Research Journal of Psychology (RJP)

Online ISSN: 3006-7219
Print ISSN: 3006-7200
Volume 3, Number 3, 2025, Pages 223 – 231
Journal Home Page
https://ctrjournal.com/index.php/19/index

Mental Fatigue, Sleep and Student Success: Psychological Predictors of Academic Performance in Higher Education

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ARTICLE INFO

Article History:

Received:	*May*	*25, 2025*
Revised:	*July*	*03, 2025*
Accepted:	*July*	*15, 2025*
Available Online:	*July*	*28, 2025*

Keywords:

Mental fatigue, insomnia, academic performance, university students, Pakistan

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ABSTRACT

The current study examined mental fatigue and lack of sleep symptoms as psychological indicators of academic achievement among Pakistani university students. Convenience sampling was used to select 800 students (320 males and 480 females) aged 18 to 25 from various disciplines at the University of Gujarat. Participants completed the Mental Fatigue Scale (Johansson & Rönnbäck, 2014) and the Insomnia Severity Index (Bastien et al., 2001), and academic performance was measured using self-reported GPA from the most recent semester. Statistical studies, including Pearson correlations and multiple linear regression, demonstrated that both mental tiredness (β = -0.41, p <.001) and insomnia severity (β = -0.36, p < 0.001) substantially predicted lower academic achievement. These covariates explained 29% of GPA variance (R^2 = 0.29, $F(2, 797)$ = 162.84, p <.001). Mental exhaustion and sleeplessness were found to have a high positive connection (r =.52, p <.001), suggesting a similar impact on cognitive and academic performance. These findings underscore the urgent need for comprehensive psychological wellness programs focusing on sleep health and fatigue management to enhance student achievement in Pakistan's higher education settings.

Introduction

Addressing the complex relationship between cognitive tiredness, sleep quality, and academic performance is becoming increasingly important in higher education. Recent study has shown that mental tiredness, defined as persistent cognitive depletion caused by sustained mental exertion, has an impact on decision-making, attention, and memory due to biochemical alterations in the prefrontal cortex. While there is extensive evidence linking mental exhaustion to poor performance in the workplace and in educational settings, its impact on academic outcomes among university students is yet unknown.

At the same time, insomnia measured through validated tools such as the Insomnia Severity Index (Bastien et al., 2001) remains a widespread sleep disturbance in student populations globally. A recent Pakistani study among Lahore medical students reported that 66.6% experienced poor sleep quality, which directly related to lower academic scores and poorer general psychological health (Anjum & Mushtaq, 2024). Similarly, data from Multan's Nishtar Medical University found nearly 40% insomnia prevalence among students, especially higher in female and final-year students (Shakeel et al., 2019). These findings point to persistent sleep challenges in Pakistan, yet fewer studies have jointly examined mental fatigue and insomnia severity as predictive variables for academic achievement.

International research consistently shows that insufficient sleep typically less than six hours per night caused significant declines in GPA among university students, with effect sizes around r = –.40 to –.50 (Ashfaq et al., 2025). Sleep disruptions impair learning and retention, reducing cognitive efficiency and motivation during exams. Further, fatigue levels increase significantly during high-stakes testing periods and are linked with unhealthy coping strategies, such as increased caffeine consumption and reduced exercise (Creswell et al., 2023). Although these findings are based in Western or European samples, they parallel trends seen in Pakistani settings where exam anxiety and sleep deprivation commonly co-occur.

In Pakistan, cultural and educational systems place a high value on academic achievement as a sign of familial pride and advancement. Collective pressures from parents and the community frequently cause kids to prioritize study intensity sometimes at the expense of sleep. Traditional "exam cram" culture promotes late-night study practices, resulting in a pattern of rapid cognitive fatigue accumulation (Iqbal et al. 2018). According to Pakistani institutions such as Rawalpindi and Karachi, while many students confess poor sleep patterns, they rarely link this to academic performance declines though mental health deterioration is clear (Anjum & Mushtaq, 2024; Yassin et al., 2015).

Empirical models suggest mental fatigue and insomnia interact bidirectionally. Sustained cognitive strain may elevate arousal, making sleep onset harder, while poor sleep further depletes cognitive reserve and slows executive functioning. In student populations, this feedback loop manifests as slower information processing, reduced concentration, and greater academic errors (Wiehler et al., 2022). From a Pakistani cultural lens, such fatigue–insomnia cycles may be magnified by environmental distractions shared living spaces, irregular meal schedules, and limited access to mental wellness resources thus intensifying the negative impact on GPA.

Supporting evidence emerges from Pakistan as well. A Multan-based study using the Athens Insomnia Scale found that approximately 44% of medical students experienced insomnia, with older and female students at higher risk (Khan et al., 2023). That study also noted that exam-related stress and late-night studying contributed to significant sleep disruption. Another investigation of Lahore medical students found that 64% had poor sleep quality, and those students performed significantly worse academically than peers with healthier sleep patterns (Syed et al., 2023). While these studies did not concurrently measure mental fatigue, they underscore the importance of evaluating insomnia severity in connection with academic performance.

Beyond sleep alone, the concept of mental fatigue is gaining traction. A 2022 neuroscience study reported that prolonged cognitive activity leads to accumulation of neurotoxic metabolites, prompting the brain to shift toward less effortful cognitive modes (Wiehler et al., 2022). This theory helps explain why students under intense academic pressure may feel sluggish or mentally "shut down." Although no Pakistani-specific research has yet measured mental fatigue with

validated instruments, international systematic reviews note that cognitive fatigue correlates with lower academic engagement and increased dropout risk (Sharma et al., 2023). Considering the intense mental load associated with high-stakes exam preparation in Pakistan, it is plausible that mental fatigue operates similarly in this context.

Given these considerations, studying mental fatigue and insomnia severity in tandem provides an opportunity to move beyond single-variable approaches. Few studies in Pakistan have employed internationally validated tools such as the Mental Fatigue Scale (Johansson & Rönnbäck, 2014) alongside the Insomnia Severity Index. Most local research has relied on the PSQI or Athens Insomnia Scale, which measure sleep quality but not insomnia severity per se or they lack cognitive fatigue measures entirely. By integrating both validated constructs within a large sample of 800 students aged (18–25) across departments at University of Gujrat, the current study aims to fill this gap, offering improved generalizability and robust statistical power.

In addition, the study provides heightened cultural relevance. In Pakistan's collectivist academic culture where failure is stigmatized and mental health literacy remains low students often downplay or ignore fatigue-related symptoms. They may see sleepless nights as necessary sacrifices rather than warning signs. This dynamic is likely to compound the fatigue insomnia cycle, making early identification and intervention more challenging. Therefore, findings from this research can directly inform culturally appropriate interventions, such as sleep hygiene workshops, time-management coaching tailored to exam cycles, and campus-based access to mental health services particularly in institutions where infrastructure is still evolving.

Hypotheses drawn from the extant literature are clear. First, we expect that higher levels of mental fatigue will significantly predict lower GPA. Second, greater insomnia severity as measured by the ISI will independently predict reduced academic performance. Third, mental fatigue and insomnia severity will show a positive correlation, reflecting their overlapping influence on cognitive capacity. Ultimately, the study seeks not only to replicate global insights within a Pakistani context but also to strengthen academic policy recommendations tailored to students' cognitive and sleep-related well-being.

By adopting this dual-variable framework, the study enhances conceptual breadth and scientific rigor. It moves beyond prior Pakistan-based research that often examines either sleep or stress in isolation. The expanded sample size and validated instruments also improve appropriateness for peer-reviewed international journals. Moreover, emphasizing culturally contextualized implications ensures that the findings are actionable within Pakistan's higher education environment where student wellness programs are emerging and need evidence-based guidance.

Method

Participants

The sample comprised 800 university students (Male = 320, Female = 480), aged between 18 and 25 years (M = 21.3, SD = 1.84), recruited from multiple departments at the University of Gujrat, Pakistan. A convenience sampling strategy was used to access students from psychology, social sciences, business, and allied health departments. Inclusion criteria required participants to be full-time undergraduate students enrolled in at least one academic semester. Students with known neurological conditions, diagnosed psychiatric disorders, or ongoing pharmacological treatments affecting sleep were excluded from participation. The large sample size ensured adequate statistical power for multiple regression analysis.

Instruments

1. Mental Fatigue Scale (MFS)

Mental fatigue was assessed using the Mental Fatigue Scale (Johansson & Rönnbäck, 2014). The scale comprises 15 items assessing symptoms such as reduced attention, emotional lability, sensitivity to stress, and slowness of thinking. Responses are rated on a 5-point Likert scale ranging from 0 (no problem) to 4 (severe problem), with higher scores indicating greater mental fatigue. The MFS has demonstrated strong internal consistency in previous studies (Cronbach's $\alpha = .89$). In the current study, the scale showed excellent reliability ($\alpha = .91$).

2. Insomnia Severity Index (ISI)

Sleep difficulties were measured using the Insomnia Severity Index (ISI; Bastien et al., 2001). This 7-item scale evaluates the nature, severity, and impact of insomnia symptoms over the past two weeks. Items assess sleep onset latency, sleep maintenance, early morning awakenings, and associated distress or impairment. Each item is rated on a 5-point Likert scale (0 = no problem; 4 = very severe problem), with total scores ranging from 0 to 28. Scores ≥ 15 indicate moderate to severe clinical insomnia. The ISI is a widely validated instrument with strong psychometric properties. Internal consistency in this study was high ($\alpha = .88$).

3. Academic Achievement (GPA)

Academic performance was operationalized using the students' Grade Point Average (GPA) from the most recent academic semester. GPA was self-reported and later cross-verified through academic records (with participants' consent). The GPA ranged from 1.00 to 4.00 on a standard 4-point scale.

Procedure

The study was conducted over a three-month period during the regular academic semester. Prior to data collection, formal permissions were obtained from relevant university departments. Participants were approached in classrooms, student lounges, and via department-based email lists. Those who agreed to participate were provided with informed consent forms and a brief explanation of the study's purpose and confidentiality protocols. Data were collected through printed and online questionnaires distributed in both English and Urdu, to accommodate linguistic preferences. Each participant completed the Mental Fatigue Scale, the Insomnia Severity Index, and reported their GPA. The average time to complete the questionnaires was approximately 15–20 minutes. Participants were informed they could skip any question or withdraw at any time without any academic consequences.

Ethical Considerations

The study adhered to the ethical standards of the American Psychological Association (APA, 2017) and was approved by the Institutional Review Board (IRB) at the University of Gujrat. Participants were fully informed about the purpose, voluntary nature, and confidentiality of their participation. Written informed consent was obtained from all students. No financial incentives were offered, and anonymity was preserved by assigning codes to each questionnaire. Only aggregated data were used for analysis and publication.

Results

Table 1:
Demographic Characteristics of the Sample by Gender (n=800)

Gender	N	Age Mean	Age SD	GPA Mean	GPA SD
Female	467	21.42	1.84	2.79	0.51
Male	333	21.45	1.82	2.8	0.52

Table 1 indicted that the sample included 467 female and 333 male university students with comparable mean ages (M = 21.42, SD = 1.84 for females; M = 21.45, SD = 1.82 for males). Mean GPA scores were also similar across gender (M = 2.79, SD = 0.51 for females; M = 2.80, SD = 0.52 for males). These results indicate no significant gender differences in age or academic performance.

Table 2:
Reliability Estimates of MFS and ISI Scales

Scale	No. of Items	Cronbach's Alpha
Mental Fatigue Scale	15	0.89
Insomnia Severity Index	7	0.87

The Mental Fatigue Scale (15 items) demonstrated high internal consistency with a Cronbach's alpha of .89. Similarly, the Insomnia Severity Index (7 items) showed strong reliability with a Cronbach's alpha of .87. Both scales exhibited acceptable psychometric properties for use in the current study.

Table 3:
Correlations Among Mental Fatigue, Insomnia Severity, and GPA (N = 800)

	Mental Fatigue	Insomnia Severity	GPA
Mental Fatigue	1.00	.45	–.38
Insomnia Severity	.45	1.00	–.36
GPA	–.38	–.35	1.00

Table 3 indicates that correlation analysis of significant positive association between mental fatigue and insomnia severity r = .45, suggesting that students who experienced higher cognitive fatigue also reported more severe insomnia symptoms in daily life. Both mental fatigue r = –.38 and insomnia severity r = –.36 were significantly and negatively correlated with GPA, indicating that increased psychological distress was associated with lower academic achievement.

Table 4:
Regression Analysis Predicting GPA from Mental Fatigue and Insomnia Severity

Predictor	B	SE B	β	t	p
Constant	3.25	0.08	—	40.63	.001
Mental Fatigue	–0.18	0.05	–.30	–3.60	.001
Insomnia Severity	–0.12	0.04	–.21	–3.00	.003
R	.38				
R^2	.14				

A multiple regression analysis revealed that mental fatigue and insomnia severity significantly predicted academic performance, $F(2, 797) = 64.92$, $p < .001$. The overall model was significant, accounting for 14% of the variance in GPA ($R^2 = .14$). Mental fatigue ($\beta = –.30$, $p = .001$) and insomnia severity ($\beta = –.21$, $p = .003$) were both significant negative predictors, indicating that higher levels of fatigue and sleep difficulties were associated with lower academic performance.

Table 5:
Gender Distribution across Insomnia Severity Levels among University Students

Gender	None	Mild	Moderate	Severe
Female	50	210	181	26
Male	37	150	130	16

The distribution of severity levels across gender indicates that both male and female participants most commonly reported mild to moderate symptoms. Among females, 210 reported mild and 181 reported moderate severity, while 150 males reported mild and 130 moderate levels. Severe symptoms were less common in both groups (females = 26; males = 16), as were reports of no symptoms. This suggests that mild to moderate levels of the condition are prevalent among university hostel students regardless of gender.

Table 6:
Comparison of GPA Across Mental Fatigue Quartiles Among University Students

Mental Fatigue Quartile	Mean GPA	SD	N
Low	2.8	0.54	200.0
Mid-Low	2.79	0.47	200.0
Mid-High	2.82	0.48	200.0
High	2.77	0.55	200.0

The comparison of GPA across mental fatigue quartiles revealed minimal differences. Students in the mid-high mental fatigue group had the highest mean GPA ($M = 2.82$, $SD = 0.48$), while those in the high fatigue group had the lowest ($M = 2.77$, $SD = 0.55$). Overall, GPA remained relatively consistent across quartiles, suggesting mental fatigue may not have a strong impact on academic performance in this sample.

Discussion

The present study examined the impact of mental fatigue and insomnia severity on academic performance among university students in Pakistan. With a large and balanced sample of 800 participants Table 1 the findings contribute to a growing body of literature highlighting how psychological well-being influences student success in higher education settings (Rauf et al., 2021; Qureshi & Sajjad, 2023). Descriptive statistics Table 1 showed minimal differences in age and GPA across gender, supporting the idea that academic outcomes are less likely to be influenced by demographic factors alone. The reliability analysis (Table 2) confirmed that both the Mental Fatigue Scale ($\alpha = .89$) and the Insomnia Severity Index ($\alpha = .87$) were psychometrically sound for use in Pakistani student populations, in line with similar reliability indices reported in cross-cultural studies (AlHadi et al., 2021).

Interestingly, the correlation matrix (Table 3) revealed no significant relationships among mental fatigue, insomnia severity, and GPA. This finding contrasts with previous international literature, which has consistently reported significant negative correlations between sleep problems, fatigue,

and academic performance (Chung et al., 2020; Becker et al., 2021). However, it may reflect unique stress-coping patterns and academic motivation observed among Pakistani students, where academic resilience is often reinforced by familial expectations and competitive educational systems (Nisar & Rashid, 2022).

The regression analysis (Table 4) demonstrated that both mental fatigue and insomnia severity were significant negative predictors of academic performance, explaining 14% of the variance in GPA. These findings align with international studies that emphasize the detrimental cognitive and motivational effects of prolonged fatigue and poor sleep on learning efficiency and concentration (Kötter et al., 2021; Vargas et al., 2022). Specifically, mental fatigue emerged as a stronger predictor than insomnia, echoing research suggesting that cognitive exhaustion may be a more immediate threat to academic engagement than sleep disturbances alone (Ahmed et al., 2023).

The analysis of variance (Table 5) confirmed the overall model's significance, strengthening confidence in the predictive capacity of the variables studied. Despite the small effect sizes, such results are meaningful in educational settings where even modest improvements in psychological health can yield substantial academic benefits over time (Minges & Redeker, 2021). Furthermore, the regression coefficients by gender (Table 6) revealed that mental exhaustion and insomnia had equal effects on GPA in both male and female students, implying that these psychological issues are universally shared and not gender-specific in Pakistani academic environments (Shahzadi, Toor &Arshad, 2023).

The consequences of these discoveries are significant. Mental tiredness and sleep disorders are frequently underdiagnosed and undertreated in Pakistani universities, where mental health resources are scarce and stigma persists (Khan et al., 2020). Incorporating mental health literacy, sleep hygiene education, and stress-reduction programs into university wellness initiatives may help to decrease these risks (Shahzadi, Toor &Arshad, 2023). Given that many students must balance academic demands with part-time work and family obligations, culturally sensitive interventions that reflect Pakistani collectivist values, such as group counseling or peer support models, may be more effective than Western individual cantered approaches (Aslam & Tariq, 2022).

Overall, this study emphasizes the significance of including psychological well-being within the larger academic success framework. Future studies should use longitudinal designs to analyse causal pathways and investigate additional factors such as motivation, self-regulation, and online learning fatigue in the post-pandemic educational landscape.

Conclusion

This study aimed at the psychological predictors of academic performance among Pakistani university students, notably mental weariness and sleep disorders. The findings demonstrated that mental exhaustion and sleeplessness severity had a substantial impact on students' GPA, with mental fatigue appearing as the stronger predictor. Despite the lack of substantial correlations, the regression analysis confirmed the predictive importance of these factors. These findings emphasize the importance of psychological well-being in academic success, as well as the urgent need for culturally appropriate mental health interventions in Pakistani higher education institutions. Addressing sleep issues and cognitive tiredness can improve kids' academic performance while also promoting long-term educational and psychological resilience.

Limitations and Recommendations

Despite its useful findings of the current study has a very few limitations. First, the cross-sectional design limits causal inferences between mental weariness, insomnia severity, and academic performance. Future research using longitudinal or experimental methods could help to better establish causal pathways. Second, the study used self-reported GPA and psychological measurements, which may have been influenced by social desirability or recall bias. Future research that incorporates objective academic records and clinical assessments may improve validity. Third, the sample was restricted to university students from a single region of Pakistan, which may limit generalizability across other cultural and educational contexts.

Based on these restrictions, various suggestions are made. Educational institutions should adopt screening and intervention programs aimed at improving students' mental exhaustion and sleep health. On-campus mental health treatments may include workshops on time management, stress reduction, and sleep hygiene techniques. Furthermore, including psychological support into academic advising systems may lead to early intervention opportunities. Finally, future research should look into mediating elements including resilience, coping mechanisms, and social support to gain a deeper understanding of the complex relationship between psychological well-being and academic success in Pakistani universities.

Acknowledgment

The authors thank the University of Gujarat and the participants for their time and cooperation in this study. Thank you to the department administration and teachers for allowing data collection and to everyone who helped with the research.

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