievement while the rest (29.3%) had very good learning achievement. None of the samples had fair or poor learning achievement. The relationship between sleep quality and students' academic achievement is shown in the following cross-table:

Table 5: Cross table between sleep quality and learning achievement of the sample

	Learning achievement				Total	p
	Very good	Good	Fair	Poor		
Sleep quality						1,0
Good	11	25	0	0	36	
Poor	6	16	0	0	22	
Total	17	41	0	0	58	

Bivariate analysis was performed using the R statistical software version 4.2.1. The Fisher Exact test statistical test was chosen for analysis because the Chi-square test criteria were not met. Based on the results of the data analysis, there were 11 samples with good sleep quality with excellent achievement, and 25 samples had good sleep quality with good achievement. While in samples with poor sleep quality, 6 samples were found to have very good learning achievement and the rest (22 samples) had good learning achievement. The relationship between sleep quality and learning achievement was tested by Fisher Exact test analysis. The p-value = 1.000

which means the p-value> 0.05, therefore H0 is accepted and it is concluded that there is no relationship between sleep quality and learning achievement of junior high school students in Denpasar City.

DISCUSSION
The results of this study showed that most of the samples (62.1%) had good sleep quality while the rest (37.9%) had poor sleep quality. Research at State Junior High School 22 Pontianak found similar results, namely most samples (61.5%) had good sleep quality.[12] Similar results were presented in research at State Senior High School 9 Manado which found 131 (57%)

samples had good sleep quality and 99 samples had poor sleep quality.[13] This is also consistent with research conducted on adolescents in Tegal City which showed 118 samples (65.4%) had good sleep quality and 75 samples (34.6%) had poor sleep quality.[14] However, contrasting results were obtained in a study investigating the relationship between gadget use and sleep quality in students of State Junior High School 1 Banda Aceh which found most of the samples (53.3%) had poor sleep quality.[15] This difference in the distribution of sleep quality may be due to internal and external factors that vary in each population or region.

Impaired sleep quality in adolescents is associated with a higher risk of depression and impaired mood regulation. In addition, sleep disturbances are also correlated with the incidence of obesity and metabolic disorders. This is due to the role of sleep in the regulation of the hormone leptin and ghrelin. A person with short sleep duration and poor sleep quality has a higher risk of cardiovascular disease (CHD) and coronary heart disease.[16]

Sleep quality is often associated with memory retention and the ability to concentrate which subsequently impacts students' academic performance. Concerning students' academic performance, 29.3% of the sample had excellent academic performance and 70.7% had good academic performance. None of the samples had a fair or poor academic performance. An analytical test to find the relationship between sleep quality and learning achievement resulted in a non-significant relationship between these variables (p=1.000). The results of this study contradicted the theoretical basis that sleep quality is one of the internal factors that can affect learning achievement.

Research by Aminuddin in 2018 aimed at assessing the relationship between sleep quality and learning achievement in students of the Nursing Academy of the East Kalimantan Provincial Government of Samarinda found that there was no significant relationship between sleep quality and learning achievement. This is caused by various factors affecting adolescent learning achievement besides sleep quality. Learning achievement can be influenced by individual factors (physiology and psychology) as well as environmental factors.[17] The results of the research by Nafi`a et al in 2020 which used 60 female adolescent respondents at the Man`baul Hikam Islamic Boarding School also found similar results. The results of the Spearman Rank test obtained the results of rs = 0.000 and p-value = 1.000 which means there is no relationship between sleep quality and learning achievement.[18] Research by Kireinata et al in 2018 which investigated the relationship between sleep disturbances and learning achievement in 80 adolescent respondents of Karitas Surabaya Catholic High School students also found no significant relationship between sleep disturbances and learning achievement (p>0.601).[19]

Research by Hami et al in 2021 assessing the relationship between sleep quality and the achievement index of new students at Sari Mulia University also found similar results. This study used a sample of 120 respondents and obtained a significance value of 0.425.[20]

Ahrberg et al's 2012 study examined the interaction of sleep quality, stress levels, and academic performance in medical students at the University of Munich. This study used 144 samples and assessed the sleep quality and academic performance of students over one semester, before exams, and after exams. It was found that academic performance was significantly correlated with sleep quality before exams (r=0.027, p>0.3) but not significantly correlated with sleep quality within a semester (r=0.027, p>0.3) or sleep quality after exams (r=0.023, p>0.3). The correlation between sleep quality and stress level was also assessed and a positive correlation was found both before and after the exam as well as during the semester. The interaction of these three variables may be due to stress

experienced before the exam affecting sleep quality and subsequently affecting student performance. Another possibility is that poor sleep quality increases stress which then impacts students' academic performance.[21]

Tonetti et al in 2015 examined the impact of sleep time, duration, and quality on learning outcomes in adolescents and found that objectively measured sleep efficiency correlated with learning outcomes. However, this study did not find a meaningful correlation between subjective sleep time, duration and quality on learning outcomes.[22]

In relation to learning motivation and concentration, a study by Ponidjan et al in 2022 found a significant relationship between sleep quality and learning motivation and concentration in adolescents. This study was conducted in junior high schools in the Wuwuk village, Minahasa Regency with a sample size of 85 people. Statistical results found a significant relationship with a p value = 0.00 and odd ratio = 3.81 for the relationship between sleep quality and learning concentration and a p value = 0.03 and odd ratio = 5.35 for the relationship between sleep quality and learning motivation. This means that not only does sleep quality affect students' motivation and learning concentration, but also students with poor sleep quality have a 3.81 times risk of having impaired learning concentration and 5.35 times to have low learning motivation.[23] Both motivation and learning concentration are internal factors that affect student learning achievement.[24]

The nonsignificant relationship between sleep quality and learning achievement in this study may be caused by the presence of confounding variables, namely internal factors and external factors that affect student learning achievement. Internal factors consist of physical factors, psychological factors, and physical psychological maturity. Psychological factors can be further divided into two, namely intellectual factors (intelligence, talent, and achievement) and non-intellectual factors (motivation, attitudes, habits, interests, discipline, and emotions). Meanwhile, external factors consist of social factors, cultural factors, school environment factors, and home environment. Among these factors, school environment factors that change due to the implementation of online learning systems and psychological factors, especially students' motivation, discipline, and focus when taking online learning have a great influence on the student's academic achievement. This is evidenced by Nikita et al's research which found that online learning has a significant effect on students' learning achievement.[25] In addition, online learning systems are less able to assess students' psychomotor ability.

The advantage of this study is that there is no similar study that assesses sleep quality in public junior high school students in Denpasar City. In addition, research linking sleep quality with learning achievement among public junior high school students in Denpasar City has also never been conducted.

Nevertheless, this study also has some weaknesses including confounding variables that cannot be intervened that affect learning achievements such as environmental factors, physiological and psychological conditions, and physical and mental maturity. In addition, learning achievement measured using the final semester report card score can be influenced by remedial exams if students do not reach passing grade.

CONCLUSION
There is no significant relationship between sleep quality and learning achievement in junior high school students in Denpasar.

Informed Consent and Patient Details: The authors declare that this research article does not contain any personal information that could lead to the identification of the volunteers.

Declaration by Authors
Ethical Approval: This study has obtained ethical clearance issued by the Research

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