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Research Paper

The Power of Sleep: How Quality of Rest Shapes Academic Performance in Young Adults (16–20 years)

Swetha G.T.[1]*, Mrs. Dhruthi S. Prasad[2]

ABSTRACT

Sleep is essential for cognitive, emotional, and physical functioning, yet many adolescents experience poor sleep quality. This study examined the relationship between sleep quality and academic performance in young adults aged 16–20 years. A cross-sectional survey of 150 students from Bengaluru Urban was conducted using the Simplified Pittsburgh Sleep Quality Index (PSQI-S) and a self-reported Academic Performance Scale (APS-S). Descriptive statistics indicated moderate sleep disruption and generally moderate-to-high academic performance. Pearson correlation analysis revealed a strong negative association between sleep quality and academic performance ($r = -0.791$, $p < .001$), indicating that poorer sleep quality is linked to lower academic achievement. These findings underscore the importance of sleep quality, rather than sleep duration alone, in supporting cognitive functioning and learning outcomes. Interventions promoting sleep hygiene, digital curfews, and alignment of institutional schedules with adolescents' biological rhythms may enhance academic success and overall well-being.

Keywords: *Sleep, Academic Performance, Adolescence, Sleep Quality, Cognitive Function*

Sleep is a fundamental biological process that supports physiological homeostasis, neurocognitive functioning, and emotional regulation (Walker, 2017). It alternates between non-rapid eye movement (NREM) and rapid eye movement (REM) stages, each providing specific restorative benefits. Deep NREM sleep facilitates declarative memory consolidation and tissue repair, whereas REM sleep supports procedural memory, emotional processing, and problem-solving abilities (Carskadon & Dement, 2011; Diekelmann & Born, 2010; Rasch & Born, 2013).

Sleep also impacts hormonal regulation, including cortisol, melatonin, leptin, and ghrelin, thereby influencing stress response, appetite, metabolism, and immune functioning (Van Cauter et al., 2008; Irwin, 2015). Chronic sleep deprivation has been linked to attentional deficits, impaired learning, mood dysregulation, and long-term health risks such as obesity, diabetes, and cardiovascular disease (Medic et al., 2017).

[1]MSc Psychology Student, Dept. of psychology, JAIN deemed-to-be-University, Bengaluru
[2]Assistant Professor, Dept. of psychology, JAIN deemed-to-be-University, Bengaluru
*Corresponding Author

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Despite the established role of sleep in cognitive and emotional functioning, many adolescents experience sleep disruption due to academic workload, social commitments, and evening technology use. While international research links sleep to academic performance, evidence in the Indian context remains limited, particularly regarding **sleep quality** rather than duration alone. This study addresses this gap by examining the relationship between sleep quality and academic performance in young adults aged 16–20 years.

LITERATURE REVIEW

Sleep Quality

Sleep quality is a multidimensional construct encompassing restorative value, continuity, and alignment with circadian rhythms (Buysse, 2014). High-quality sleep enables ease of sleep onset, uninterrupted sleep, proper progression through sleep stages, and alert awakening. Poor sleep quality is associated with difficulties in sleep initiation, fragmentation, and daytime dysfunction, adversely affecting physical, cognitive, and emotional health (Ohayon et al., 2017; Medic et al., 2017). Lifestyle factors (e.g., caffeine intake, screen exposure), stress, environmental conditions, and underlying health issues significantly influence sleep quality (Hirshkowitz et al., 2015).

Sleep and Academic Performance

Adequate sleep supports attention, memory consolidation, and executive functioning, all crucial for academic success (Krause et al., 2017). Empirical evidence consistently reports that students with higher sleep quality exhibit superior retention, creative problem-solving, and examination performance (Curcio et al., 2006; Eide & Showalter, 2012). Conversely, sleep deprivation impairs focus, slows processing speed, and disrupts memory, with even short-term sleep restriction producing cognitive deficits comparable to alcohol intoxication (Alhola & Polo-Kantola, 2007; Killgore, 2010).

Theoretical Framework

This study draws on multiple theoretical perspectives:

- **Borbély's Two-Process Model (1982):** Homeostatic and circadian processes regulate sleep; poor sleep disrupts next-day functioning.
- **Synaptic Homeostasis Hypothesis (Tononi & Cirelli, 2014):** Sleep downscales synapses to optimize learning.
- **Active Systems Consolidation Theory (Diekelmann & Born, 2010):** NREM and REM sleep reorganize memories.
- **Zimmerman's Self-Regulated Learning Model (2000):** Sleep influences motivation, planning, and adaptive study strategies.
- **Bronfenbrenner's Bioecological Model (2006):** Environmental factors interact with biological sleep patterns to influence academic outcomes.

METHODOLOGY

Design

A cross-sectional, quantitative, correlational survey design was employed to examine the relationship between sleep quality and academic performance.

Participants

The sample comprised 150 students aged 16–20 years from Bengaluru Urban, recruited through simple random sampling.

Instruments

- **Simplified Pittsburgh Sleep Quality Index (PSQI-S):** Assesses sleep quality; higher scores indicate poorer sleep. Cronbach's alpha in the present sample: 0.81.
- **Academic Performance Scale (APS-S):** Self-reported academic outcomes; higher scores indicate better performance. Validation: Kuncel, Credé, & Thomas (2005).
- **Demographic Questionnaire:** Age, gender, academic stream, and daily study hours.

Procedure

Ethical approval was obtained from the institutional review board. Informed consent/assent was collected prior to participation. Questionnaires were administered online and in classroom settings. Incomplete responses were excluded.

Variables

- **Independent Variable:** Sleep quality (PSQI-S)
- **Dependent Variable:** Academic performance (APS-S)
- **Control Variables:** Age, gender, academic stream, daily study hours

Data Analysis

Descriptive statistics summarized participant demographics and primary variables. Pearson correlation examined the relationship between sleep quality and academic performance, with significance set at $\alpha = 0.05$. Normality assumptions were assessed through skewness and kurtosis values.

RESULTS

Descriptive statistics for the primary study variables are presented in Table 1. The participants (N = 150) had a mean age of 17.99 years (SD = 1.48). Sleep quality scores indicated moderate disruption (M = 11.79, SD = 3.65), while academic performance scores were generally moderate to high (M = 16.91, SD = 4.81). Skewness and kurtosis values suggested approximately normal distributions for both sleep quality and academic performance.

Pearson correlation analysis revealed a strong, negative relationship between sleep quality and academic performance ($r = -0.791$, $p < .001$), indicating that poorer sleep quality was associated with lower academic achievement. Age was not significantly correlated with either sleep quality ($r = 0.034$, $p = .704$) or academic performance ($r = -0.048$, $p = .567$).

Table 1 Descriptive Statistics for Major Study Variables (N = 150)

Variable	M	SD	Min	25%	Median	75%	Max	Skewness	Kurtosis
Age	17.99	1.48	16	17	18	19	20	0.06	−1.37
Sleep Quality Score (PSQI-S)	11.79	3.65	4	8	12	15	19	0.23	−1.28
Academic Performance (APS-S)	16.91	4.81	7	13	17	22	24	−0.29	−1.30

Note. M = mean; SD = standard deviation; PSQI-S = Simplified Pittsburgh Sleep Quality Index; APS-S = Academic Performance Scale. Skewness and kurtosis values indicate approximately normal distributions.

Table 2 Pearson Correlation Coefficients Among Study Variables (N = 150)

Variables	1	2	3
1. Age	1	0.034	−0.048
2. Sleep Quality Score (PSQI-S)	0.034	1	−0.791**
3. Academic Performance (APS-S)	−0.048	−0.791**	1

Note. p < .001. PSQI-S = Simplified Pittsburgh Sleep Quality Index; APS-S = Academic Performance Scale.

DISCUSSION

The present study demonstrated a robust negative association between sleep quality and academic performance among young adults aged 16–20 years. This finding aligns with prior research indicating that fragmented or non-restorative sleep impairs attention, memory consolidation, executive function, and self-regulated learning (Becker et al., 2019; Dewald et al., 2010; Curcio et al., 2006). Poor sleep likely disrupts both NREM and REM processes critical for declarative and procedural memory, as well as emotional regulation, contributing to reduced learning efficiency and academic achievement (Diekelmann & Born, 2010; Walker, 2017).

Contextual factors such as evening technology use, academic workload, and social jetlag may exacerbate sleep disruption, highlighting the need for multi-level interventions. Practical applications include promoting structured sleep hygiene, limiting evening digital device exposure, and considering later school start times to align with adolescents' circadian rhythms (Bowers & Moyer, 2017; Gradisar et al., 2011).

Limitations include reliance on self-reported measures, cross-sectional design, and a regional sample, which constrain causal inference and generalizability. Future research should incorporate longitudinal designs, objective sleep assessments (e.g., actigraphy), and examine mediating factors such as executive function and emotional regulation. Cross-cultural studies may further elucidate environmental influences on the sleep–academic performance relationship.

In conclusion, these findings underscore that sleep quality is a critical determinant of academic success in young adults. Interventions targeting lifestyle habits, sleep hygiene, and institutional scheduling have the potential to enhance cognitive functioning, learning outcomes, and overall well-being.

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Conflict of Interest

The author(s) declared no conflict of interest.

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