Sleep Quality and Academic Performance among Postgraduate Students in Sri Lanka

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ABSTRACT

This study evaluated the effect of sleep quality on perceived academic performance of postgraduate students in Sri Lanka. Postgraduate students often juggle complicated schedules of overload from of advanced studies, part-time jobs, family obligations, and self-initiated studies, creating a situation where sleep may be inadequate or disrupted and therefore may impact academic performance. A quantitative survey was performed on 385 postgraduate students covering postgraduate programs. Data analysis was carried out using IBM SPSS Statistics Version 29. Descriptive statistics, distributional diagnostics, internal consistency, Pearson and Spearman correlations, one-way Analysis of Variance, Tukey HSD, and Ordinary Least Squares regressions were applied. The average sleep quality was 2.21 (SD = 0.41) with lower scores representing better quality of sleep and average performance 3.19 (SD = 0.47). The disturbance of sleep scale was found to have limited internal consistency (Cronbach's α = .504), while the sleep performance beliefs scale showed good internal consistency (α = .965). There was a statistically significant weak negative correlation of sleep quality and perceived academic performance (Pearson's $r = -.122$, $p = .016$; Spearman's $\rho = -.120$, $p = .018$). The reported simple regression model was not significant ($R^2 = .003$, $F(1, 383) = 1.27$, $p = .260$), and there was no difference in the level of study and sleep quality ($F(2, 382) = 2.557$, $p = .079$). Sleep may be a relevant concern regarding postgraduate students' academic performance; however, sleep should not be the only consideration. Regular sleep, combined with the mental well-being influenced by a combination of stress, self-regulation, and context, is likely to be the primary driver of academic performance. The study suggests postgraduate student support systems should include sleep awareness and sustainable study practices and encourages longitudinal research in Sri Lanka.

Keywords: sleep quality; academic performance; postgraduate students; Sri Lanka; higher education

INTRODUCTION

Sleep affects several aspects of functioning that are important for learning within higher education, including attention, memory consolidation, executive functioning, and emotional regulation and control. Students must maintain concentration, integrate information, recall previously learned information, and control their effort to complete tasks over long periods. These considerations indicate that sleep should not just be viewed as a health and lifestyle issue. It should be understood as a cognitive and emotional process component that facilitates the learning process (Curcio et al., 2010; Rasch & Born, 2013). Sleep-related issues, including irregular sleep, insufficient sleep, excessive daytime sleepiness, and disturbed sleep, are some of the most prevalent concerns among university students. Students often delay bedtime because of assignments, work, social, media, and digital activities, and because of academic and professional-related anxiety (Hershner & Chervin, 2014; Lund et al., 2010).

This problem is likely to be of greater concern to postgraduate students. With greater autonomy in scheduling their studies, and possibly working, postgraduate students are more likely to be older than undergraduate students. Postgraduate students may be juggling various demands, including education, employment, finances,

and family obligations. This level of education may include laboratory work, assignments, statistical work, research, presentations, reading, and preparing a thesis. These activities require significant cognitive effort and may take time beyond scheduled teaching activities. This flexibility can be positive for students, but it can contribute to academically relevant, irregular routines that may extend into the late hours of the night.

Most international literature shows that academic functioning and sleep quality are connected, though the specifics vary. Sleep loss negatively impacts academic performance through its effects on alertness, memory, and cognitive processing (Curcio et al., 2010). It has also been the focus of numerous empirical studies looking at college students. Several empirical studies have examined the link between students' sleep and their academic performance (Ahrberg et al., 2012; Gilbert & Weaver, 2010; Howell et al., 2004). Sleep timing and consistency, in addition to sleep duration, have more recently gained attention. For instance, Okano et al. (2019) have analyzed the role of sleep quality, duration, consistency and performance in academics. It must be noted, that lack of sleep does not mean that student performance will be lacking. There are several explanations for students having poor sleep such as motivation and high effort, and academic compensation that may be influenced by their prior academic performance and other resources.

The Sri Lankan postgraduate context is unique and requires further study because postgraduate students may have a combination of variables such as commuting, work, family, economic, research, and varied study concerns. It may also result in a sleep environment that is quite distinct from the residential undergraduate population that is predominantly found in many international studies. Thus, this study has assessed the quality of sleep, disturbance of sleep, perceived academic performance, sleep-performance beliefs, and performance differences by year in postgraduate students in Sri Lanka.

Problem Statement and Research Gap

Sleep and academic performance are well-studied, but three gaps are present. First, most of the studies focus on the undergraduate student population while fewer studies concern the postgraduate student population. Second, the dimension of sleep is often reduced to sleep duration. Yet sleep is multidimensional (Buysse et al., 1989) and can include sleep initiation, sleep continuity, sleep restfulness, sleep disturbances, daytime sleepiness, and sleep timing. Third, academic performance is multidimensional and cannot be captured by grades alone. It includes research productivity, concentration, confidence, engagement, completion of tasks, effectiveness at taking exams, and satisfaction with the process of learning.

These gaps are particularly important when one needs to interpret weak or inconsistent findings. Just finding a correlation that is statistically significant may suggest that the variable does not have important predictive value. The same is true of a regression for which sleep is not one of the significant predictors. The strength of a measurement may also impact the relationship between sleep and other academic variables. If a sleep measure is internally inconsistent, the correlation with academic measures would be attenuated. In this study, several different types of analysis are combined (i.e., descriptive, psychometric, correlational, comparative, and predictive) instead of relying on a single statistical test.

Purpose and Research Questions

This study investigated how sleep quality impacts academic performance among postgraduate students in Sri Lanka, and was conducted in four steps. First, sleep quality of the participants was described. Second, the study investigated whether there was a connection between sleep quality and participants' perceived academic performance. Third, the study investigated the differences in sleep quality according to the year of participants' postgraduate studies. Lastly, the study investigated whether sleep quality could be used to predict academic performance. The overall goal of the study was to determine how sleep quality impacts academic performance of postgraduate students in Sri Lanka.

Theoretical Framework

Sleep and the performance of academic tasks relate to each other in multiple ways. The memory consolidation account regards sleep as consolidating and integrating newly learned information, making it an active and

integral part of the learning process that goes beyond and precedes the learning event (Rasch & Born, 2013). For postgraduate learners, sleep disruption may negatively affect learning.

The second account emphasizes executive function. Sleep restriction impacts cognitive flexibility and decision-making as well as working memory and attention (Killgore, 2010; Lim & Dinges, 2010). All of the above functions are of great importance to postgraduate learners when they are required to organize their research activities, when they have to interpret data and address conflicting deadlines and when they have to face and handle various, unknown challenges.

The last two accounts are the circadian perspective and social-jetlag. Here the focus extends to the timing and regularity of sleep. Students may appear to have adequate sleep, but if there is misalignment between their biological and academic clocks, this may impact their alertness and learning (Wittmann et al., 2006). This is the case for postgraduate students who have flexible study schedules and late night computer use and who have irregular work or research schedules.

Self-regulation theory also offers a useful explanation. Students decide how to distribute their time among studying, sleeping, working, social and family time. Students think they can be more productive by sacrificing sleep time. However, long-term sleep restriction makes it difficult to pay attention and self-regulate during studying (Pilcher & Walters, 1997). Stress and arousal models describe a circular interaction in which academic workload and anxiety cause sleep problems while sleep restriction increases fatigue and irritability and perceived stress (Almojali et al., 2017; Hershner & Chervin, 2014).

All of these models anticipate that sleep should have some importance for education even though they do not expect a major direct correlation between sleep and grades or perceptions of performance. Sleep may act upon many things such as attention, memory, emotional and self-regulation, and stress. A simple cross-sectional regression might only demonstrate a small part of the total educational significance of sleep.

METHOD

Research Design

A quantitative, cross-sectional survey design was utilized. This survey design allowed research participants to describe their sleep experiences and analyze statistical association between sleep quality, academic performance, and year of study. Since this survey design was cross-sectional, there was no way to analyze temporary sequence and cause. As such, the analysis was carried out to identify associations and predictive relationships within the study data. This by no means suggested that a change in sleep quality caused a change in academic performance.

Participants and Setting

The final analytical dataset comprised 385 responses from postgraduate students in Sri Lanka. The cited disciplines include Statistics, Physics, Biology-related, Environmental Science, Chemistry, Applied Mathematics, Biotechnology, Mathematics, Data Science, and Computer Science. Having many disciplines represented enhanced the academic breadth of the sample and lessened the probability that the results represented only one discipline. The sample included students enrolled in postgraduate studies across three years. The breakdown was as follows: 161 first-year students, 137 second-year students, and 87 third-year students.

Measures

To collect the data, researchers administered a filled-in self-report questionnaire. The researchers treated sleep quality in this study as an overall sleep experience and sleep-related functioning. The sleep-related functioning measures included issues of sleep initiation, interrupting sleep, sleep interruptions, and daytime sleep. Poor sleep quality was represented by a better composite score in this study.

The items covering sleep disturbance addressed challenges of sleep initiation, nighttime waking, bathroom breaks, difficulty of breathing, feeling too hot or too cold, bad dreams, and pain. This Sleep Disturbance Scale lacked internal consistency (Cronbach's α = .504) which indicated that in this sample, the items did not function as one highly unidimensional construct, and therefore findings related to sleep disturbance were reported cautiously.

In this study, academic performance was measured by the perceived academic functioning along with the satisfaction of taking examinations and general academic satisfaction. This is not intended to measure an objective grade point average or an official examination score. Rather, this is an assessment of the students' perceptions of their own academic functioning in the given study.

Besides this, a separate sleep-performance-beliefs scale measured the students' views regarding the part that sleep plays in concentration, retention, exams, assignments, problem solving, and overall performance. This scale reported excellent internal consistency (Cronbach's α = .965).

Data Collection and Ethics

Participants were informed about the purpose of the study and provided their consent to take part as volunteers. Self-administered questionnaires made the participants avoid disclosing their sleep issues to the interviewer. The aggregate responses made the study team focus on the overall trends and results while maintaining the participants' confidentiality and ensuring that their participation was voluntary. Research documentation reported the study as ethically approved within the institutional research framework of the doctoral study.

Data Analysis

Data were analyzed using IBM SPSS Statistics Version 29. Descriptive statistics were used to summarize key variables. Distributional diagnostics were performed on skewness and kurtosis. For the assessment of internal consistency, Cronbach's alpha, and item-level, diagnostics were conducted. For the estimation of the linear relationship of sleep quality and academic performance, Pearson's correlation was utilized. In contrast, Spearman's rho was used to assess the relationship in a non-parametric way.

A one-way ANOVA was performed to analyze if there was a difference in sleep quality scores amongst first-, second-, and third-year students. To analyze pairwise differences, Tukey HSD post hoc comparisons were executed. Lastly, the relationship between sleep quality and perceived academic performance was assessed using ordinary least squares regression. Effect size was taken into consideration along with statistical significance because p-values by themselves do not show the practical importance

RESULTS

Descriptive Findings

The mean sleep quality score was 2.21 (SD = 0.41), indicating a moderate level of sleep-related difficulties in the coding system. The mean perceived academic performance score was 3.19 (SD = 0.47). The overall trend indicates that the participants were not experiencing severe sleep dysfunction as a group, but rather moderate sleep difficulties among participants who were generally functioning at an adequate level from an academic perspective.

The measurement analysis provided an important distinction for the sleep-disturbance and sleep-performance-beliefs scales. The sleep-disturbance scale showed an alpha value of .504, indicating insufficient internal consistency at a group level. Conversely, the sleep-performance-beliefs scale showed an alpha value of .965 and therefore demonstrated very high internal consistency. It is important to consider the quality of the measurement alongside the findings..

Association Between Sleep Quality and Academic Performance

Pearson's correlation showed a statistically significant but weak negative correlation between sleep quality and academic performance, r = -.122, p = .016, N = 385. Participants showing higher sleep quality showed poorer sleep and thus the correlation was negative. Poor sleep was determined to impact academic functioning in a negative way; however, the correlation was weak. The correlation was similar in magnitude when using the nonparametric Spearman's rho, ρ = -.120, p = .018. Therefore, poor sleep quality was determined to have little impact on postgraduate academic functioning. The evidence collected likely will not allow for much interpretation on the impacts of sleep quality on postgraduate academic functioning, as claims can be made for a weak correlation, and poor sleep quality can be determined to account for small deviations in academic functioning at most. This understanding of the study is vital.

Table 1. Primary Associations Between Sleep Quality and Academic Performance

Analysis	Statistic	p	Interpretation
Pearson correlation	$r = -.122$	.016	Small, statistically significant negative association
Spearman correlation	$\rho = -.120$	.018	Small, statistically significant negative association
Simple regression	$R^2 = .003$	.260	Sleep quality did not significantly predict performance
ANOVA by year	$F(2, 382) = 2.557$	.079	No statistically significant difference

Note. N = 385. Higher sleep-quality scores represented poorer sleep in the study coding.

Regression Analysis

A simple ordinary least squares regression model was constructed, which resulted in $R^2 = .003$, $F(1, 383) = 1.27$, $p = .260$ and was found to be non-significant. The standardized regression coefficient was $\beta = -.058$, while $B = -.065$ (SE = .058). Based on the regression model, sleep quality contributed approximately 0.3% of the variance in perceived academic performance. Based on the simple regression result, sleep quality had very limited predictive utility when it was the only predictor of perceived academic performance. Academic performance is a multifaceted construct that can be impacted by a number of factors such as prior academic performance, level of motivation, study efforts, amount of work, level of stress, amount and quality of adult supervision, the design of the assessment task, dictionary financial means, family obligations, and a host of other factors that were not included in the simple regression model.

Differences by Year of Study

The one-way ANOVA yielded no statistically significant difference in sleep quality across years of study, $F(2, 382) = 2.557$, $p = .079$, with a very small partial eta-squared estimate of around .013. Therefore, we cannot draw any statistically significant conclusion regarding sleep quality among first-, second-, and third-year postgraduate students, nor can we make any conclusion regarding which year may have experienced poorer sleep quality.

Tukey's HSD post hoc analysis confirmed there were no significant pairwise differences. Therefore, the descriptive data should not be interpreted as evidence of a change in sleep quality across the postgraduate years. It may indicate that during the postgraduate years, varying periods during which the postgraduate work and research load may be more intense and varied, and therefore deserving of more in-depth study.

DISCUSSION

The primary finding was that sleep quality showed a significant correlation with perceived performance, but the correlation was weak and sleep quality did not improve performance in the regression equation. The results

suggest a more complex view of sleep in postgraduate education. The findings are in line with the existing literature which shows that sleep impacts cognitive and emotional functioning. These findings show that the positive effects of sleep on education may be difficult to describe in terms of a large direct effect on the postgraduate student survey.

The significant Pearson and Spearman correlations are in line with the existing literature which shows that sleep quality impacts academic functioning (Ahrberg et al., 2012; Gilbert & Weaver, 2010; Howell et al., 2004; Jalali et al., 2020). Similar conclusions have been made in the literature that sleep loss has a negative impact on learning through attention, memory, and cognitive processes (Curcio et al., 2010; Lim & Dinges, 2010). The effect size was much smaller than expected if sleep was the most important only factor in academic performance. This further supports the idea that postgraduate achievement is the result of several overlapping factors.

One account relates to the outcome of the study itself. The performance measure for the study reflected assessment and general academic satisfaction, whereas an objective indication of the institution was represented by a record of grades. Perceived academic functioning is educatively significant because students can experience issues related to concentration, fatigue, low confidence, general dissatisfaction, and other issues of an academic nature, before these issues can be reflected in grade scores. Subjective measures can be influenced by an individual's mood, expectations, peer-related comparisons, and tendencies to respond in a certain way. Subsequent studies should incorporate measures of perceived academic functioning and objective measures (e.g. GPA, examination scores, completion of a thesis, research output, and progress as evaluated by a supervisor).

A second account relates to the quality of the measurement. The sleep disturbance scale had a low level of internal consistency ($\alpha = .504$). When items do not capture a coherent measure, the score is considered unreliable and relationships with other variables may be low. The sleep-performance beliefs scale had high reliability, and so it is conceivable that study participants formed coherent beliefs regarding the academic importance of sleep. However, a belief or understanding of the importance of sleep may be in stark contrast to the student's actual behavior. Students can continue to sacrifice sleep when competing demands (e.g. work, assignments, or family responsibilities) conflict with academia.

A third account relates to the issues of stress and workload. Postgraduate students may experience a reciprocal cycle when academic work interferes with the quality and/or quantity of sleep and sleep causes fatigue and perceived stress. Capturing reciprocal processes in a cross-sectional study is difficult, and it may be that the weak direct effects may co-exist with important indirect effects or conditional/dependency effects on self-regulation (e.g. motivation and emotions).

The year-of-study analysis provides more evidence for caution. Although ANOVA got close to being statistically significant, the effect was small and no pairwise comparisons were significant. Postgraduate study is an unpredictable and non-linear process. Students can have intense, time-consuming phases along the way, such as coursework, examinations, development of a research proposal, data collection, analysis, and writing a thesis. A cross-sectional comparison of year groups is unable to determine whether there is deterioration in sleep at different phases, or whether some cohorts have more work than others. Research that follows individuals over time is necessary to understand the impact at different phases of the postgraduate experience.

Implications for Postgraduate Education in Sri Lanka

The findings provide insight to inform the development of an appropriate institutional response. Higher education institutions must avoid both failing to address sleep as a student issue leading to a burden on students, and elevating sleep to the sole response to academic challenges. Socio-academic factors, such as planning, workload, mental-health concerns, guidance and support, and time and study management, must be incorporated into a framework addressing sleep. Postgraduate students, compared to undergraduate students, experience less standardized routines. Sleep can be disrupted by a variety of factors, even if total sleep duration is adequate, due to flexible study, work, and research deadlines, employment, commuting and family obligations. The support framework should be designed to address sleep duration and sleep regularity, as well

as workload and daytime functioning. Fatigue and concentration problems should be addressed through brief sleep-fatigue screening as part of academic advising, counseling, or well-being services. However, concerns related to standard study practices should not be resolved through clinical intervention.

Postgraduate students should be educated about the benefits of regular sleep, effective study planning, avoiding chronic sleep deprivation, and an understanding of chronic daytime sleepiness and sleep disturbance. It is also important for academic departments to evaluate the timing of assessment tasks to determine whether multiple deadlines lead to unnecessary peak workload. These changes do not require institutions to lower their academic standards but provide opportunities for greater academic achievement through a greater understanding of the biological needs of students.

As postgraduate students primarily work independently, there is a heightened responsibility on the shoulders of their superiors. Some supervisors overlook long work hours, which students may come to consider the norm. De-escalation of concerned conversations around workload, timelines, and milestones with research-stage expectations, exhaustion, and burnout detection and support, should be considered as part of the supportive supervisory practice. Student support services may be able to use sleep as a component of their more elaborate counseling and academic support assessments, especially when difficulty concentrating, academic dissatisfaction, and fatigue complaints are reported.

Strengths and Limitations

Several strengths are worth noting. The study includes a reasonably large postgraduate population of 385 respondents and covers many disciplines. The analytical technique extended beyond simple correlation and incorporated elements of psychometric evaluation, non-parametric testing, group comparison, and regression. Reporting findings regarding statistical significance and effect size provides a more realistic appraisal of the sleep-performance nexus.

The limitations also merit consideration. First, the cross-sectional nature of the study restricted the researcher's ability to draw a causal link. Second, self-reported measures introduced the possibility of recall bias and common-method bias. Third, self-reported, measure of academic performance was substituted for more objective performance data. Fourth, the sleep-disturbance scale demonstrated poor internal consistency. Finally, simple regression with subjective measures of sleep quality as the only predictor was employed.

Recommendations for Future Research

A multi-institutional sampling strategy enhances external validity and offers researchers the opportunity to explore the impact of institutional type, program structure, discipline, and study mode on the sleep-performance relationship.

Longitudinal designs are particularly useful. Several repeated assessments could evaluate sleep during the different stages of coursework, studying for and taking assessments, research, and data analysis and writing the thesis. Objective measures (e.g., actigraphy) can be used with subjective measures. New measures also need to be formally analyzed for their items and piloted before any large-scale measure.

More sophisticated statistical models should examine possible mediating and moderating effects instead of sleep as an isolated predictor. Stress, academic workload, self-regulation, technology use, employment, commuting time, family obligations, and mental well-being could potentially explain poor sleep and no large decline in formal performance. Researchers should also measure sleep duration, sleep quality, sleep regularity, chronotype, and daytime sleepiness, and not merge multiple constructs.

CONCLUSION

This study offers context-specific data on sleep and scholarly conduct associating postgraduate students in Sri Lanka. Results indicated a statistically significant, but weak, correlation between sleep quality and subjective self-evaluations of academic accomplishments. The simple regression model also showed sleeping quality did

not play a role in predicting accomplishment. According to these findings, sleep quality was not shown to differ across years of postgraduate studies. These results do not support the notion that sleep is irrelevant in scholarly activities and imply that the role of sleep, as a predictor of scholarly accomplishments, should be viewed as of low significance, especially when studied in isolation, across the country's postgraduate population.

The most appropriate conclusion in support of these findings is of a systems nature. Sleep quality interacts with cognitive functioning, emotional self-regulation, and stamina together with the scholarly workload and demands, self-regulatory factors, and the scholarly environment. Postgraduate studies in Sri Lanka may provide added emphasis on sleep and sustainable study promotions in their services to students; including an emphasis on sleep in future studies on sleep and its role in scholarly and work activities may take a more longitudinal, multi-institutional, and objectively measured approach.

DECLARATIONS

Ethical Approval and Informed Consent

Ethical approval was obtained for the doctoral study in question, through the appropriate institutional research process. Participants were able to withdraw at any time. Each participant was fully informed of the study details prior to giving consent to participate. Individual responses were kept confidential and reported in aggregate form.

Conflict of Interest

The author declares no known financial or personal conflicts of interest that could have influenced the conduct, analysis, interpretation, or reporting of this study.

Data Availability

The dataset cannot be made publicly available because it contains participant-level data which was collected under conditions of confidentiality. Requests for data should therefore be directed to the corresponding author, all such requests being subject to ethical considerations, confidentiality obligations, and institutional requirements.

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