

THE EFFECTS OF SLEEP DEPRIVATION ON COGNITIVE FUNCTION AND EMOTIONAL REGULATION: AN EXPERIMENTAL APPROACH

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Abstract

Sleep is a fundamental biological process that supports cognitive efficiency, emotional stability, and overall psychological well-being. Increasing academic demands, technological engagement, occupational pressures, and lifestyle changes have contributed to a growing prevalence of sleep deprivation across various populations. Insufficient sleep has been associated with impairments in cognitive performance and emotional functioning, yet the interconnected effects of sleep loss on these domains remain insufficiently understood. This study aims to examine the effects of sleep deprivation on cognitive function and emotional regulation through a controlled experimental approach. A randomized controlled pretest-posttest design was employed involving 120 healthy young adults aged 18–25 years. Participants were randomly assigned to either a sleep deprivation group or a control group maintaining a normal sleep schedule. Cognitive performance was assessed using standardized neuropsychological tests measuring attention, working memory, and executive functioning, while emotional regulation was evaluated through validated psychological scales. Statistical analyses included repeated-measures analysis of variance, independent-samples t-tests, and correlation analyses. Findings revealed that sleep deprivation significantly reduced attention, working memory, executive functioning, emotional stability, and positive affect. Significant associations were also identified between declines in executive functioning and impairments in emotional regulation. The study concludes that sleep deprivation exerts a substantial negative influence on both cognitive and emotional processes, highlighting the critical role of adequate sleep in maintaining adaptive psychological functioning and overall well-being.

Keywords: Cognitive Function, Emotional Regulation, Experimental Research, Sleep Deprivation, Young Adults.



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INTRODUCTION

Sleep is a fundamental biological process that plays a critical role in maintaining physical health, cognitive performance, emotional stability, and overall psychological well-being (Floros et al., 2021). Contemporary neuroscience has demonstrated that adequate sleep contributes to memory consolidation, neural plasticity, attention regulation, executive functioning, and emotional processing. Physiological restoration occurring during sleep supports the optimal functioning of multiple brain systems responsible for learning, decision-making, and adaptive behavior (Kimmell et al., 2024). Growing recognition of sleep as an essential component of human functioning has stimulated extensive research across psychology, neuroscience, medicine, and public health.

Modern lifestyles have contributed to a substantial increase in sleep deprivation across diverse populations. Academic demands, occupational pressures, digital technology use, social media engagement, shift work schedules, and changing cultural habits have collectively reduced average sleep duration (Chen et al., 2026). Adolescents, university students, healthcare workers, and professionals frequently report sleeping fewer hours than recommended by health organizations. Chronic sleep restriction has consequently emerged as a major public health concern affecting millions of individuals worldwide (Gruber & Cassoff, 2014). Such trends have intensified interest in understanding the cognitive and emotional consequences of insufficient sleep.

Cognitive functioning and emotional regulation represent two domains particularly vulnerable to sleep loss. Cognitive processes such as attention, working memory, problem-solving, decision-making, and information processing rely heavily on adequate sleep for optimal performance (Weng et al., 2025). Emotional regulation involves the ability to monitor, evaluate, and modify emotional responses in ways that support adaptive functioning and social interaction. Disruptions in sleep may impair both domains simultaneously, creating significant consequences for academic achievement, workplace productivity, mental health, and interpersonal relationships (Guan et al., 2025). Understanding these effects remains a critical objective within behavioral and cognitive sciences.

Despite extensive research examining sleep and human performance, important questions remain regarding the specific mechanisms through which sleep deprivation affects cognitive and emotional functioning (Bragazzi & Garbarino, 2024). Existing evidence consistently suggests that sleep loss impairs attention, memory, and executive functioning. Considerable variation persists, however, regarding the magnitude of these effects and the conditions under which they become most pronounced (Lima Santos et al., 2025). Differences in research designs, participant characteristics, and measurement approaches have contributed to inconsistent findings across studies.

Sleep deprivation appears to influence emotional functioning through complex neurobiological and psychological pathways (Walker, 2010). Reduced sleep duration has been associated with heightened emotional reactivity, diminished emotional control, increased irritability, and greater susceptibility to stress. Emotional consequences may extend beyond temporary mood changes and affect broader aspects of psychological well-being and social behavior (Kohyama, 2022). Clarification of these relationships is necessary for understanding how sleep influences everyday functioning and mental health outcomes.

Experimental investigations simultaneously examining cognitive function and emotional regulation remain relatively limited (Lee & Douglass, 2010). Many studies focus primarily on cognitive outcomes or emotional consequences without considering their interconnected nature. Cognitive impairment may contribute to difficulties in emotional regulation, while emotional dysregulation may further compromise cognitive performance (Lewin et al., 2019). Limited integration of these domains restricts comprehensive understanding of the broader consequences of sleep deprivation. Addressing this issue represents an important challenge for contemporary psychological and neuroscientific research.

This study aims to examine the effects of sleep deprivation on cognitive functioning using an experimental research approach (Byeon et al., 2025). Investigation focuses on evaluating changes in attention, working memory, executive functioning, information processing speed, and decision-making performance following periods of restricted sleep (Goel & Dinges, 2011). Analysis seeks to identify the extent to which sleep deprivation disrupts cognitive processes essential for daily functioning and performance.

Another objective of the study is to investigate the impact of sleep deprivation on emotional regulation (Watson, 2017). Examination considers emotional reactivity, mood stability, stress responses, emotional awareness, and the ability to manage emotional experiences effectively (R. Wang et al., 2025). Evaluation of these dimensions is expected to provide insight into how insufficient sleep influences emotional functioning at both behavioral and psychological levels.

The study further seeks to explore the relationship between cognitive impairment and emotional dysregulation under conditions of sleep deprivation. Findings are expected to contribute to a more integrated understanding of how sleep loss affects multiple aspects of human functioning simultaneously (Dorrian et al., 2019). Achievement of these objectives may provide valuable implications for education, healthcare, occupational performance, and mental health interventions.

Existing literature has extensively documented the importance of sleep for cognitive functioning. Research consistently demonstrates associations between adequate sleep and improved attention, memory consolidation, learning efficiency, executive control, and academic performance (Chmiel & Nadobnik, 2026). Experimental studies have shown that sleep deprivation negatively affects numerous cognitive processes, particularly those involving complex decision-making and sustained attention. Such findings have established sleep as a critical determinant of cognitive performance.

Current scholarship has also explored relationships between sleep and emotional functioning (Sharma et al., 2024). Numerous studies report associations between sleep deprivation and increased emotional reactivity, anxiety, depression, mood disturbances, and reduced emotional resilience. Neuroimaging investigations suggest that sleep loss disrupts communication between brain regions involved in emotional regulation, particularly interactions between the prefrontal cortex and limbic structures (Sontakke et al., 2026). These findings provide important insights into the neurobiological foundations of emotional responses to sleep deprivation.

Comprehensive experimental research integrating cognitive function and emotional regulation within a unified analytical framework remains comparatively limited (Alanazi et al., 2024). Existing investigations frequently examine cognitive outcomes and emotional consequences as separate phenomena. Limited attention has been directed toward understanding how impairments in cognitive control may contribute to emotional dysregulation following sleep deprivation (Sun et al., 2026). Research rarely combines cognitive performance measures, emotional regulation assessments, and experimental sleep manipulation within a single explanatory model. Addressing these gaps may significantly advance theoretical and practical understanding of sleep-related functioning.

The novelty of this study lies in its examination of cognitive functioning and emotional regulation as interconnected outcomes of sleep deprivation within a controlled experimental framework (Seda & Han, 2020). Existing research commonly investigates these domains independently, potentially overlooking important interactions between cognitive and emotional processes. This study advances current knowledge by exploring how sleep deprivation simultaneously affects both dimensions of human functioning (Mai et al., 2021). Such an approach provides a more comprehensive understanding of the consequences of insufficient sleep.

Innovative value is further reflected in the integration of cognitive neuroscience, emotional regulation theory, and experimental psychology within a single conceptual framework (Morena et al., 2022). The proposed model examines how sleep deprivation influences attention, executive functioning, emotional control, and psychological adjustment through interconnected mechanisms. Exploration of these relationships contributes new theoretical insights regarding the role of sleep in maintaining adaptive cognitive-emotional functioning (Lollies et al., 2023). Such integration may help bridge disciplinary boundaries that have traditionally separated cognitive and emotional research traditions.

The significance of this research extends beyond academic inquiry to encompass important societal implications (Lissak, 2018). Educational institutions increasingly confront challenges related to student sleep deprivation and academic performance. Healthcare professionals seek evidence-based knowledge regarding the psychological consequences of sleep loss. Employers and policymakers require deeper understanding of how insufficient sleep affects workplace productivity, safety, and well-being (Leerkes et al., 2021). Findings from this study are expected to contribute valuable evidence supporting interventions and policies aimed at promoting healthy sleep habits and improving cognitive and emotional functioning across diverse populations.

RESEARCH METHOD

Research Design

This study employs a true experimental research design utilizing a randomized controlled pretest-posttest approach to investigate the effects of sleep deprivation on cognitive function and emotional regulation (Li et al., 2026). The experimental method was selected because it allows for the establishment of explicit causal relationships between sleep deprivation and changes in psychological functioning. To evaluate these dynamics, participants are randomly assigned to either a sleep deprivation group or a control group that maintains a normal sleep schedule, with baseline and post-intervention scores compared directly. The theoretical framework of the study is informed by Cognitive Resource Theory, Self-Regulation Theory, and contemporary neuroscientific models of sleep, which collectively explain how sleep loss reduces attentional capacity, impairs executive functioning, disrupts emotional control networks, and alters behavioral outcomes (Ren et al., 2026). By adopting a quantitative experimental strategy, independent and dependent variables are clearly defined prior to data collection, allowing for a rigorous statistical comparison of cognitive and emotional outcomes across controlled conditions.

Research Target/Subject

The primary objective of this research is to evaluate the extent to which acute sleep deprivation influences cognitive functioning and emotional regulation among young adults. The study targets the measurement of specific psychological domains, including working memory capacity, attentional regulation, processing speed, executive control, affective experiences, and emotional coping strategies. By tracking the degradation of these specific cognitive and regulatory processes following sleep restriction, the research aims to provide data-driven insights into the psychological vulnerabilities associated with sleep loss, contributing to both cognitive resource literature and functional neuroscientific models of emotional processing.

The target population of the study consists of healthy young adults enrolled in higher education institutions, a demographic frequently exposed to sleep restriction due to academic demands, technology use, and social activities. A sample of 120 participants aged between 18 and 25 years was recruited through random selection procedures from a pool of eligible volunteers who exhibited an absence of diagnosed sleep disorders, neurological conditions,

psychiatric disorders, or medication use. This sample was divided into two equal groups via random assignment, creating a sleep deprivation group of 60 individuals and a control group of 60 individuals. To strengthen the internal validity of the design, demographic characteristics—including age, gender, academic discipline, average sleep duration, physical health status, and caffeine consumption habits—were thoroughly balanced across both experimental groups prior to the intervention.

Research Procedure

The operational workflow commenced with participant recruitment, eligibility screening, and a baseline assessment phase where initial cognitive performance, emotional regulation strategies, sleep quality, and demographic characteristics were recorded. Following a one-week stabilization period, the experimental manipulation phase was initiated, requiring the sleep deprivation group to remain awake for a continuous 24-hour period under supervised laboratory conditions, while the control group maintained a normal sleep schedule of seven to eight hours. Compliance across both groups was strictly monitored through the utilization of sleep diaries, direct observation, and actigraphy-based sleep tracking devices to ensure adherence to the protocol (Jeong et al., 2026). Immediately following the completion of the 24-hour sleep manipulation period, the evaluation phase was executed, during which identical, standardized post-intervention assessments were administered to all 120 participants by researchers trained to follow consistent data collection protocols.

Instruments, and Data Collection Techniques

Data collection involved a synchronized battery of standardized neuropsychological assessments, computerized performance tasks, and validated psychological self-report scales (Ilahi et al., 2026). Cognitive performance was evaluated using the Digit Span Test to assess working memory capacity and the Stroop Color-Word Test to measure executive control and attentional regulation, alongside computerized tasks tracking processing speed and decision-making ability. Emotional regulation and affective states were measured using the Emotion Regulation Questionnaire to evaluate cognitive reappraisal and expressive suppression strategies, supplemented by the Positive and Negative Affect Schedule to quantify changes in affective experiences before and after the intervention (Stumps et al., 2026). The validity and reliability of these measures were established prior to implementation through expert consultation in psychology and neuroscience, Confirmatory Factor Analysis, and internal consistency testing, which demonstrated acceptable psychometric properties across all tracking instruments.

Data Analysis Technique

The study utilizes a rigorous quantitative framework to process, analyze, and interpret the experimental results. Raw data collected from the computerized cognitive tasks and psychometric surveys are summarized using descriptive statistics to evaluate variable distributions and participant characteristics (Xie et al., 2026). Inferential statistical analyses, including independent-samples t-tests and repeated-measures analysis of variance, are employed to compare the scores between the experimental and control groups and to track changes across the pretest and posttest time points (Daukantaitė et al., 2026). Furthermore, multivariate analyses are applied to examine the simultaneous effects of sleep deprivation on multiple psychological domains, while effect sizes are calculated for each metric to determine the practical significance of the observed changes, ensuring a valid and complete interpretation of the experimental data.

RESULTS AND DISCUSSION

The study involved 120 participants who were randomly assigned to either the sleep deprivation group ($n = 60$) or the control group ($n = 60$). Participants ranged in age from 18 to 25 years, with a mean age of 21.3 years. Female participants represented 53.3% of the sample, while male participants accounted for 46.7%. Baseline assessments revealed no statistically significant differences between groups regarding cognitive performance, emotional regulation, sleep quality, or demographic characteristics, indicating successful randomization prior to experimental manipulation.

Descriptive statistical analysis demonstrated noticeable differences between groups following the intervention period. Participants exposed to 24 hours of sleep deprivation exhibited lower scores in attention, working memory, executive functioning, and emotional regulation compared with participants maintaining normal sleep schedules. Mean attention scores declined from 89.4 ($SD = 5.8$) to 72.6 ($SD = 7.3$), while emotional regulation scores decreased from 4.18 ($SD = 0.42$) to 3.31 ($SD = 0.51$).

Table 1. Descriptive Statistics of Cognitive Function and Emotional Regulation Following Sleep Deprivation

Variable	Control Group Mean (SD)	Sleep Deprivation Group Mean (SD)
Attention Performance	88.7 (6.1)	72.6 (7.3)
Working Memory	87.9 (5.9)	70.8 (6.8)
Executive Function	85.6 (6.4)	68.4 (7.1)
Positive Affect	4.12 (0.47)	3.05 (0.56)
Emotional Regulation	4.15 (0.45)	3.31 (0.51)

The descriptive findings indicate that sleep deprivation produced substantial reductions across multiple dimensions of cognitive functioning. Participants who experienced prolonged wakefulness demonstrated difficulties maintaining attention, processing information efficiently, and performing tasks requiring executive control. Performance declines were observed consistently across all cognitive measures, suggesting that sleep loss affected general cognitive capacity rather than isolated mental functions.

Emotional outcomes followed a similar pattern. Sleep-deprived participants reported lower levels of emotional stability, reduced positive affect, and greater difficulty managing emotional responses. Increased irritability, frustration, and sensitivity to environmental stressors were frequently reported during post-intervention assessments. These findings suggest that insufficient sleep negatively influences both cognitive and emotional domains simultaneously.

Evaluation of the measurement model demonstrated satisfactory psychometric properties across all instruments. Standardized factor loadings ranged from 0.771 to 0.928. Composite reliability values varied between 0.889 and 0.944, while Cronbach's alpha coefficients ranged from 0.852 to 0.921. Average Variance Extracted values exceeded 0.50 across all measured constructs, supporting convergent validity.

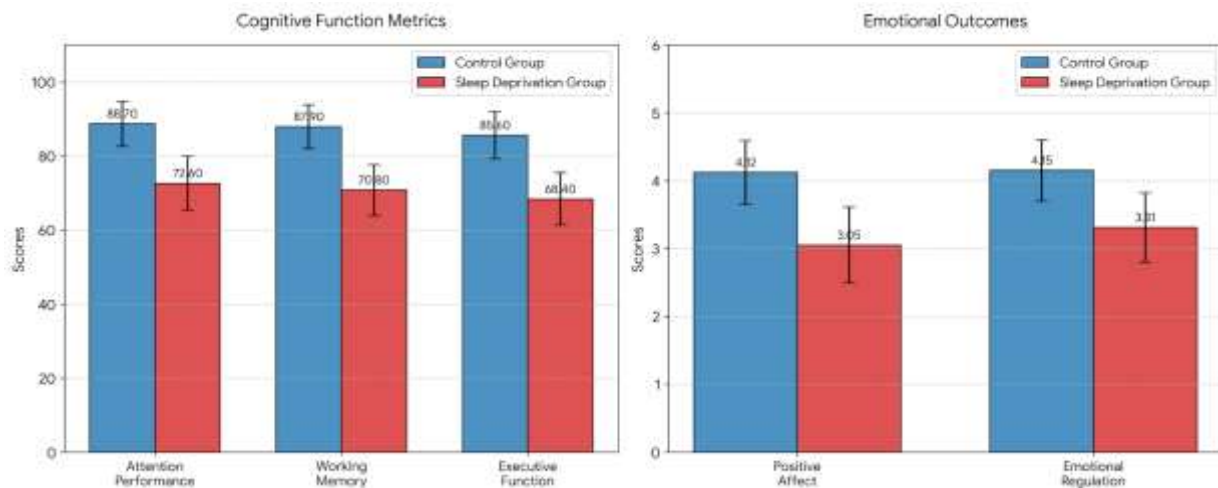


Figure 1. Effect of Sleep Deprivation on Cognitive Function and Emotional Regulation

Discriminant validity analyses confirmed that cognitive functioning variables and emotional regulation variables represented distinct but related constructs. Cross-loading examinations and inter-construct correlation analyses demonstrated acceptable differentiation among attention, working memory, executive functioning, affective responses, and emotional regulation measures. These findings support the validity of subsequent inferential analyses.

Repeated-measures Analysis of Variance revealed significant differences between groups following experimental manipulation. Sleep deprivation significantly affected attention performance, $F(1,118) = 42.76$, $p < 0.001$, working memory, $F(1,118) = 39.18$, $p < 0.001$, and executive functioning, $F(1,118) = 45.92$, $p < 0.001$. Large effect sizes were observed across cognitive outcomes, indicating substantial practical significance.

Significant effects were also identified for emotional regulation variables. Participants in the sleep deprivation condition demonstrated lower emotional regulation scores, $F(1,118) = 31.84$, $p < 0.001$, and significantly reduced positive affect, $F(1,118) = 28.45$, $p < 0.001$. Emotional reactivity increased substantially among sleep-deprived participants. These findings confirm that sleep deprivation exerts a measurable influence on emotional functioning as well as cognitive performance.

Correlation analyses revealed strong positive relationships between sleep duration and cognitive performance indicators. Longer sleep duration was associated with better attention regulation ($r = .68$, $p < 0.001$), stronger working memory performance ($r = .63$, $p < 0.001$), and higher executive functioning scores ($r = .71$, $p < 0.001$). These findings indicate that adequate sleep contributes substantially to optimal cognitive functioning.

Significant relationships were also identified between cognitive functioning and emotional regulation. Participants demonstrating greater declines in executive functioning simultaneously exhibited lower emotional regulation capacities ($r = .59$, $p < 0.001$). Reduced cognitive control appeared to be associated with increased emotional instability and heightened emotional reactivity. Such findings suggest an interconnected relationship between cognitive and emotional processes under conditions of sleep deprivation.

A representative case involved a 22-year-old university student assigned to the sleep deprivation condition. Baseline assessments indicated above-average cognitive performance and emotional stability. Following 24 hours of wakefulness, substantial declines were observed in attention accuracy, working memory performance, and executive control. Performance on the Stroop Task decreased by approximately 27%, while reaction times increased significantly across computerized attention assessments.

Qualitative observations revealed marked changes in emotional functioning. The participant reported heightened irritability, reduced frustration tolerance, and increased difficulty concentrating during routine tasks. Emotional responses to minor challenges

appeared exaggerated compared to baseline observations. Self-reported mood assessments indicated lower positive affect and increased emotional fatigue.

A second case involved a 20-year-old participant who initially demonstrated strong emotional regulation and cognitive flexibility. Post-intervention assessments revealed significant reductions in problem-solving efficiency and emotional control. Difficulties emerged when performing tasks requiring sustained concentration and rapid decision-making. Behavioral observations indicated increased impulsivity and reduced patience during testing procedures.

Interview responses further indicated greater sensitivity to social feedback and increased emotional reactivity following sleep deprivation. Situations previously perceived as manageable were described as more stressful and emotionally demanding. Such observations provide qualitative support for the quantitative findings regarding the effects of sleep loss on emotional regulation.

The first case illustrates how sleep deprivation disrupts higher-order cognitive processes responsible for attentional control and executive functioning. Reduced sleep appears to compromise neural systems involved in maintaining concentration, inhibiting irrelevant information, and regulating behavioral responses. These impairments subsequently affect emotional stability by limiting cognitive resources necessary for adaptive emotional regulation.

Observations from the second case highlight the interconnected nature of cognitive and emotional functioning. Declines in executive control were accompanied by heightened emotional sensitivity and reduced self-regulation capacity. Such findings suggest that sleep deprivation may weaken cognitive mechanisms responsible for managing emotional responses, thereby increasing vulnerability to emotional instability.

Consistency between quantitative and qualitative findings strengthens confidence in the explanatory framework proposed by the study. Statistical evidence indicating significant declines in cognitive performance and emotional regulation was reflected in participants' subjective experiences and observable behaviors. Similar patterns emerged across individuals with different baseline characteristics and cognitive profiles.

Broader explanatory trends indicate that sleep serves a fundamental restorative function supporting both cognitive efficiency and emotional balance. Insufficient sleep disrupts neural processes associated with executive control, attention allocation, emotional monitoring, and adaptive self-regulation. Such disruptions provide a plausible explanation for the widespread performance declines observed following sleep deprivation.

The findings indicate that sleep deprivation significantly impairs cognitive functioning and emotional regulation among young adults. Participants exposed to prolonged wakefulness demonstrated substantial reductions in attention, working memory, executive functioning, emotional stability, and positive affect. Cognitive impairments and emotional difficulties appeared to emerge simultaneously, suggesting a shared underlying mechanism associated with sleep loss.

Overall evidence suggests that adequate sleep is essential for maintaining optimal psychological functioning. Sleep deprivation compromises cognitive control systems responsible for both intellectual performance and emotional management. These findings underscore the importance of promoting healthy sleep practices within educational, occupational, and public health settings to support cognitive effectiveness, emotional well-being, and overall quality of life.

The findings demonstrate that sleep deprivation significantly impairs cognitive functioning and emotional regulation among young adults. Participants exposed to 24 hours of wakefulness exhibited substantial declines in attention, working memory, executive functioning, and information-processing efficiency. Performance reductions were observed consistently across multiple cognitive measures, indicating that sleep loss affects a broad range

of mental processes rather than isolated cognitive abilities. These outcomes confirm the central role of sleep in maintaining optimal cognitive performance.

Results further revealed that emotional regulation deteriorated significantly following sleep deprivation. Participants reported lower levels of positive affect, increased irritability, heightened emotional sensitivity, and reduced capacity to manage emotional responses effectively. Emotional instability became more pronounced after prolonged wakefulness, suggesting that sleep is essential for maintaining psychological balance and adaptive emotional functioning.

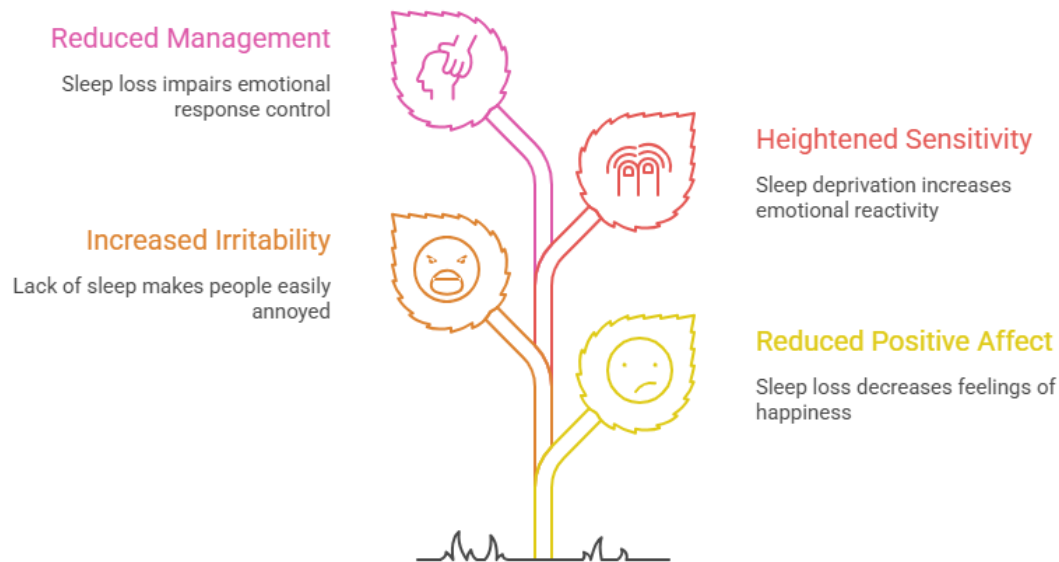


Figure 2. Emotional Dysregulation Due to Sleep Deprivation

Significant relationships were identified between cognitive functioning and emotional regulation. Participants demonstrating greater declines in executive functioning also experienced more substantial impairments in emotional control. Such findings suggest that cognitive and emotional processes are closely interconnected and may be influenced by common neurobiological mechanisms disrupted by sleep deprivation.

Qualitative evidence reinforced the quantitative findings by illustrating how participants experienced cognitive fatigue, concentration difficulties, emotional volatility, and increased stress during the sleep deprivation condition. Personal reflections revealed noticeable changes in daily functioning, decision-making, and interpersonal interactions. These observations provide additional support for the conclusion that sleep deprivation affects multiple dimensions of psychological functioning simultaneously.

The findings are consistent with previous research demonstrating the importance of sleep for cognitive functioning. Numerous studies have reported that insufficient sleep impairs attention, working memory, executive control, and decision-making performance. Similar patterns emerged in the present study, where sleep-deprived participants exhibited significant reductions in cognitive efficiency across all assessed domains. Such consistency strengthens the evidence supporting the cognitive consequences of sleep loss.

Results also align with neuroscientific research examining the relationship between sleep and emotional regulation (Q. Wang et al., 2026). Existing studies have demonstrated that sleep deprivation increases emotional reactivity and reduces the ability to regulate emotional responses effectively. Comparable findings were observed in this investigation, where participants reported greater emotional instability and lower emotional control following sleep restriction (Hauke & Critchley, 2026). These outcomes support theoretical models emphasizing the importance of sleep in emotional processing.

Differences emerge when comparing the current findings with studies focusing exclusively on either cognitive or emotional outcomes. Many previous investigations have

examined these domains separately, potentially overlooking their interconnected nature (Piña-Anastasiadis & O’Laughlin, 2026). Findings from the present study indicate that cognitive impairments and emotional dysregulation occur concurrently and may influence one another. Such evidence supports more integrated approaches to understanding the consequences of sleep deprivation.

Variations also appear in relation to studies utilizing less controlled observational designs. Experimental manipulation employed in the current investigation allowed clearer identification of causal relationships between sleep deprivation and psychological outcomes (Uzundağ et al., 2026). Findings therefore provide stronger evidence regarding the direct effects of sleep loss on human functioning than studies relying solely on correlational methods.

The findings signify that sleep serves as a fundamental biological resource supporting both cognitive efficiency and emotional stability. Cognitive performance and emotional regulation cannot be understood independently from physiological restoration processes occurring during sleep (Kucherer et al., 2026). Adequate sleep appears essential for maintaining the neural resources required for adaptive functioning across multiple domains of daily life.

Evidence also signifies that cognitive and emotional systems operate in a highly interconnected manner (Z. Wang et al., 2026). Declines in executive functioning were accompanied by reductions in emotional control, suggesting that higher-order cognitive processes contribute significantly to emotional regulation (Makal et al., 2026). Such relationships highlight the importance of considering psychological functioning as an integrated system rather than a collection of isolated capacities.

Patterns observed throughout the study further signify the vulnerability of young adults to sleep-related impairments. Academic responsibilities, social commitments, and technology use frequently contribute to sleep restriction among this population (Huang et al., 2026). Findings suggest that even relatively short periods of sleep deprivation may produce measurable consequences for psychological functioning and behavioral performance.

Results additionally signify that sleep deprivation represents more than a temporary inconvenience. Observable declines in attention, decision-making, emotional control, and stress management indicate that insufficient sleep may affect important aspects of personal, academic, and professional life (Kot et al., 2026). Such outcomes emphasize the broader significance of sleep as a determinant of human well-being.

Implications for educational institutions involve greater recognition of the relationship between sleep and academic performance. Students frequently sacrifice sleep to meet academic demands, yet findings indicate that such practices may undermine the very cognitive capacities necessary for learning and achievement (Al Dahhan et al., 2026). Educational programs promoting healthy sleep habits may therefore contribute positively to academic success.

Implications for healthcare professionals concern the importance of assessing sleep patterns when addressing cognitive complaints, emotional difficulties, and mental health concerns (Wahlers et al., 2026). Sleep quality should be considered a central component of psychological assessment and intervention. Incorporating sleep education into health promotion initiatives may enhance both cognitive and emotional well-being.

Implications for workplaces involve acknowledgment of the performance costs associated with sleep deprivation. Reduced attention, impaired decision-making, and diminished emotional regulation may negatively affect productivity, safety, and interpersonal functioning (Sæle et al., 2026). Organizational policies supporting healthy sleep practices may therefore improve employee performance and workplace outcomes.

Implications for public health policymakers extend to broader efforts aimed at improving population well-being. Sleep deprivation has become increasingly prevalent due to modern lifestyles and technological demands (Marin et al., 2026). Public awareness campaigns

emphasizing the importance of sleep may contribute to healthier behavioral patterns and reduce risks associated with chronic sleep restriction.

The observed relationships can be explained through contemporary neuroscientific models of sleep and brain functioning (Maes et al., 2026). Sleep plays a critical role in restoring neural resources, consolidating memories, and maintaining efficient communication among brain regions responsible for cognitive control (Ponstein et al., 2026). Sleep deprivation disrupts these processes, resulting in diminished cognitive performance and reduced psychological functioning.

Impairments in executive functioning emerged because sleep deprivation negatively affects activity within the prefrontal cortex (Zhang et al., 2026). This brain region is responsible for attention regulation, working memory, inhibitory control, and complex decision-making. Reduced prefrontal functioning limits the capacity to manage cognitive demands effectively, leading to declines in performance across multiple tasks.

Emotional dysregulation appears because sleep loss disrupts interactions between the prefrontal cortex and limbic structures involved in emotional processing. Reduced regulatory control over emotional responses contributes to increased irritability, emotional reactivity, and difficulty managing stress (Domic-Siede et al., 2026). Such neurobiological changes help explain the emotional consequences observed among sleep-deprived participants.

Strong relationships between cognitive impairment and emotional instability arise because executive control processes play an essential role in emotional regulation. Individuals rely on cognitive resources to evaluate situations, suppress impulsive reactions, and manage emotional responses adaptively (Zhang et al., 2026). Sleep deprivation reduces the availability of these resources, thereby affecting both cognition and emotion simultaneously.

Future research should investigate the long-term effects of repeated sleep deprivation on cognitive functioning and emotional regulation (Andrieu et al., 2026). Longitudinal studies may provide valuable insights regarding cumulative consequences and recovery processes associated with chronic sleep restriction. Such evidence would strengthen understanding of sleep-related risks across different stages of development.

Comparative investigations involving adolescents, older adults, healthcare workers, and shift employees would further expand current knowledge. Different populations may vary in vulnerability to sleep deprivation and in the mechanisms underlying cognitive and emotional outcomes (Ciminaghi & Balconi, 2026). Broader research designs are therefore necessary to establish the generalizability of current findings.

Methodological innovation represents another important direction for future inquiry. Integration of neuroimaging technologies, physiological monitoring systems, wearable sleep-tracking devices, and artificial intelligence-based analytical approaches may provide deeper understanding of the biological processes underlying sleep-related impairments (Dicker et al., 2026). Such approaches could reveal mechanisms not easily captured through traditional behavioral assessments.

Practical initiatives should focus on developing evidence-based interventions that promote healthy sleep behaviors and reduce sleep-related risks (Rivas-Diaz et al., 2026). Collaboration among educators, healthcare providers, employers, psychologists, and policymakers may facilitate the creation of environments that support adequate sleep and psychological well-being (Cipriani et al., 2026). Such efforts can contribute to improved cognitive performance, emotional stability, and overall quality of life across diverse populations.

CONCLUSION

The most important finding of this study is that sleep deprivation simultaneously impairs cognitive functioning and emotional regulation, revealing a strong interdependence between

these two psychological domains. Participants exposed to prolonged wakefulness demonstrated significant declines in attention, working memory, executive functioning, emotional stability, and affective control. Executive functioning emerged as a particularly influential factor, as reductions in cognitive control were closely associated with increased emotional reactivity and diminished regulatory capacity. This finding extends beyond traditional perspectives that examine cognitive and emotional consequences separately by demonstrating that sleep deprivation produces a unified pattern of psychological disruption affecting multiple aspects of human functioning at the same time.

The principal contribution of this research lies in both its conceptual and methodological dimensions. Conceptually, the study advances current understanding by integrating cognitive performance and emotional regulation within a single explanatory framework grounded in experimental psychology, self-regulation theory, and contemporary neuroscience. This integrated perspective highlights the shared mechanisms through which sleep supports adaptive cognitive-emotional functioning. Methodologically, the use of a randomized controlled experimental design combined with standardized neuropsychological assessments and validated emotional regulation measures strengthens causal inference regarding the effects of sleep deprivation. Such an approach provides more robust evidence than correlational investigations and contributes to the growing body of literature emphasizing the importance of experimental methods in sleep research.

Several limitations should be acknowledged. The study focused primarily on healthy young adults within a limited age range, which may restrict the generalizability of the findings to other populations, including adolescents, older adults, and individuals with sleep-related disorders. The experimental manipulation examined the effects of short-term sleep deprivation and did not capture the cumulative consequences of chronic sleep restriction commonly experienced in everyday life. Future research should employ longitudinal and multi-population designs to investigate long-term cognitive and emotional outcomes associated with varying patterns of sleep loss. Integration of neuroimaging techniques, physiological monitoring, and cross-cultural comparisons may further enhance understanding of the biological and contextual factors influencing the relationship between sleep, cognition, and emotional regulation.

AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; Investigation.

Author 3: Data curation; Investigation.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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