

The Relationship Between Bedtime Procrastination, Rumination, and Sleep Quality Among Physically Inactive Undergraduate Students

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Abstract

This study investigated the relationships between bedtime procrastination, rumination, and sleep quality among physically inactive students. Using a cross-sectional online survey design, a total of 135 physically inactive undergraduate students participated in the study. The participants were recruited through purposive sampling. It was hypothesized that both bedtime procrastination and rumination were associated with sleep quality. The study used the Bedtime Procrastination Scale (BPS), Ruminative Response Scale (RRS), and Pittsburgh Sleep Quality Index (PSQI) to assess bedtime procrastination, ruminative thought, and sleep quality, respectively. Data analysis was conducted using Pearson correlation coefficient. The results found a significant positive correlation between bedtime procrastination and sleep quality, $r(135) = .758, p < .001$. Similarly, a significant positive correlation was found between rumination and sleep quality, $r(135) = .614, p < .001$. In conclusion, the findings highlight that physically inactive students with greater levels of bedtime procrastination and rumination exhibited poorer sleep quality.

Keywords: bedtime procrastination, physically inactive, rumination, sleep quality, students

INTRODUCTION

Sleep is a developmental need that is important for both psychological and physical health in which individuals spend one third of their life asleep. University students often report poor sleep quality such as sleep interruptions, restlessness, early morning awakenings with difficulty falling back asleep, and trouble initiating sleep (Nurismadiana & Lee, 2018). Poor sleep quality has been associated with impair cognitive functioning and negatively impact overall well-being, potentially affecting the students' academic performance.

Bedtime procrastination been associated with irregular sleep habits (Kroese et al., 2014). Engaging in stimulating activities at bedtime, such as excessive media use (Exelmans & Van den Bulck, 2017), may promote bedtime procrastination, which in turn affects sleep quality among university students. Previous studies have identified bedtime procrastination as a significant contributor to poor sleep among Polish adolescents (Kadzikowska-Wrzosek, 2020) and university students (Herzog-Krzywoszańska & Krzywoszański, 2019). However, little is known whether these findings extend to university students in Malaysia. Besides, poor sleep quality has been associated with rumination. According to the cognitive-behavioral model of insomnia, maladaptive cognitive patterns such as rumination is a significant predictor of poor sleep quality (Hage et al., 2008). Previous studies have reported a positive correlation between rumination and poor sleep quality in adolescents (Liu et al., 2017) and young adults (Thomsen et al., 2003). Nevertheless, limited research has explored this association in Malaysian context.

Poor sleep quality among university students is an increasing concern due to its impacts on overall well-being. Research shows that chronic poor sleep can lead to various physical limitation (Mishra et al., 2020), psychological issues such as depression and anxiety, and diminished cognitive function (Liu et al., 2018). These consequences affect both university students and adults. In Malaysia, studies have shown that many university students experience inadequate or poor-quality sleep. Kee et al. (2021) reported that lifestyle behaviours significantly influence sleep quality among Malaysian students. Similarly, Nurismadiana and Lee (2018) found that nearly one-third of students, approximately 70.6% were classified as poor sleepers, frequently experiencing daytime sleepiness due to disturbances like restlessness, early awakenings, and trouble falling asleep.

According to the World Health Organization (WHO, 2020), physical activity is any bodily movement produced by skeletal muscles that requires energy expenditure. Individuals aged 18 and above are considered physically inactive if they engage in less than 150 minutes of moderate-intensity activity per week (WHO, 2020). Notably, the National Health and Morbidity Survey (NHMS) reported that 25.1% of Malaysians were physically inactive, accounting for 16.4% of the nation's mortality rate (NHMS, 2019). To reduce the adverse effects of prolonged sedentary behaviour, the WHO recommends that adults should engage in at least 150 minutes of moderate-intensity aerobic exercise per week (WHO, 2020). Research has established an association between physical inactivity and poor sleep quality. For example, Huang et al. (2022) found that physical inactivity heightened the negative association between poor sleep quality and all-cause mortality. Similarly, Nakakubo et al. (2017) reported that physical inactivity and poor sleep adversely affected cognitive performance among older adults in community settings.

Although most people intend to achieve a good night sleep, they often fail to follow through. This discrepancy between intention to sleep and inability to act on it is recognized as bedtime procrastination (Loft & Cameron, 2013; Kadzikowska-Wrzosek, 2018). Bedtime procrastination is a general procrastination, characterized by postponing intended actions without a clear reason - delaying sleep despite knowing the potential negative consequences, such as morning fatigue (Nauts et al., 2016). Previous studies have demonstrated associations between bedtime procrastination and psychological conditions including anxiety and depression (Lee, 2008; Zou et al., 2019), as well as impaired concentration. Moreover, the use of smartphones at bedtime has been shown to delay sleep onset and reduce overall sleep quality (Grandner et al., 2013).

Rumination has been identified as a contributing factor to various physiological health, including restless sleep. Harvey's cognitive model of insomnia provides a theoretical basis for understanding how rumination exacerbates sleep difficulties, particularly during periods of extreme stress (Harvey, 2002). Individuals who have tendency for rumination often experience heightened cognitive activity, which triggers autonomic arousal and emotional distress. This hyperarousal state changes them more sensitive to perceived internal and external threats to their sleep, which then further impairing sleep quality (Li et al., 2019). Existing studies provide preliminary evidence supporting the association between rumination and sleep disturbances. For instance, Krajniak and colleagues (2013) demonstrated significant relationships between rumination and sleep issues among young adults with a history of suicide attempts. Similarly, Slavish and Graham-Engeland (2015) found that rumination was correlated with poorer sleep quality in young adults. Furthermore, studies suggest that rumination may mediate the relationship between stressful life events and subsequent sleep-related difficulties (Amaral et al., 2018). Taken together, this study examined the relationship between bedtime procrastination, rumination, and sleep quality among physically inactive students. Understanding this association could inform targeted interventions and prevention programmes to improve sleep and overall wellbeing among university students.

METHODOLOGY

Research design

This study used a cross-sectional online survey design. To maximise the recruitment, the survey link was distributed through social media platforms and the university's student email (SISWA Mail). The participants provided online informed consent prior to completing the survey. The survey consisted of four sections covering demographic information, bedtime procrastination, rumination, and sleep quality. It took approximately 10 to 15 minutes to complete. Ethical approval for the study was obtained from the Human Research Ethics Committee of Universiti Pendidikan Sultan Idris (Reference number: 2023-040-1).

Instruments

Bedtime Procrastination Scale

The Bedtime Procrastination Scale (BPS; Kroese et al., 2014) measures the tendency to go to bed later than intended without external circumstances causing the delay. The BPS consist of nine items (e.g., "I go to bed later than I had intended," "Often I am still doing other things when it is time to go to bed"), rated on a 5- point scale from 1 (never) to 5 (always). Four items (2, 3, 7, and 9) are reverse scored. Scores range from 9 to 45, with higher scores indicating greater bedtime procrastination. The BPS has demonstrated high internal consistency with Cronbach's alpha of .92, and an exploratory factor analysis supports a single-factor structure (Kroese et al., 2014).

Ruminative Response Scale

The Ruminative Responses Scale (RRS; Treynor et al., 2003) assesses the extent of rumination. It contains 22 items categorized into three subscales: Depression, Brooding, and Reflection. Participants rate each item on a 4-point Likert scale from 1 (never) to 4 (always). The scores range from 22 to 88, with higher scores reflecting more frequent ruminative thoughts.

Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) is a self-reported instrument that evaluates sleep quality over the past month. It consists of 19 items grouped into seven components: sleep duration, sleep disturbances, sleep latency, daytime dysfunction, sleep efficiency, overall sleep quality, and use of sleep medication. Each component is rated on a 0 to 3 scale, with higher scores indicating greater dysfunction. The sum of the seven components scores yields a global score ranging from 0 to 21, where scores above 5 denote poor sleep quality. The PSQI has demonstrated good internal consistency (Cronbach's alpha = .83) and strong content validity, with a scale-level content validity index (S-CVI/Ave) of .905 (Wang, 2022).

Procedure

The survey was conducted online through social media platforms and UPSI's SISWA Mail. Prospective participants read an information sheet, provided informed consent, and completed a self-screening questionnaire. Those who met the inclusion criteria proceeded to complete the full survey. Descriptive statistics (mean, standard deviation, frequency, and percentage) were used to summarize demographic data. Pearson correlation analyses were performed to examine the relationship between bedtime procrastination, rumination, and sleep quality. Statistical analyses were conducted using IBM SPSS Statistics version 26.

Participants

A total of 135 undergraduate students from Universiti Pendidikan Sultan Idris (UPSI) participated in the survey through purposive sampling. Eligibility criteria included (i) being 18 years old and above,

(ii) currently enrolled as an undergraduate students at UPSI, (iii) being physically inactive, defined as engaging less than 150 minutes of moderate-intensity physical activity or 75 minutes of vigorous-intensity activity per week over the past month (e.g., sitting or lying down while watching television or using a computer), and (iv) being able to complete the survey in English. Exclusion criteria involved who: (i) worked part-time night shifts and (ii) had been diagnosed with a sleep disorder, physical conditions affecting sleep, or psychological disorders (e.g., depression). The sample size was determined using the G*Power software version 3.1 (Faul et al., 2007). See Table 1.

Table 1 Participants' demographic characteristics ($n = 135$)

	Mean	Standard Deviation	Frequency	Percentage
Age (20-29 years old)	22.37	1.687		
Gender				
Male			30	22.2
Female			105	77.8
Faculty				
FBK			12	8.9
FPE			26	19.3
FPM			58	43.0
FSK			6	4.4
FSKIK			12	8.9
FSM			21	15.6
Years of study				
1			27	20
2			17	12.6
3			22	16.3
4			69	51.1
Type of sleepers				
Good sleepers			10	7.4
Poor sleepers			125	92.6
Sleep quality (Score: 1-16)	10.7	3.2		
Bedtime procrastination (Score: 17-45)	38.4	6.4		
Rumination (Score: 37-88)	71.4	10.2		

FPM = Faculty of Human Development, FPE = Faculty of Management and Economics, FSM = Faculty of Science and Mathematics, FBK = Faculty of Languages and Communication, FSK = Faculty of Human Sciences, FSKIK = Faculty of Art, Sustainability and Creative Industry.

The mean age of the 135 participants was 22.37 years ($SD = 1.7$), with female comprising 77.8% of the sample. Most participants were from the Faculty of Human Development (43%), followed by the Faculty of Management and Economics (19.3%), and the Faculty of Science and Mathematics (15.6%). Over half (51.1%) were in their fourth year of study. Regarding sleep quality, 92.6% ($n = 125$) were considered good sleepers. The mean global PSQI score was 10.7 ($SD = 3.2$) exceeding the clinical cutoff for poor sleep quality. Participants' mean bedtime procrastination was 38.4 ($SD = 6.4$), and the mean rumination score was 71.4 ($SD = 10.2$), suggesting a tendency to procrastinate bedtime and engage in ruminative thoughts.

RESULTS

The Relationships Between Bedtime Procrastination, Rumination, and Sleep Quality

Table 2 presents the correlation results. Pearson correlation analysis revealed a significant positive correlation between bedtime procrastination and sleep quality, $r(135) = .758, p < .001$, indicating that higher levels of procrastination were associated with poorer sleep quality. Similarly, rumination was significantly and positively correlated with poor sleep quality, $r(135) = .614, p < .001$. These findings suggest that both bedtime procrastination and rumination are significant predictors of diminished sleep quality among physically inactive students at UPSI.

Table 2 Pearson correlations coefficients between bedtime procrastination, rumination, and sleep quality

Variables	Bedtime Procrastination	Rumination	Sleep quality
Bedtime Procrastination	-	-	-
Rumination	-	-	-
Sleep quality	.758**	.614**	-

** $p < .001$; Higher scores indicate greater bedtime procrastination, higher rumination, and poorer sleep quality

DISCUSSION

This study aimed to examine the association between bedtime procrastination, rumination, and sleep quality among university students. The survey revealed that approximately 92% of participants self-reported poor sleep quality. This prevalence is notably higher than that reported in previous studies conducted among university students in Saudi Arabia (76%; Almojali et al., 2017), United States (62%; Becker et al., 2018), and India (51%; Ghrouz et al., 2019). Furthermore, the prevalence exceeds the percentage found in two Malaysian studies, which reported prevalences of 74.4% (Lyn & Wah, 2020) and 60% (Saat et al., 2020). The high percentage of students experiencing poor sleep is worrying as disrupted sleep is associated with various short- and long-term health consequences.

Given the high prevalence of poor sleep quality in physically inactive university students, this study also investigated the roles of bedtime procrastination and rumination. The findings indicated that physically inactive individuals who procrastinated at bedtime exhibited poorer sleep quality. These findings consistent with previous studies (Carlson et al., 2023; Cui et al., 2021; Ma et al., 2022). Specifically, Carlson and colleagues (2023) found that greater bedtime procrastination was associated with lower sleep efficiency, delayed sleep timing, and shorter sleep duration.

Considering the established associations between bedtime procrastination and poor sleep, the relationship between rumination and sleep quality was expected. The findings revealed that greater levels of rumination were associated with poorer sleep quality. Consistent with this, Du et al. (2020) found a significant correlation between rumination and diminished sleep quality in a large sample students' population. Similarly, Butz and Stahlberg (2018) reported that ruminative thinking significantly affects sleep quality among Germany university students. Furthermore, previous research has demonstrated that rumination mediates the relationships between psychological factors and sleep quality, with greater rumination levels strengthening the association between stress and pre-sleep arousal (Tousignant et al., 2019), mindfulness and poor sleep quality (Liu et al., 2018) and depressive symptoms and sleep disturbances (Bian et al., 2020).

Clinically, the results of this study have essential implications for addressing sleep problems. Interventions should focus on reducing bedtime procrastination and rumination using cognitive behaviour therapy (Jeoung et al., 2023) or acceptance and commitment therapy (Lee et al., 2025). During psychological assessment of sleep disturbances, it is important to identify bedtime procrastination and rumination as contributing factors and explore ways to modify these behaviours to improve sleep quality. Methodologically, future research should investigate the roles of bedtime

procrastination and rumination using more complex design such experience sampling methods or multilevel modelling including the use of objective measures such as actigraphy.

CONCLUSION

This study indicates the significant relationships between bedtime procrastination, rumination and sleep quality among physically inactive undergraduate students. These findings have paved ways for future studies on interventions of sleep disturbances such as insomnia. The findings are crucial for developing future prevention programmes and promoting healthy sleep habits tailored to the needs of physically inactive undergraduate students.

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