

Research Article

Napping Behavior Affects the Incidence of Excessive Daytime Sleepiness and Daytime Dysfunction among College Students

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ABSTRACT (ENGLISH)

Background: The prevalence of napping behavior, Excessive Daytime Sleepiness (EDS), and impaired functioning during the day is high among students and has an impact on academic and daily life.

Objective: This study examined the relationship between napping behavior and EDS and daytime dysfunction in 288 students at the University of Indonesia.

Methods: The quantitative method was used with a cross-sectional design. The questionnaires used are the Napping Behavior Questionnaire, the Epworth Sleepiness Scale, and the Daytime Feelings and Functioning Scale.

Results: The results showed a significant relationship between napping behavior and EDS and daytime dysfunctional. As many as 72.9% of students did napping, 69.1% experienced EDS, and the average function during the day It was 4:47 PM.

Conclusion: Students who napped had higher incidence of EDS and daytime dysfunctional. Students are advised to improve sleep patterns and reduce napping duration. It is necessary to promote sleep health, napping, EDS, and function during the day in the campus environment.

Keywords: Napping Behavior, Excessive Daytime Sleepiness (EDS), Daytime Function, College Student

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ABSTRAK (INDONESIA)

Latar Belakang: Prevalensi kebiasaan tidur siang, *Excessive Daytime Sleepiness* (EDS), dan gangguan fungsi di siang hari cukup tinggi di kalangan mahasiswa dan berdampak pada kehidupan akademik serta kehidupan sehari-hari.

Tujuan: Penelitian ini mengkaji hubungan antara *Excessive Daytime Sleepiness* (EDS), dan gangguan fungsi di siang hari pada 288 mahasiswa Universitas Indonesia.

Metode: Penelitian ini menggunakan metode kuantitatif dengan desain cross-sectional. Kuesioner yang digunakan adalah Kuesioner Perilaku Tidur Siang, Skala Kantuk Epworth, dan Skala Perasaan dan Fungsi Siang Hari.

Hasil: Hasil menunjukkan hubungan yang signifikan antara perilaku *napping* dengan EDS dan disfungsi siang hari. Sebanyak 72,9% mahasiswa melakukan *napping*, 69,1% mengalami EDS, dan rerata fungsi di siang hari adalah 16,47

Kesimpulan: Mahasiswa yang *napping* memiliki kejadian EDS dan disfungsi di siang hari yang lebih tinggi. Mahasiswa disarankan untuk memperbaiki pola tidur dan mengurangi durasi *napping*. Perlu dilakukan promosi kesehatan tidur, *napping*, EDS, dan fungsi di siang hari di lingkungan kampus.

Kata kunci: Perilaku *napping*, *Excessive Daytime Sleepiness* (EDS), Fungsi di Siang Hari, Mahasiswa.

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Introduction

Sleep deprivation is a condition where a person receives less sleep than recommended based on their age and health (Suni, 2022). Sleep deprivation may occur across all age groups, including college students. According to the National Sleep Foundation, students should get 7-9 hours of sleep per day. Lack of sleep in students can lead to impaired daytime functioning (Suni, 2022). Amin, et al. (2015) reported that of 384 health students, 66.6 % stated that sleep deprivation had a negative impact on their academic performance, 45.3 % attended classes while drowsy, experienced poor concentration and comprehension, 61.5% experienced decreased communication skills, and 63.3 % had difficulty making wise decisions.

Lack of sleep also causes Excessiveness Daytime Sleepiness (EDS). EDS is defined as a state of drowsiness or difficulty remaining alert or awake during the day (Suni, 2022). Previous studies reported a high prevalence of EDS

among college students, including 68.5 % of students in Sudan (Mirghani & Elbadawi, 2015), 55% of students in Brazil (Ramos et al., 2021), 72.4 % of students in India, and 80.2 % of nursing students in Indonesia (Regina, Bayhakki, & Utami, 2022). Individuals with EDS experience signs and symptoms such as frequent napping, falling asleep suddenly, and not feeling refreshed during the day (NHS, 2020).

Napping is a short period of sleep outside of a regular sleep cycle, and it typically happens during the day (Suni, 2022). Research by Kong, Cui, & Gong (2022) in China reported that over 86% of people take naps. Similar results were found by Ye, Johnson, Keane, & Manasia (2015), who reported that 75% of college students in the United States take naps. Lovato, Lack, & Wright (2014) also reported that 54% of college students in Australia take naps.

Napping affects the incidence of EDS and daytime dysfunction among students based on

its duration and frequency. Daytime dysfunction is defined as a group of symptoms caused by poor sleep quality that may interfere with daily activities. These symptoms are fatigue, difficulty concentrating, impaired memory, mood changes, excessive daytime sleepiness, and dissatisfaction with sleep quality (Huang et al., 2024). Research conducted by Mantua & Spencer (2017) showed that napping can reduce EDS and improve cognitive function. Nevertheless, other studies have also reported negative effects of napping on EDS and daytime dysfunction. In a recent study by Lovato, Lack, & Wright (2014), students who frequently took long naps reported feeling sleepier upon waking, had higher EDS scores, and experienced worse daytime dysfunction compared to students who were not napping.

Research regarding *napping* has not been widely conducted in Indonesia. Previous research was limited to examined sleep in general, such as the study by Angels, Marunduh, & Rampengan (2013) which examined sleep duration in overweight adolescents, and the study by Fatmawati & Hidayah (2019) which examined sleep patterns in postpartum mothers. Previous studies on napping behavior have been conducted with non-student participants, such as the study by Fadmawaty, Septiana, & Thoha (2022), which examined the effect of napping on blood pressure in patients with hypertension, and the study by Fernando (2017), which examined the effect of short-term sleep interventions on the

alertness levels of medical and paramedical workers during night shifts.

These findings highlight the need to examine napping behavior and its relationship with excessive daytime sleepiness (EDS) and daytime dysfunction. Therefore, this study investigates the relationship between napping habits, EDS, and daytime dysfunction among college students.

Methods

Study Design and Participants

The study design was used a cross-sectional study to determine the relationship between napping behavior and EDS and daytime dysfunction among college students. The data collection instruments consisted of four parts: respondent characteristics, *Napping Behavior Questionnaire* (NBQ), *Epworth Sleepiness Score* (ESS), and *Daytime Feelings & Functioning Scale* (DFFS) (Lovato, Lack, & Wright, 2014; Gradisar et al., 2006; Johns, 1991).

Data Collection and Measures

The Napping Behavior Questionnaire (NBQ) is a questionnaire designed to measure napping behavior, developed by Lovato, Lack, & Wright in 2014. The NBQ asking questions regarding napping characteristics, such as frequency (<1 day, 1–2 days, 3–4 days, 5–6 days, >6 days), duration (<15 minutes, 15–30 minutes, 30–45 minutes, 45–60 minutes, >60 minutes), time (8:00 AM–10:00 AM, 11:00 AM–1:00 PM, 2:00 PM–4:00 PM, 5:00 PM–

7:00 PM, 8:00 PM–10:00 PM) and reasons (due to daytime sleepiness, to refresh oneself, etc.) for napping, the process of falling asleep and waking up from a nap (spontaneous or planned), as well as asking whether respondents felt they were getting enough sleep at night. In this questionnaire, the cutoff was divided into “nappers” (napping ≥ 1 day per week) and “non-nappers” (napping < 1 day per week).

The Epworth Sleepiness Scale (ESS) is a questionnaire consisting of eight questions about the probability of respondents falling asleep while performing various activities. These activities include sitting and reading, watching television, sitting quietly in public place, being a passenger in a car that has been driving for more than an hour, lying down to rest during the day, sitting and talking with someone, sitting after lunch, and being in a car that has come to a stop due to traffic. The scale is rated on a 4-point scale (0–3). ESS scores can range from 0 to 24, with a score < 10 indicating that the person does not experience EDS, and a score ≥ 10 indicating that they do experience EDS.

The Daytime Functioning and Feeling Questionnaire, developed by Gradisar et al. in 2006, is a 12-item Likert scale that measures the frequency of various feelings experienced during the day. Individual item responses range from 0 (never) to 3 (almost all the time). The total score ranges from 0 to 36, with higher scores indicating more severe daytime dysfunction. The following statements in the

questionnaire such as feeling lethargic, being easily irritated, lacking motivation, being unable to concentrate, suffering from short-term memory, and feeling depressed. (Harris et al., 2012; Gradisar et al., 2006).

Data Analysis

The data analysis was conducted using normality tests, univariate analysis, and bivariate analysis. Normality tests were used to evaluate whether the distribution of the previously collected data adhered to a normal distribution. Univariate analysis was performed to provide a detailed description of the respondents' characteristics, napping behavior, EDS, and daytime dysfunction among regular undergraduate students at the University of Indonesia (UI), who were divided into four groups. Bivariate analysis was conducted to examine the relationships among the three study variables: napping behavior and EDS using the chi-square test, and daytime dysfunction using the t-test.

Ethical Considerations

The study was conducted in accordance with health ethics principles. There are three fundamental principles of human health research: the principle of respecting human dignity, the principle of doing good and avoiding harm, and the principle of justice. These three principles ensure that the research is ethically and legally accountable (Adiputra et al., 2021; KEPPKN, 2021). This study received ethical approval from the Health Research Ethics Committee (Approval No. KET-

063/UN2.F12.D1.2.1/PPM.00.02/2023).

Informed consent was obtained from all participants before the research began.

Results

The results of the study show that the median age of students is 20 years, with female students dominating (67.7%) compared to male

students. In addition, the number of students majoring in the Social Sciences and Humanities (49%) was higher than in the other two fields, with the largest number of students who completed the questionnaire being first-year students (44.4%). The characteristics of the respondents are shown in Table 1.

Table 1. Distribution Characteristics Respondents

Variables	Frequency (n)	Percentage (%)
Gender		
Man	93	32.3
Woman	195	67.7
Origin of the Science Group		
Science and Technology Cluster	95	33
Health Sciences Cluster	52	18
Social Sciences and Humanities Cluster	141	49
College Year		
First year	128	44.4
Second year	67	23.3
Third year	44	15.3
Fourth year	49	17

The data are presented as frequencies (n) and percentages (%)

The study findings indicate that the prevalence of “nappers” (72.9%) was higher than that of “non-nappers.” The prevalence of EDS (69.1%) was also higher among students who experienced EDS than among those who did not (Table 2). In addition, the average daytime functioning score among students was 16.47 (Table 3).

Based on the characteristics student *nappers*, the results of the study show more than half of the students take naps 1 – 2 days every week

(62.9%), at 14.00 – 16.00 (74.3%), with a *napping duration of* >30 minutes (89%). In addition, data was found that students *napped the most* (48.1%) and wake up from *napping* spontaneously (81.9%). The most common reason students take naps was because they feel sleepy during the day (62.4%). The majority students also felt that they rarely got enough sleep at night (84.8%).

Table 2. Respondents' *Napping* Behavior and EDS (N=288)

Variables	Frequency (n)	Percentage (%)
Napping Behavior		
Non- nappers	78	27.1
Nappers	210	72.9
Excessive Daytime Sleepiness		
Not experiencing EDS	89	30.9
Experiencing EDS	199	69.1

n = sample size; % = percentage

An analysis of the relationship among the three variables was also conducted. The results of the chi-square test examining the relationship between napping behavior and EDS and daytime dysfunction showed a p-value < α (0.05). This indicates a statistically significant relationship between napping behavior and the occurrence of EDS and daytime dysfunction (Tables 4 and 5).

Table 3. Mean Disfungsi During the Day Respondents (N=288)

Variables	Mean	Min-Max	Elementary School
Functions during the Day	16 ,47	0 - 36	7,053

The characteristic finding of this study has shown that most *nappers* were male (81.9%). The *chi-square analysis test* showed a significant relationship between *napping behavior* with gender (p-value < 0.05). The study also found that student *nappers* the majority came from the science and technology group (75.8%), and the fourth year of study (79.6%).

Based on analysis EDS overview based on characteristics, the number of female students (72.8%) compared to male students who experience EDS with there is a significant relationship between gender and EDS. Students who have EDS the majority came from the science and technology group (72.6%), and the second year of college (74.6%).

An analysis of the relationship between daytime dysfunction and student characteristics showed that the average daytime functioning score was higher among female students than among male students. A t-test analysis also revealed a significant association between gender and daytime dysfunction. Furthermore, students in the health sciences field had the highest average daytime functioning score (18.13) compared to students in other fields, as did first-year students (17.30).

Table 5. Relationship between *Napping* Behavior with Dysfunction during the Day (N=288)

<i>Napping</i> Behavior	Dysfunction during the Day	<i>p</i> -value
	Average daytime function	
Non- nappers	15,03	0, 03
Nappers	17,00	

$p = p$ value based on Chi-square test (χ^2). Significant at $p < .05$

Discussion

This study divided students into two groups, *nappers* for those who take naps at least 1 – 2 days a week, and *non- nappers* who did not take a nap in one week. The results of the study showed a high number of *napping students*, namely 72.9 % (210 students). There are differences in the percentage of students based on previous studies. First, the percentage of students who *nap* once a week less in some studies, such as as many as 58.54 % of students in Italy (Cellini et al., 2020), 50% of college students in California (Duggan et al., 2016), and 54.6 % of students in Australia (Lovato, Lack, & Wright, 2014).

These studies found that as many as 70% of students in America (Nicholson et al., 2020), 70,2% of students in India (Goel et al., 2016), and 61.9 % of students in China (Dai et al., 2023) doing *napping* at least once a week. The differences that occur are likely due to cultural factors (Lovato, Lack, & Wright, 2014), such as Italian students who choose not to *nap* because they prioritize class or other social activities (Cellini et al., 2020), and *napping* which is a common lifestyle in China (Dai et al., 2023).

The finding revealed that the prevalence of EDS among college students was 69.1%. This result is

consistent with similar studies, namely 68.5% of Sudanese students (Mirghani & Elbadawi, 2015), 55% of students in Brazil (Ramos et al., 2021), 72.4% of students in India, and 80.2% of nursing students in Indonesia (Regina, Bayhakki, & Utami, 2022). The high prevalence of EDS among students in this study may be attributed to several factors beyond napping behavior. The quantity and quality of students' sleep also significantly influence the occurrence of EDS.

An analysis of the relationship between napping behavior and Excessive Daytime Sleepiness (EDS) reported that both non-napping and napping college students experienced EDS, with a higher percentage among napping students (60.3% vs. 72.4%). The results of this study indicate that there is a relationship between napping behavior and EDS. These findings are also supported by previous studies, as reported by Lovato, Lack, & Wright (2014), who examined a sample of psychology students in Australia, and Ozder & Eker (2015), with a sample of academic physicians.

In this study, the average daytime functioning score among regular undergraduate students at Universitas Indonesia was 16.7. Previous studies involving patients with comorbid insomnia and obstructive sleep apnea showed fairly similar

results, with average scores of 17.4 (Bensen-Boakes et al., 2022) and 17.77 (Sweetman, 2018). Based on these results, the average daytime dysfunction among students is equivalent to the average daytime dysfunction among patients with sleep disorders. This indicates the presence of severe daytime dysfunction among regular undergraduate students at the University of Indonesia. Research suggests that daytime dysfunction among students is associated with insufficient sleep and sleep disorders, one of which is circadian rhythm disorder (Kayaba et al., 2020).

Analysis of *napping behavior* with daytime dysfunction report average daytime function in college *nappers* higher than *non-napper students* (17,00 : 15,03). Research results show the relationship between *napping* behavior with daytime dysfunction. These results are in accordance with research Lovato, Lack, & Wright (2014) also reported a significant relationship between the two variables. In Lovato's study, the average scores of college *nappers* with *non-nappers* less than this study (12.80 : 11.00).

Napping has various benefits, such as helping to overcome daytime sleepiness, especially for people who experienced sleep deprivation the previous night (Summer, 2022). Research by Cai, et al. (2020), who examined elderly people, reported a relationship between *napping* and orientation, language function, and memory ability. Elderly people who napped showed improved cognitive performance, but Cai's study did not clearly describe the duration and frequency of *napping* done by the elderly. Other studies also show the benefits of *napping*, including strengthening

memory, helping prepare for learning, and improving self-control and emotional stability. (From Rezende & Rey- López, 2015)

Study previously report connection between *napping* with mood and atmosphere liver. Research results Romdhani et al. (2021b) with respondents' judo athletes demonstrate that short *napping* for 20 minutes can increase time reaction, atmosphere heart and reduce drowsiness in Bandung which is not *napping* and *napping* > 90 minutes. Research Leong et al. (2023) report similar things, with *napping* with duration 10 – 60 minutes own benefit raise atmosphere heart and *napping* for 30 minutes raise ability coding memory. Leong argues that *napping* for 30 minutes give benefit best for *young adult*.

Excessive napping or long *napping* have a negative impact (Lovato, Lack, & Wright, 2014). *Excessively long and frequent naps among older adults may impair cognitive function, increase prolonged sitting, and reduce social activity* (De Rezende & Rey- López, 2015). Qu et al. 's research al. (2014) who took a sample of elderly people in China found that *long napping* (> 30 minutes) is associated with the incidence of non-alcoholic fatty liver disease. Yamada's research et al. (2016) reported a relationship between *napping* more than 60 minutes per day with an increased risk of type 2 diabetes.

The naps conducted by the students in this study was mostly *long napping*. The study found that students who did long *napping* have a higher percentage of EDS than students who do *napping* ≤ 30 minutes, although no statistically significant

relationship was found. In addition, Lovato, Lack, & Wright (2014) reported a significant relationship between *napping frequency* with the occurrence of EDS. However, this study did not find a significant relationship between the two variables.

In this study, the highest average daytime function was also found. be in *the napping* students ≥ 3 days/week, but no significant relationship was found between *napping frequency* with daytime dysfunction. Furthermore, the research results This also shows a higher average daytime function in students who *nap for a long time*. The analysis also shows a significant relationship between *napping duration* and daytime dysfunction. supported by research with adult respondents (≥ 19 years) reporting that long-duration *napping* (>60 minutes) was associated with poor cognitive function, and vice versa (Chang et al., 2022). Research conducted by Lovato, Lack, & Wright (2014) on college students reported similar findings, with daytime function worse days for students who frequently and *long napping* (> 30 minutes).

Several factors influence behavior *napping* on students, such as quality and quantity of night sleep, chronotype, and likelihood existence disturbance Sleep like disturbance rhythm circadian. Previous studies reported sleep latency (Park, Chiang & Irwin, et al., 2019), sleep duration, and sleep time that college students have tends to be less compared to students with lower levels of education (Becker, Jarret, & Luebbe, 2018). Chronotype also influences quality sleep, with students who have chronotype Evening own quality more sleep bad compared to with other chronotypes (Azizah & Pujasari, 2021).

Additionally, the disturbance sleep is also common occurs in students. Li et al. (2018) reported reason occurrence disturbance Sleep This is Because curriculum comprehensive education. In this study, most students also felt they only occasionally got enough sleep at night. This lack of sleep can contribute to students experiencing daytime sleepiness. Daytime sleepiness is reflected in EDS scores, which were also found to be high in this study. triggers *napping* and causes a high prevalence of students who *nap* in this study.

Excessive and prolonged sleeping can disrupt natural sleep rhythms and negatively *impact* sleep quality of life and achievements academic student. Nielson et al. (2021) explained that poor daytime functioning can affect students' academic performance and lead to lower GPAs. Cai, et al. (2021) explained several potential problems that may arise if there is daytime dysfunction, such as excessive daytime sleepiness, decreased concentration, and decreased daytime performance. This finding is supported by Kayaba et al. (2020) who reported several forms of daytime disruption in school life, such as absenteeism, tardiness, and falling asleep during class.

Conclusion

This study found a statistically significant relationship between napping behavior and EDS and daytime functioning. In addition, the results also showed an association between napping behavior, EDS, and daytime functioning. The study also reported that more than half of the regular undergraduate students at the University of Indonesia nap at least once a week and experience

EDS. These students also experience a significant decline in daytime functioning. The study's findings can help students understand the importance of good sleep patterns, regular napping habits, and the occurrence of Excessive Daytime Sleepiness (EDS) and daytime dysfunction. This can encourage students to improve their sleep patterns and napping habits, which are often characterized by long durations.

Limitation

A primary limitation of this study is its narrow sample, which was restricted entirely to undergraduate students.

Funding Statement

This research was conducted without external funding support.

Conflict of Interest

None declared.

Data Availability

Data that supports the findings of this study could be obtained from the corresponding author upon reasonable request.

Author Contributions

Noviana Tricipta Dewi: Conceptualization, methodology, investigation, data collection, data analysis, writing original draft

Hening Pujasari: Conceptualization, methodology, supervision, review, validation,

Tuti Nuraini: Supervision, review, validation

Kuntarti: Review, validation

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