

Research Article

Evaluating the Association between Irrational Procrastination and Daytime Sleepiness among Medical Students in South India: A Web-Based Cross-Sectional Study

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ABSTRACT

Background: Procrastination represents a self-regulatory failure characterized by voluntary delay of intended tasks despite foreseeable harm. Sleep disturbance and excessive daytime sleepiness are highly prevalent among medical students, yet procrastination is less frequently examined as a behavioral correlate of sleep-related impairment.

Methods: A web-based cross-sectional study was conducted among medical students across five South Indian states. Participants completed a structured questionnaire capturing sociodemographic characteristics and validated instruments: the Irrational Procrastination Scale (IPS; 9 items, 5-point Likert) and the Epworth Sleepiness Scale (ESS; 0-24). Inferential analyses evaluated differences in procrastination and daytime sleepiness across demographic strata, and Pearson correlation assessed association between IPS and ESS scores.

Results: A total of 364 students were included (56.6% female). Kerala contributed the largest proportion (43.1%). Mean (SD) IPS score was 20.00 (13.92) and mean (SD) ESS score was 19.98 (10.03). Procrastination differed significantly by gender ($p=0.019$), year of study ($p=0.005$), state ($p=0.001$), and marital status ($p=0.040$). Daytime sleepiness also differed significantly across gender ($p=0.017$), year of study ($p=0.004$), state ($p<0.001$), and marital status ($p=0.008$). IPS and ESS scores demonstrated a **moderate positive correlation** ($r=0.517$; $p<0.001$), indicating higher procrastination was associated with higher daytime sleepiness.

Conclusion: In this multi-state sample of South Indian medical students, irrational procrastination showed a moderate, statistically robust association with daytime sleepiness. These findings support procrastination as a potentially modifiable behavioral target within student sleep-health initiatives.

Keywords: Procrastination; Daytime Sleepiness; Epworth Sleepiness Scale; Irrational Procrastination Scale; Medical Students; South India.

INTRODUCTION

Procrastination is commonly defined as the voluntary delay of an intended course of action despite expecting that the delay will be detrimental, and it has been conceptualized as a pervasive form of self-regulatory failure with measurable academic, psychological, and functional costs [1]. Meta-analytic evidence indicates that procrastination is systematically linked to lower conscientiousness, reduced self-efficacy, and poorer performance outcomes—relationships that collectively position procrastination as more than a benign “time-management issue,” but rather as a behavioral marker of impaired goal regulation [2]. Contemporary models further propose that procrastination often functions as short-term mood repair: when tasks evoke discomfort or threat, individuals may choose immediate relief

over long-term goals, thereby trading transient emotional benefit for downstream consequences [3]. In high-demand training environments such as medical education, where workload is persistent and evaluative pressure is frequent, this self-regulatory tradeoff may become especially consequential. Sleep is a highly sensitive endpoint of self-regulation. Even when students hold strong intentions to sleep adequately, bedtime and sleep duration are continually exposed to competing demands, including study completion, digital engagement, and stress-related rumination. In this context, “bedtime procrastination”—the act of going to bed later than intended without external constraints—has been introduced as a specific health-behavior manifestation of procrastination [4]. Initial work describing bedtime procrastination

demonstrated that many individuals experience a recurring intention–behavior gap at bedtime and that such delays are meaningfully associated with insufficient sleep and reduced wellbeing [4]. A broader self-regulation perspective has reinforced this view, proposing that bedtime procrastination reflects the same underlying deficits implicated in daytime delay behaviors—namely, diminished capacity to align momentary actions with longer-term goals—thereby linking procrastination to sleep insufficiency at the population level [5].

Among medical students, sleep disturbance is consistently documented and clinically relevant. A large systematic review and meta-analysis synthesizing evidence from 109 studies (over 59,000 medical students) reported substantial global prevalence of sleep problems, emphasizing that sleep impairment is not an isolated phenomenon but a widespread issue within medical training ecosystems [7]. Excessive daytime sleepiness is particularly concerning because it directly affects attention, learning efficiency, mood stability, and patient-safety–relevant performance. The Epworth Sleepiness Scale (ESS) is a widely used, validated self-administered measure designed to quantify general daytime sleep propensity across common situations, offering a standardized approach to estimating daytime sleepiness burden in student populations [6]. Indian clinical settings also report meaningful levels of daytime sleepiness measured using ESS among young medical professionals, underscoring the broader relevance of sleepiness in medical training trajectories [8]. Despite converging evidence that (i) procrastination reflects self-regulatory vulnerability [1–3], (ii) bedtime procrastination is associated with insufficient sleep [4,5], and (iii) sleep problems are prevalent in medical trainees [7,8], the relationship between irrational procrastination and daytime sleepiness remains comparatively under-characterized in multi-state Indian medical student samples. Establishing this association is important because it suggests a potentially modifiable behavioral pathway: if higher procrastination aligns with higher daytime sleepiness, then interventions targeting procrastination (structured planning, behavioral activation, self-control supports, and bedtime intention implementation) may complement sleep-health strategies in medical colleges. Therefore, the present study aimed to assess procrastination and daytime sleepiness among South Indian medical students and to evaluate

the association between these constructs using validated scales.

MATERIALS AND METHODS

Study Design, Setting, and Duration

A web-based cross-sectional study was conducted among medical students enrolled in multiple medical colleges across five South Indian states (Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana). Data were collected using a digital questionnaire administered via an online form.

Participants and Sampling

Medical students from first year through final year were eligible. A total sample size of 364 was obtained using convenience sampling with distribution across institutions and states.

Inclusion and Exclusion Criteria

Students currently enrolled in MBBS training (first year to final year) were included. Students reporting a past psychiatric illness were excluded.

Ethical Considerations

Institutional Ethics Committee approval was obtained prior to data collection. Participants provided informed consent digitally before completing the questionnaire, and responses were collected anonymously.

Instruments and Variables

Sociodemographic variables included gender, state, year of study, and marital status. Procrastination was measured using the Irrational Procrastination Scale (IPS), a 9-item instrument rated on a 5-point Likert scale, with higher scores reflecting higher irrational procrastination. Daytime sleepiness was measured using the Epworth Sleepiness Scale (ESS), which yields a total score from 0 to 24.

Data Management and Statistical Analysis

Data were coded and entered in Microsoft Excel and SPSS (Version 25)**.

Descriptive statistics summarized participant characteristics and scale scores. Groupwise comparisons tested associations between sociodemographic characteristics and procrastination/significance threshold $p < 0.05$). The relationship between IPS and ESS scores was evaluated using Pearson product–moment correlation (two-tailed significance).

RESULTS

A total of 364 medical students were analyzed. Females constituted 56.6% ($n=206$) and males

43.4% (n=158). Students were recruited from five South Indian states, with the largest proportion from Kerala (43.1%, n=157), while the remaining participants were distributed across Andhra Pradesh (13.7%), Karnataka (14.8%), Tamil Nadu (13.7%), and Telangana (14.6%). Most respondents were unmarried (90.4%, n=329), reflecting the typical sociodemographic profile of undergraduate medical cohorts. Representation across training years was broad, with the highest participation from second year (25.8%) and third year (25.5%).

On psychometric assessment, mean (SD) Irrational Procrastination Scale (IPS) score was 20.00 (13.92) and mean (SD) Epworth Sleepiness Scale (ESS) score was 19.98

(10.03), indicating substantial variability in both procrastination tendency and daytime sleep propensity within the cohort. Importantly, procrastination demonstrated significant variation across gender, year of study, state, and marital status (all $p < 0.05$). Daytime sleepiness also differed significantly across the same demographic strata (all $p \leq 0.017$), suggesting that contextual and training-stage factors may shape sleep-related functional outcomes.

Correlation analysis revealed a moderate positive association between procrastination and daytime sleepiness ($r = 0.517$; $p < 0.001$), indicating that higher irrational procrastination scores aligned with higher daytime sleepiness scores in this sample.

Table 1. Participant Profile and Outcome-Wise Significance (P-Values) By Characteristic

Characteristic	Distribution in sample	p-value (IPS)	p-value (ESS)
Gender	Female 206 (56.6%); Male 158 (43.4%)	0.019	0.017
Year of study	1st 85 (23.4%); 2nd 94 (25.8%); 3rd 93 (25.5%); 4th 57 (15.7%); 5th 35 (9.6%)	0.005	0.004
State	AP 50 (13.7%); KA 54 (14.8%); Kerala 157 (43.1%); TN 50 (13.7%); TS 53 (14.6%)	0.001	<0.001
Marital status	Unmarried 329 (90.4%); Married 33 (9.1%); Widow/Separated 2 (0.5%)	0.040	0.008

Interpretation

The cohort showed broad representation across years of study, with higher participation from the second and third years, and a predominance of students from Kerala. Both procrastination and daytime sleepiness varied significantly across gender, year, state, and marital status, indicating meaningful

heterogeneity in behavioral regulation and daytime functional outcomes across demographic strata. These patterns suggest that procrastination and sleepiness in medical students may be shaped by training stage and local contextual influences, rather than being uniformly distributed.

Table 2. Descriptive Statistics and Association Between Ips And Ess

Measure / Association	Mean	SD	Effect estimate	p-value
IPS total score	20.00	13.92	—	—
ESS total score	19.98	10.03	—	—
IPS vs ESS (Pearson correlation)	—	—	$r = 0.517$	<0.001

Interpretation

Mean scores indicated notable levels of both irrational procrastination and daytime sleepiness with substantial dispersion, implying that a clinically meaningful subset of students may experience elevated behavioral delay and daytime impairment. The correlation analysis demonstrated a moderate positive association

between the two constructs, suggesting that procrastination may be behaviorally linked to sleep-related functional consequences. Although causality cannot be inferred from cross-sectional data, the strength and significance of the correlation support procrastination as a relevant correlate of daytime sleepiness.

Table 3. Sociodemographic Associations with Procrastination (Ips)

Factor	Outcome	p-value
Gender	Procrastination (IPS)	0.019
Year of study	Procrastination (IPS)	0.005

State	Procrastination (IPS)	0.001
Marital status	Procrastination (IPS)	0.040

Interpretation

Procrastination differed significantly across multiple demographic dimensions, suggesting that delay behaviors in medical students may be context-dependent. Variation by year of study plausibly reflects changing academic structures, examination intensity, and time autonomy as students progress through

training. State-level differences may represent institutional scheduling, learning environments, and cultural patterns of study timing. Although marital status comprised a smaller subgroup, its association with IPS indicates that role demands and responsibilities may influence self-regulation and task initiation.

Table 4. Sociodemographic Associations with Daytime Sleepiness (Ess)

Factor	Outcome	p-value
Gender	Daytime sleepiness (ESS)	0.017
Year of study	Daytime sleepiness (ESS)	0.004
State	Daytime sleepiness (ESS)	<0.001
Marital status	Daytime sleepiness (ESS)	0.008

Interpretation

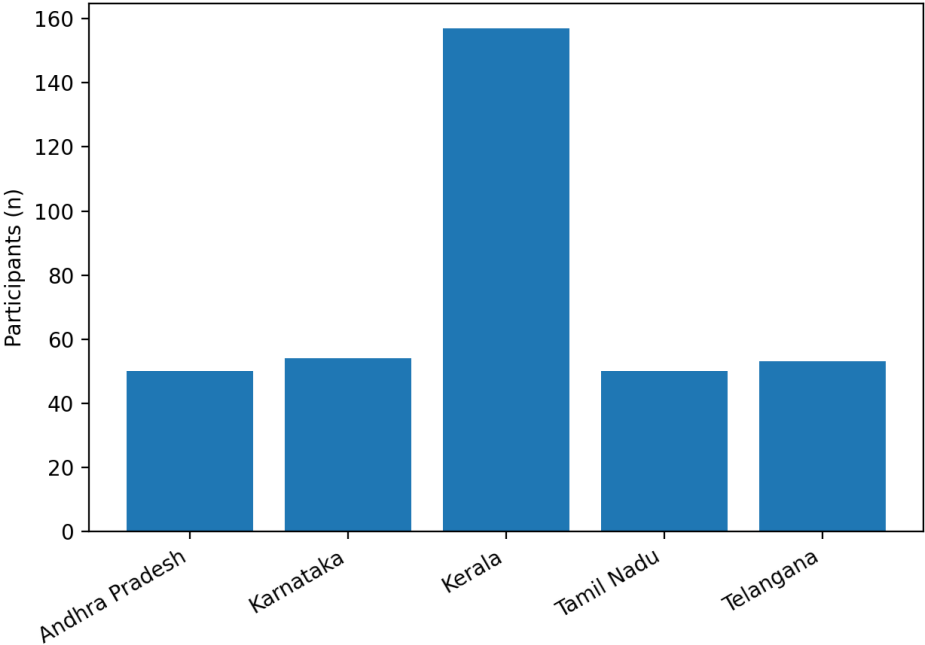
Daytime sleepiness also varied significantly across gender, training year, state, and marital status, indicating that daytime functional impairment is not evenly distributed within this cohort. Differences across years likely reflect evolving schedule demands and clinical

exposure that may reduce sleep opportunity or fragment sleep timing. Regional/state-level variation may reflect differences in institutional routines, living arrangements, and commuting burden. These results highlight the need for targeted sleep-health strategies that account for contextual and training-stage differences.

Figures

Figure 1. Participant Distribution by State (South India)

Figure 1. Participant distribution by state (South India)



Interpretation

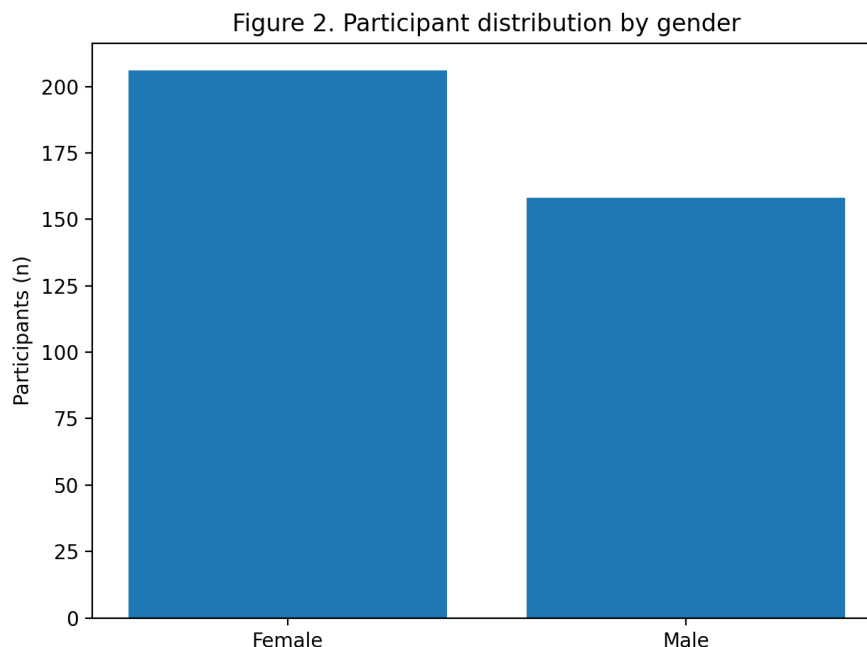
The figure demonstrates unequal representation across states, with Kerala contributing the largest share of respondents.

This distribution is useful for understanding contextual variability because student schedules, academic expectations, and institutional rhythms may differ across regions

and colleges. However, the dominance of one state implies that overall estimates—particularly for mean scale scores—may reflect the lived experiences of students in Kerala more strongly

than other states, which should be considered when generalizing to all South Indian medical students.

Figure 2. Participant Distribution by Gender



Interpretation

Gender distribution showed a modest female predominance. This matters because sss-related symptoms, and self-regulation patterns can differ by gender in student populations. The significant gender differences observed in both procrastination and daytime sleepiness outcomes suggest gender-linked behavioral and psychosocial factors may shape sleepiness risk. The figure supports interpretability of subgroup analyses by illustrating that both male and female groups had substantial sample sizes, strengthening confidence in gender-stratified comparisons.

DISCUSSION

This web-based cross-sectional study demonstrated a moderate, statistically significant positive association between irrational procrastination and daytime sleepiness among South Indian medical students ($r=0.517$; $p<0.001$).

In practical terms, students reporting greater irrational delay tendencies also reported higher propensity to doze during routine daytime situations, suggesting that procrastination may be behaviorally linked to impaired daytime alertness in this population.

Our findings align closely with broader student-sleep research showing that procrastination is meaningfully related to multiple sleep outcomes. In a large multi-university U.S. student study examining procrastination alongside sleep behaviors, procrastination was associated with indicators such as insomnia symptoms and daytime sleepiness, supporting the premise that procrastination may co-occur with sleep-related impairment rather than remaining limited to academic performance domains [9]. Extending this idea to a sleep-timing framework, the bedtime procrastination literature suggests that delays at bedtime—often driven by self-regulatory failures—contribute to insufficient sleep and downstream fatigue. A systematic review and meta-analysis reported that bedtime procrastination was moderately associated with shorter sleep duration, poorer sleep quality, and greater daytime fatigue, indicating that procrastination-related timing behaviors can translate into measurable next-day consequences [10]. The observed association can be interpreted through several complementary mechanisms. First, procrastination may shift academic workload into late-night hours, compressing sleep opportunity and increasing sleep debt. Second, procrastination is often accompanied by rumination and negative affect (e.g., guilt,

worry about unfinished tasks), which can elevate pre-sleep cognitive arousal and worsen sleep continuity, thereby increasing daytime sleepiness even when time in bed is not markedly reduced. Third, procrastination can amplify engagement in immediate-reward behaviors (e.g., scrolling, gaming) at night, creating intentional bedtime delay. Mechanistically informed evidence supports these pathways: a moderated mediation model among college students found that bedtime procrastination related to daytime sleepiness, with insomnia as a mediator and chronotype influencing the pathway, implying that delayed bedtime behaviors may promote sleepiness through sleep disturbance and misalignment [11].

Our results are also consistent with more recent models emphasizing that bedtime procrastination is not merely circadian preference but can reflect daily fluctuations in self-regulation and recovery. Commentary on emerging empirical work notes that daily bedtime procrastination has been associated with poorer sleep restoration and reduced duration/efficiency, reinforcing the notion that procrastination-related delays can erode sleep quality and next-day functioning [12]. In addition, a large 2024 college-student study integrating time anxiety, irrational procrastination, and sleep quality showed that irrational procrastination can act as an explanatory pathway linking psychological stressors to worse sleep outcomes, conceptually supporting the broader link between procrastination traits and sleep-related impairment in student populations [13]. Importantly, medical trainees frequently exhibit high baseline sleep vulnerability. A systematic review and meta-analysis of sleep problems among medical students worldwide reported substantial prevalence, emphasizing that medical training environments are intrinsically sleep-disruptive for many learners [14]. Within India, ESS-based studies among medical students similarly document clinically relevant daytime sleepiness, providing contextual support that daytime impairment is a salient

concern in comparable settings [15]. Against this high-risk backdrop, our data suggest that procrastination may act as a behavioral amplifier of sleepiness—potentially worsening the functional consequences of already limited or fragmented sleep.

Limitations and implications

This study's cross-sectional design prevents causal inference; it is plausible that daytime sleepiness also increases procrastination by impairing executive function and sustained attention. Convenience sampling and uneven state representation may limit generalizability. Self-report tools measure perceived sleepiness and procrastination and may be influenced by reporting bias. Nonetheless, the association magnitude supports a clinically meaningful signal: integrating procrastination-focused supports (structured planning, implementation intentions for bedtime, self-control scaffolding) alongside sleep-health education may offer a pragmatic approach for medical colleges. Prospective studies with objective sleep measures (e.g., actigraphy) and mediation testing (bedtime procrastination → insomnia → sleepiness) are warranted.

CONCLUSION

In this web-based cross-sectional study of South Indian medical students, irrational procrastination was moderately and significantly associated with daytime sleepiness, indicating that higher procrastination aligned with greater next-day functional impairment risk. Both procrastination and sleepiness varied across demographic and training-context factors, suggesting meaningful heterogeneity in behavioral and sleep-related vulnerability within medical education settings. While causality cannot be inferred, the strength of association supports procrastination as a plausible, modifiable behavioral target for student sleep-health strategies. Longitudinal and mechanism-focused studies are warranted to clarify directionality and to evaluate integrated interventions combining procrastination reduction with structured sleep support.

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