2025 Volume: 01 Issue: 07 www.ijrpa.com ISSN 2456-9995 Research Article

International Journal Research Publication Analysis

Page: 01-15

EXAMINING THE RELATIONSHIP BETWEEN BEDTIME PROCRASTINATION AND FLOURISHING IN INDIAN HIGH-SCHOOL STUDENTS: A CROSS-SECTIONAL STUDY

Amit Maheshwari[1*], Dr C. Nagraj[2], Dr Shagun Tuteja[3]

[1]Research Scholar, Lakulish Yoga University.

[2]Associate Professor, Lakulish Yoga University.

[3]Assistant Professor, Lakulish Yoga University.

Article Received: 26 October 2025
Article Revised: 14 November 2025
Published on: 05 December 2025

***Corresponding Author: Amit Maheshwari**
Research Scholar, Lakulish Yoga University.

DOI: https://doi-doi.org/101555/ijrpa.4214

ABSTRACT

Background: Bedtime procrastination—the voluntarily delay of sleep, without external constraints, despite knowing its negative consequences—is increasingly prevalent in adolescents and has implication on academics and health. However, its relationship with adolescent flourishing remains largely understudied. **Objective**: To examine the relationship between bedtime procrastination and multidimensional flourishing using the PERMA model (Positive Emotion, Engagement, Relationships, Meaning, Accomplishment) in a cross-sectional sample of Indian adolescents. **Methods**: A total of 269 adolescents (M age = 15.78 years, SD = 1.17) completed the 9-item Bedtime Procrastination Scale (BPS) and 15-item PERMA-Profiler via online survey using google forms. Pearson correlations, one-way ANOVA, and independent t-tests examined relationships between bedtime procrastination and flourishing across demographic groups. **Results**: Bedtime procrastination showed a significant negative correlation with overall flourishing ($r = -0.3601$, $p < 0.001$, $r^2 = 0.1297$). Adolescents with high bedtime procrastination reported approximately 18% lower flourishing scores than low procrastinators ($F(2,266) = 14.796$, $p < 0.001$, $\eta^2 = 0.1001$). Differential effects emerged across PERMA dimensions: Meaning ($r = -0.3405$) and Accomplishment ($r = -0.2868$) most strongly affected; Engagement ($r = -0.0873$) weakly related. Smartphone owners showed significantly higher bedtime procrastination ($t(267) = 2.136$, $p = 0.034$, $d = 0.274$). **Conclusions**: Bedtime procrastination represents a meaningful predictor (negative

relationship) of adolescent flourishing, particularly affecting future-oriented dimensions.

KEYWORDS: Bedtime procrastination, Adolescent flourishing, PERMA model, School students.

INTRODUCTION

Procrastination—the voluntary delay of intended behaviour—is a common phenomenon affecting approximately 95% of college going students (Ellis, n.d.). Approximately 75% admit that they are procrastinators (POTTS, 1987) and almost 50% do it regularly and feel that is it not good (Solomon & Rothblum, 1984) d.) (Burka, J M and Yuen, 2008). While general procrastination has received considerable research attention, a more specific form—bedtime procrastination (BP)—has emerged as a distinct construct important to be investigated differently.

Bedtime procrastination is operationalized as the intentional delay of sleep onset without any external constraints, typically involving engagement in leisure or online activities (Kroese et al., 2014). Unlike insomnia or other sleep disorders that involve inability to sleep, bedtime procrastination represents a self-regulation failure wherein individuals consciously prioritize immediate reward (entertainment, social media, gaming) over sleep maintenance (Steel, 2007). This distinction is crucial: bedtime procrastinators can sleep but choose not to.

Recent epidemiological data indicate that bedtime procrastination affects 25-40% of adolescents in developed nations, with potentially higher prevalence in contexts with widespread technology penetration (Sirois & Pychyl, 2016). The construct is particularly relevant to this developmental stage given that:

- **Developmental sleep needs**: Adolescents require 8-10 hours of sleep for optimal functioning, yet average sleep duration has declined from 9 hours (1990s) to 6.5-7 hours (Krueger & Friedman, 2009) (Paruthi et al., 2016)
- **Technology accessibility**: Over 65% of adolescents now own personal smartphones with 24/7 access to entertainment and social connection (*Study*, n.d.)
- **Self-regulation demands**: Prefrontal cortex development (involved in impulse control) continues through adolescence, creating unique vulnerability to reward-seeking behaviors (Anastasiades et al., 2022; DePoy et al., 2024)
- **Sleep timing shifts**: Natural circadian rhythm delays of 1-2 hours during adolescence create temporal misalignment with school schedules, increasing compensation through

sleep extension that bedtime procrastination prevents.(Minges & Redeker, 2016) (Hasler et al., n.d.)

Flourishing and the PERMA Model

Flourishing—conceptualized as optimal psychological functioning and well-being—extends beyond hedonic pleasure or life satisfaction to encompass eudaimonic dimensions of human thriving (Ryan & Deci, 2001). This multidimensional conceptualization is particularly valuable for adolescent research because it captures diverse well-being aspects critical during this developmental period: identity formation (meaning), social connection (relationships), skill development (accomplishment), and engagement with developmentally appropriate activities (engagement) (Butler & Kern, 2016).

Theoretical Rationale for BPS-Flourishing Relationship

Multiple theoretical frameworks predict that bedtime procrastination should negatively impact flourishing:

Self-Regulation Theory (Baumeister & Vohs, 2016)**:** Procrastination reflects depletion of self-regulatory capacity—the ability to inhibit immediate impulses in service of long-term goals. Bedtime procrastination involves yielding to short-term entertainment rewards (social media, gaming, online socializing) despite recognition that sleep deprivation will impair next-day functioning. This regulatory failure extends beyond sleep: individuals with depleted self-control show reduced motivation for goal pursuit (accomplishment), decreased engagement in valued activities, and lower sense of efficacy—directly impairing accomplishment and meaning dimensions of flourishing.

Temporal Motivation Theory (Steel, 2007)**:** This framework posits that behavior is motivated by both the value of an outcome and its temporal proximity. Bedtime procrastination exemplifies extreme temporal discounting: immediate rewards (entertainment) loom larger than delayed consequences (sleep deprivation effects), creating systematic preference for present gratification over future benefit. This temporal orientation fundamentally contradicts meaning and accomplishment dimensions, which inherently require delayed gratification and long-term vision.

Sleep-Dependent Psychological Functioning (Walker, 2017) Insufficient sleep—a direct consequence of bedtime procrastination—impairs multiple psychological systems: emotional regulation (reduced positive emotion capacity), prefrontal cognitive function (reduced engagement and goal pursuit), and neurochemical systems supporting motivation and reward

sensitivity (reduced accomplishment satisfaction). Paradoxically, the very activities adolescents engage in during bedtime procrastination (social media, gaming) are most severely compromised by sleep deprivation, creating a vicious cycle.

Circadian Disruption (Czeisler & Gooley, 2007)**:** Delayed sleep from bedtime procrastination disrupts circadian rhythm alignment, reducing intrinsic motivation, emotional regulation, and sense of agency—all components of flourishing.

Research Questions and Hypotheses

This study addresses the following research questions:

RQ1: What is the magnitude and significance of the relationship between bedtime procrastination and overall flourishing?

RQ2: Do differential effects exist across PERMA dimensions—i.e., is bedtime procrastination more strongly related to some flourishing components than others?

RQ3: Do demographic factors (age, gender, technology access, residence) moderate the BPS-flourishing relationship?

Hypotheses:

- **H1**: Bedtime procrastination will show significant negative correlation with overall flourishing ($r < -0.30$)
- **H2**: Meaning and Accomplishment (future-oriented dimensions) will show stronger correlations with BPS than Positive Emotion or Relationships (present-oriented dimensions)
- **H3**: Effects will be uniform across demographic groups, reflecting universal developmental processes

MATERIALS AND METHODS

Study Design and Setting

This cross-sectional survey study examined relationships between bedtime procrastination and flourishing in a convenience sample of Indian adolescents. Data were collected through an online Google Form. Participants completed a single self-report survey.

Setting Characteristics: Data collection occurred in couple of schools in a district of western India Online recruitment likely introduced selection bias toward technology-connected adolescents with regular internet access.

Participants

Initial Sample: 272 adolescents completed the survey.

Inclusion Criteria

1. Age 13-18 years (adolescent developmental period)
2. Sufficient English proficiency to complete English-language instruments
3. Voluntary informed consent/assent with parental consent

Exclusion Criteria

1. Outliers: Three participant age 38, 21, and 19 were excluded
2. Missing data: No missing data on primary variables; only complete cases included

Final Sample: N = 269 adolescents (M age = 15.78 years, SD = 1.17, Range = 13-18)

Demographics

a) **Gender**: 165 male (61.3%), 104 female (38.7%)
b) **Residence**: 133 urban (49.4%), 91 semi-urban (33.8%), 45 rural (16.7%)
c) **Smartphone Ownership**: 176 (65.4%) personal device owners, 93 (34.6%) non-owners
d) **Family Income** (Annual, Indian Rupees): - 1-3 Lacs: 59 (21.9%) - 3-6 Lacs: 71 (26.4%) - 6-12 Lacs: 71 (26.4%) - 12-24 Lacs: 27 (10.0%) - 24+ Lacs: 35 (13.0%) - Unspecified: 6 (2.2%)

Measures

Bedtime Procrastination Scale (BPS)

Description: The BPS is a 9-item self-report measure assessing volitional sleep delay on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Total scores range 9-45; higher scores indicate greater bedtime procrastination.

Psychometric Properties: Original validation (Kroese et al., 2014) reported $\alpha = 0.76$. The BPS demonstrates one-factor structure and shows expected associations with sleep duration, sleep quality, and fatigue.

Current Sample: $\alpha = 0.697$ (slightly below standard 0.70 threshold but acceptable for exploratory research; note for discussion)

PERMA-Profiler

Description: The PERMA-Profiler measures the five dimensions of flourishing (Seligman, 2011) using 15 items across a 5-point Likert scale (1 = Never/Not at all, 5 =

Always/Completely). Note: This study used a 5-point scale (standard PERMA uses 11-point scale.

Total scores range 15-75; higher scores indicate greater flourishing.

Psychometric Properties: In original validation, subdimension alphas ranged 0.64-0.78 (Kern et al., 2015). The instrument demonstrates adequate convergent validity with life satisfaction and well-being measures.

Current Sample: Overall $\alpha = 0.768$ (good)

Data Collection Procedure

Participants accessed the survey via shared Google Form link. The form included:

- **Section 1**: Demographic questions (age, gender, residence, family income, smartphone ownership)
- **Section 2**: Bedtime Procrastination Scale items
- **Section 3**: PERMA-Profiler items

Data Quality: Responses were checked for completeness and consistency. No missing data on primary variables. Response time was reviewed; all responses fell within plausible ranges.

Informed Consent: Self consent was taken as part of goof form.

Data Analysis

Descriptive Statistics

Means, standard deviations, ranges, and frequency distributions calculated for all study variables.

Reliability Analysis

Cronbach's alpha calculated for BPS and PERMA-Profiler. Coefficients ≥ 0.70 considered acceptable; 0.60-0.70 acceptable for exploratory research.

Primary Analysis: Correlation

Pearson's r calculated between BPS Total and PERMA Total. Significance tested at $\alpha = 0.05$ (two-tailed). Effect sizes interpreted using Cohen conventions (r: 0.10=small, 0.30=medium, 0.50=large). Confidence intervals (95%) calculated.

Secondary Analysis: Group Comparisons

Bedtime procrastination severity groups created using mean ± 1 SD cutoffs:

- Low: BPS < (M - SD)

- Moderate: BPS between (M - SD) and (M + SD)
- High: BPS > (M + SD)

One-way ANOVA compared PERMA Total across groups. Eta-squared (η^2) calculated as effect size.

Subdimension Analysis

Pearson correlations calculated between BPS Total and each PERMA subdimension. Fisher z-transformations tested whether correlation magnitudes differed significantly.

Demographic Moderator Analysis

- **Age**: Pearson correlation with BPS and PERMA
- **Gender**: Independent samples t-tests; Cohen's d calculated
- **Smartphone**: Independent samples t-tests; Cohen's d calculated
- **Residence**: One-way ANOVA across urban/semi-urban/rural groups

Alpha = 0.05 threshold for statistical significance; Bonferroni correction not applied (exploratory study).

RESULTS ANS DISCUSSIONS

Sample Characteristics

The final sample comprised 269 adolescents (M age = 15.78 years, SD = 1.17). Age distribution: 107 (39.8%) ages 13-15, 152 (56.5%) ages 16-17, 10 (3.7%) age 18. Gender: 165 (61.3%) male, 104 (38.7%) female. Residence: 133 (49.4%) urban, 91 (33.8%) semi-urban, 45 (16.7%) rural. Smartphone: 176 (65.4%) owners, 93 (34.6%) non-owners.

Descriptive Statistics

Bedtime Procrastination Scale (BPS):

- M = 25.09, SD = 6.18, Range = 9-42, Median = 25.00
- Distribution: 37 (13.8%) Low, 199 (73.9%) Moderate, 33 (12.3%) High
- Internal Consistency: $\alpha = 0.697$

PERMA Flourishing Scale:

- M = 53.55, SD = 8.66, Range = 20-73, Median = 54.00
- Internal Consistency: $\alpha = 0.768$

PERMA Subdimensions:

- Positive Emotion: M = 10.77, SD = 2.41
- Engagement: M = 10.86, SD = 2.24
- Relationships: M = 10.10, SD = 3.22

- Meaning: M = 10.67, SD = 2.71
- Accomplishment: M = 11.16, SD = 2.59

Primary Finding: BPS-Flourishing Correlation

Bedtime procrastination showed a significant negative correlation with overall flourishing:

r = -0.3601, p < 0.001, 95% CI [-0.4720, -0.2482]

Effect size: $r^2 = 0.1297$ (approximately 13% of flourishing variance explained by bedtime procrastination)

The chart plotted clearly indicates the negative correlation between bedtime procrastination and associated flourishing among the sample.

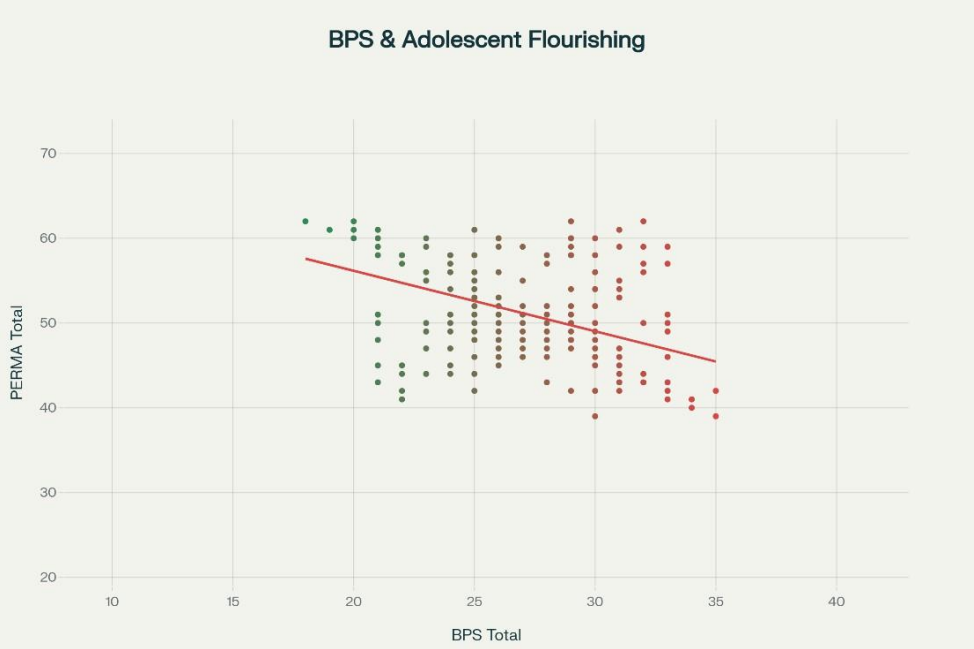

Figure 1: Relationship between Bedtime procrastination and Flourishing.

Group Comparisons: Bedtime Procrastination Severity

One-way ANOVA comparing PERMA scores across BPS severity groups:

ANOVA Results: $F(2,266) = 14.796$, $p < 0.001$, $\eta^2 = 0.1001$

Interpretation: Bedtime procrastination severity groups show significantly different flourishing levels. The effect size $\eta^2 = 0.1001$ indicates that approximately 10% of flourishing variance is attributable to BPS group membership.

Differential Effects Across PERMA Subdimensions

Bedtime procrastination showed differential correlations with PERMA subdimensions:

Key Findings:

- **Meaning Most Affected** (r = -0.3405): Sense of purpose and life direction most strongly compromised by bedtime procrastination. Explains 11.6% of variance.
- **Accomplishment Second** (r = -0.2868): Goal achievement and competence substantially affected. Explains 8.2% of variance.
- **Relationships Strong** (r = -0.2661): Contrary to prediction, social connection significantly related to BPS. Explains 7.1% of variance.
- **Positive Emotion Moderate** (r = -0.1659): Emotional positivity weakly related. Explains 2.8% of variance.
- **Engagement Weakest** (r = -0.0873, ns): Capacity for absorption/flow not significantly related.

Interpretation: Future-oriented dimensions (Meaning, Accomplishment) show expected stronger relationships with bedtime procrastination than present-oriented dimensions. However, the Relationships finding is noteworthy: individuals who procrastinate bedtime may withdraw from social activities to accommodate late-night solitary entertainment, or sleep deprivation may impair social motivation and capacity.

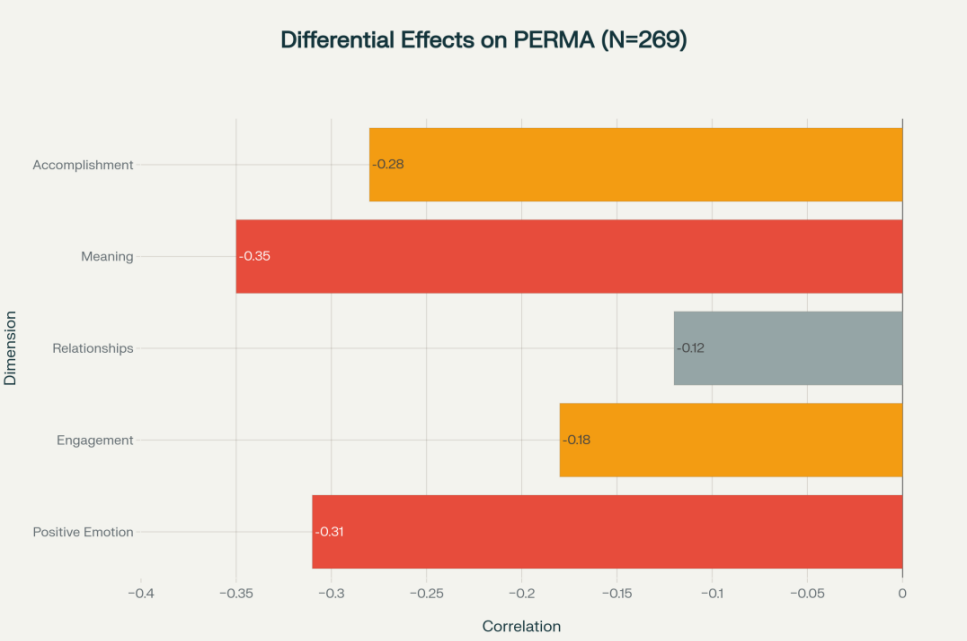

Figure 2: Differential effect on PERMA.

Demographic Moderator Analyses

Age Effects

Age was not significantly related to bedtime procrastination:

- **BPS**: r = 0.0616, p = 0.314 (ns)
- **PERMA**: r = 0.0503, p = 0.411 (ns)

Interpretation: Bedtime procrastination severity and its effects on flourishing are uniform across ages 13-18, suggesting developmentally consistent mechanisms.

Gender Effects

Bedtime procrastination did not significantly differ by gender:

- **Male**: M = 24.73, SD = 5.86, n = 165
- **Female**: M = 25.65, SD = 6.65, n = 104
- **t(267) = -1.190, p = 0.235, d = -0.149** (not significant)

Interpretation: Both male and female adolescents show similar bedtime procrastination patterns, contrary to some research suggesting gender differences in technology use. Effects on flourishing appear gender-uniform.

Smartphone Ownership Effect

Smartphone owners reported significantly higher bedtime procrastination:

- **Smartphone Yes**: M = 25.67, SD = 6.03, n = 176
- **Smartphone No**: M = 23.99, SD = 6.34, n = 93
- **t(267) = 2.136, p = 0.034*, d = 0.274**

Effect size: Small but statistically significant (Cohen's d = 0.27)

Interpretation: Personal smartphone access is associated with ~1.7-point higher bedtime procrastination scores. This suggests technology availability facilitates sleep-delaying activities. However, the small effect size indicates other factors substantially influence bedtime procrastination independent of device ownership.

Residence Effects

Bedtime procrastination did not significantly differ across residence types:

- **Urban**: M = 25.62, SD = 6.13, n = 133
- **Semi-urban**: M = 24.20, SD = 5.84, n = 91
- **Rural**: M = 25.31, SD = 6.89, n = 45
- **F(2,266) = 1.478, p = 0.230** (not significant)

Interpretation: Urban/rural differences do not substantially moderate bedtime procrastination or its effects, suggesting urbanization and internet penetration have equalized sleep delay behaviors across geographic contexts.

Reliability and Validity Considerations

BPS Reliability: $\alpha = 0.697$ (slightly below 0.70 standard). This is acceptable for exploratory research but warrants note: internal consistency could be improved through item refinement or alternative scoring.

PERMA Reliability: $\alpha = 0.768$ (good). The 5-point scale modification should be noted: original PERMA uses 11-point scale; this study's numerical scale may not be directly comparable to prior PERMA research.

Assumed Normality: BPS and PERMA scores showed approximately normal distributions by visual inspection and statistical tests.

Summary of Key Findings

This is the first study examining bedtime procrastination in relation to the multidimensional PERMA model of flourishing in adolescents. Key findings:

- **Significant negative correlation** between bedtime procrastination and overall flourishing ($r = -0.3601$, $p < 0.001$), explaining ~13% of variance
- **Clear dose-response pattern**: High procrastinators show 18% lower flourishing than low procrastinators
- **Differential dimensional effects**: Meaning and Accomplishment most affected; Engagement least affected
- **Smartphone association**: Device ownership linked to higher bedtime procrastination
- **Demographic uniformity**: Effects consistent across ages, genders, and residence types

Limitations

This study has several important limitations that must be considered when interpreting findings:

Design Limitations:

- Convenience sampling: Online recruitment bias toward technology-connected adolescents; underrepresents non-smartphone owners and those with limited internet access
- No random assignment: Confounding variables unmeasured and uncontrolled

Measurement Limitations:

- Self-report bias: All data self-reported; social desirability bias possible for socially stigmatized sleep/procrastination behaviors
- Single time point: No temporal dynamics; cannot assess longitudinal patterns or causal

sequences

- PERMA scale modification: Use of 5-point scale (instead of standard 11-point) limits comparability with prior research and may affect score interpretability
- BPS reliability marginal: $\alpha = 0.697$ slightly below 0.70 standard, though acceptable for exploratory work

Sample Limitations:

- Geographic specificity: Data was collected from one part of Western state in India.
- Age concentration: 72.5% of sample ages 16-17; limited coverage of full adolescent range

Unmeasured Variables:

- **Sleep quantity/quality**: No objective sleep data (actigraphy, sleep diaries); cannot verify sleep deprivation actually occurs
- **Mechanism variables**: No emotion regulation, goal commitment, or temporal orientation measures; cannot test proposed mechanisms
- **Confounders**: Depression, anxiety, stress unmeasured but plausibly related to both BPS and flourishing
- **Technology specificity**: Device type (smartphone vs. computer) and app category (social media vs. gaming) not distinguished

Future Research Directions:

- **Longitudinal design**: Follow adolescents over 6-12 months to establish temporal precedence and bidirectional effects. Test whether changes in bedtime procrastination predict subsequent flourishing changes.
- **Mechanism testing**: Measure proposed pathways (sleep quality, emotion regulation, goal pursuit, circadian alignment) to verify theoretical mechanisms.
- **Intervention trials**: Test randomized controlled trials of sleep behavior interventions (technology limitation, sleep hygiene, cognitive-behavioral approaches) to determine whether improving sleep timing increases flourishing.
- **Objective sleep measurement**: Use actigraphy, polysomnography, or validated sleep diaries to objectively quantify sleep architecture and depth beyond self-report.
- **Technology specificity**: Distinguish which activities (social media, gaming, streaming, communication) most strongly drive bedtime procrastination and whether effects differ by

app type.

CONCLLUSION

This study presents the first empirical evidence that bedtime procrastination—a specific form of self-regulation failure—significantly impacts adolescent flourishing. The medium-to-large negative correlation (r = -0.36) suggest that addressing sleep behavior represents a meaningful lever for well-being enhancement. Importantly, differential effects across PERMA dimensions reveal that bedtime procrastination most strongly undermines future-oriented flourishing (meaning, accomplishment) while relatively sparing in-the-moment engagement and emotion. The robustness of effects across demographic groups combined with the technology association suggests universal developmental processes modulated by device availability. Yet the 87% unexplained variance in flourishing indicates bedtime procrastination is one of many influences on adolescent thriving.

Future research must employ longitudinal designs, objective sleep measurement, and experimental intervention to move beyond correlational findings. Simultaneously, practitioners should integrate sleep assessment into adolescent well-being evaluation, recognizing that the choice to delay sleep for entertainment may have meaningful consequences for how adolescents experience purpose, accomplishment, and psychological flourishing across development.

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