



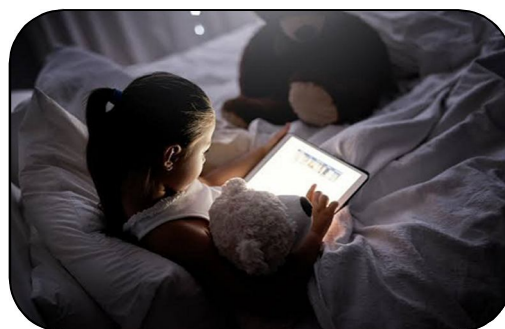
SLEEP QUALITY, SCREEN EXPOSURE, AND COGNITIVE PERFORMANCE IN ADOLESCENTS

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ABSTRACT

Adolescence is a critical developmental stage characterized by rapid physical, emotional, and cognitive changes. In recent years, the widespread use of smartphones, tablets, computers, and other digital devices has significantly increased screen exposure among adolescents. Excessive screen time, particularly before bedtime, has been associated with poor sleep quality and disturbances in circadian rhythms. Sleep plays a vital role in cognitive functioning, including attention, memory, problem-solving, decision-making, and academic performance. The present study explores the relationship between sleep quality, screen exposure, and cognitive performance in adolescents. It examines how prolonged use of digital devices affects sleep patterns and subsequently influences cognitive abilities. Existing research suggests that exposure to blue light emitted from screens suppresses melatonin production, delays sleep onset, and reduces overall sleep duration. Poor sleep quality can lead to reduced concentration, impaired memory retention, slower information processing, and increased emotional instability. The study adopts a quantitative research approach involving adolescent participants from secondary schools. Data are collected through standardized questionnaires measuring sleep quality and screen exposure, along with cognitive assessment tools. Findings indicate a significant negative relationship between excessive screen exposure and sleep quality, while sleep quality demonstrates a positive association with cognitive performance. Adolescents who reported healthy sleep habits and limited screen usage showed better cognitive outcomes compared to those with excessive digital engagement. The study highlights the importance of promoting healthy digital habits and sleep hygiene practices among adolescents to support optimal cognitive development and academic success. The findings have implications for educators, parents, mental health professionals, and policymakers in developing interventions aimed at enhancing adolescent well-being in the digital age.



KEYWORDS: Sleep Quality, Screen Exposure, Cognitive Performance, Adolescents, Digital Devices, Academic Achievement, Sleep Hygiene, Attention, Memory, Mental Health.

INTRODUCTION

Adolescence represents a unique period of human development marked by substantial neurological, psychological, and social transformations. During this stage, the brain undergoes significant structural and functional changes that influence learning, emotional regulation, and cognitive development.

Adequate sleep is one of the most important factors supporting healthy brain functioning during adolescence. Sleep contributes to memory consolidation, emotional stability, learning efficiency, and overall cognitive performance. However, modern technological advancements have dramatically altered adolescents' daily routines and sleeping habits.

The rapid growth of digital technology has made smartphones, tablets, laptops, gaming consoles, and social media platforms integral parts of adolescents' lives. Digital devices are used not only for communication and entertainment but also for educational purposes. While technology offers numerous benefits, excessive screen exposure has emerged as a major public health concern. Studies across different countries indicate that adolescents spend several hours daily on digital devices, often extending their screen use into late-night hours. This behavior has been linked to sleep disturbances, reduced sleep duration, and poor sleep quality.

Sleep quality refers to an individual's satisfaction with sleep, including factors such as sleep duration, sleep latency, sleep efficiency, and feelings of restfulness upon waking. High-quality sleep allows the brain and body to recover and prepare for daily activities. Conversely, poor sleep quality may result in fatigue, irritability, reduced motivation, and impaired cognitive functioning. Adolescents are particularly vulnerable to sleep-related problems because of biological changes in circadian rhythms combined with academic pressures and increased social engagement through digital platforms.

Screen exposure affects sleep through multiple mechanisms. The blue light emitted from electronic screens interferes with melatonin secretion, a hormone responsible for regulating sleep-wake cycles. Reduced melatonin production delays sleep onset and disrupts circadian rhythms. Furthermore, engaging content such as social media interactions, online gaming, and video streaming can increase psychological arousal, making it difficult for adolescents to relax and fall asleep. Frequent nighttime notifications and device checking behaviors also contribute to fragmented sleep patterns.

Cognitive performance encompasses mental processes such as attention, memory, reasoning, problem-solving, decision-making, and information processing. These functions are essential for academic achievement and successful adaptation to daily life. Adequate sleep supports the development and maintenance of cognitive abilities by facilitating neural plasticity and memory consolidation. Sleep deprivation, on the other hand, negatively affects attention span, working memory, executive functioning, and learning outcomes.

Recent research has increasingly focused on understanding the interconnected relationship between sleep quality, screen exposure, and cognitive functioning among adolescents. Evidence suggests that excessive screen use contributes to poor sleep, which in turn affects cognitive performance. Adolescents who experience insufficient or poor-quality sleep often report difficulties concentrating in class, remembering information, completing tasks efficiently, and maintaining emotional balance. These challenges can adversely impact academic achievement and overall psychological well-being.

The influence of digital technology on adolescent development has become particularly significant in the post-pandemic era, where online learning and virtual communication have further increased screen exposure. Although technology has facilitated educational continuity, concerns regarding its effects on sleep and cognitive health have intensified. Understanding these relationships is essential for developing evidence-based interventions that encourage responsible technology use and healthy sleep practices.

Researchers, educators, and healthcare professionals emphasize the importance of balancing technological engagement with healthy lifestyle behaviors. Strategies such as limiting screen use before bedtime, promoting digital wellness education, encouraging physical activity, and establishing consistent sleep schedules can help mitigate the negative effects of excessive screen exposure. Such interventions may contribute to improved sleep quality and enhanced cognitive functioning among adolescents.

The present study seeks to examine the association between sleep quality, screen exposure, and cognitive performance in adolescents. By exploring these relationships, the study aims to provide insights into how digital behaviors influence adolescent cognitive development and to identify potential strategies for promoting healthier sleep and technology-use habits. The findings are expected to contribute to the growing body of literature on adolescent health and inform educational and public health policies aimed at supporting the well-being of young people in an increasingly digital world.

STATEMENT OF THE PROBLEM

The increasing dependence on digital technology among adolescents has raised concerns regarding its impact on sleep quality and cognitive functioning. Modern adolescents spend a considerable amount of time using smartphones, computers, tablets, and other digital devices for educational, recreational, and social purposes. Although these technologies offer numerous advantages, excessive screen exposure, particularly during evening and nighttime hours, has been associated with disruptions in sleep patterns and reduced sleep quality. Sleep disturbances among adolescents have become increasingly common and are linked to various physical, emotional, and cognitive difficulties.

Adequate sleep is essential for healthy brain development and optimal cognitive functioning. During sleep, important neurological processes such as memory consolidation, information processing, and emotional regulation occur. When adolescents experience poor sleep quality or insufficient sleep, their ability to concentrate, learn new information, solve problems, and make effective decisions may be compromised. Consequently, poor sleep can negatively affect academic performance, social relationships, and overall psychological well-being.

Excessive screen exposure contributes to sleep problems through physiological and psychological mechanisms. Exposure to blue light emitted from digital devices suppresses melatonin production, delays sleep onset, and alters circadian rhythms. In addition, engaging digital activities such as social media use, online gaming, and video streaming can increase mental stimulation and delay bedtime. These factors collectively contribute to shorter sleep duration, fragmented sleep, and reduced sleep efficiency among adolescents.

Despite growing awareness of the effects of digital technology on sleep, many adolescents continue to engage in prolonged screen use, often without understanding its consequences for cognitive health. Furthermore, while previous studies have examined the individual relationships between screen exposure and sleep quality or sleep quality and cognitive performance, fewer studies have comprehensively explored the interconnected relationship among these three variables within adolescent populations. Understanding these relationships is crucial for identifying risk factors and developing effective interventions.

Therefore, the present study addresses the problem of how sleep quality and screen exposure influence cognitive performance among adolescents. It seeks to investigate whether increased screen exposure is associated with poorer sleep quality and whether sleep quality mediates the relationship between screen use and cognitive functioning. The study aims to generate evidence that can assist educators, parents, psychologists, and policymakers in promoting healthier technology-use behaviors and improving adolescent cognitive and academic outcomes.

If you need the next sections (Objectives of the Study, Hypotheses, Review of Literature, Research Methodology, Results and Discussion), I can provide them in the same research article format.

OBJECTIVES OF THE STUDY

The present study aims to examine the relationship between sleep quality, screen exposure, and cognitive performance among adolescents. Specifically, the study seeks to investigate the extent to which

screen exposure influences sleep quality and how sleep quality affects various aspects of cognitive functioning. Adolescents are increasingly exposed to digital devices for educational, recreational, and social purposes, making it important to understand the consequences of excessive screen use on their psychological and cognitive well-being. The study also intends to assess the patterns of screen usage among adolescents and determine whether differences in screen exposure are associated with variations in sleep quality and cognitive performance. Another objective is to identify the role of sleep quality as a potential mediating factor between screen exposure and cognitive functioning. Furthermore, the study seeks to generate empirical evidence that may assist educators, parents, psychologists, and policymakers in developing effective strategies to promote healthy technology use and improve sleep habits among adolescents. Ultimately, the research aims to contribute to the understanding of adolescent health and development in an increasingly digital environment.

Hypotheses

The study is guided by the following hypotheses:

H1: There is a significant negative relationship between screen exposure and sleep quality among adolescents.

H2: There is a significant positive relationship between sleep quality and cognitive performance among adolescents.

H3: Excessive screen exposure is significantly associated with lower cognitive performance among adolescents.

H4: Sleep quality significantly mediates the relationship between screen exposure and cognitive performance.

H5: Adolescents with lower screen exposure and better sleep quality demonstrate higher cognitive performance than adolescents with excessive screen exposure and poor sleep quality.

REVIEW OF LITERATURE

The relationship between sleep quality, screen exposure, and cognitive functioning has attracted considerable attention in psychological and educational research. Sleep is widely recognized as an essential biological process that supports physical health, emotional regulation, learning, memory consolidation, and cognitive performance. During adolescence, adequate sleep becomes particularly important because of rapid neurological development and increased academic demands. However, contemporary lifestyles characterized by extensive use of digital technologies have contributed to significant changes in adolescents' sleep behaviors and routines.

Research conducted by Cain and Gradisar (2010) highlighted that excessive use of electronic media is associated with delayed bedtimes, shorter sleep duration, and poorer sleep quality among children and adolescents. Their findings suggested that screen-based activities interfere with healthy sleep patterns through both physiological and psychological mechanisms. Similarly, Hale and Guan (2015), through a systematic review, reported consistent evidence linking screen time with adverse sleep outcomes, including difficulties falling asleep, reduced sleep duration, and increased daytime sleepiness.

The physiological effects of screen exposure have been explained through studies examining the influence of blue light emitted by electronic devices. Chang et al. (2015) found that exposure to light-emitting electronic devices before bedtime suppresses melatonin secretion and disrupts circadian rhythms. Such disruptions can delay sleep onset and negatively affect sleep efficiency. These findings are particularly relevant to adolescents who frequently use smartphones and tablets during nighttime hours.

Several studies have also investigated the consequences of poor sleep quality on cognitive functioning. Dewald et al. (2010) reported that sleep quality and sleep duration significantly influence academic performance among adolescents. Their meta-analysis demonstrated that insufficient sleep impairs attention, concentration, memory, and executive functioning. Similarly, Lo et al. (2016) observed that sleep deprivation adversely affects cognitive flexibility, working memory, and processing speed in adolescent populations.

Research examining screen exposure and cognitive performance suggests both direct and indirect effects. Swing et al. (2010) found that excessive media exposure was associated with attention difficulties and reduced cognitive functioning. Frequent engagement with digital media may reduce opportunities for sustained attention and deep cognitive processing. Furthermore, the negative impact of screen exposure on cognition often appears to be mediated by sleep disturbances.

More recent studies have emphasized the interconnected nature of these variables. Twenge and Campbell (2018) reported that adolescents who spent more time on electronic devices experienced lower psychological well-being and poorer sleep outcomes. Their findings suggested that excessive digital engagement may indirectly influence cognitive and emotional functioning through sleep-related mechanisms. Likewise, Carter et al. (2016) highlighted that nighttime technology use is a significant predictor of sleep problems and subsequent daytime cognitive difficulties among adolescents.

The existing body of literature clearly demonstrates that sleep quality, screen exposure, and cognitive performance are closely related. However, there remains a need for further research examining these relationships simultaneously within adolescent populations. The present study addresses this gap by exploring how screen exposure influences sleep quality and how both variables contribute to cognitive performance.

RESEARCH METHODOLOGY

The present study adopts a quantitative descriptive-correlational research design to examine the relationship between sleep quality, screen exposure, and cognitive performance among adolescents. The correlational approach is considered appropriate because it allows the researcher to investigate the nature and strength of relationships among variables without manipulating them. The study focuses on understanding naturally occurring patterns of behavior related to sleep and digital device usage.

The target population consists of adolescent students studying in secondary and higher secondary schools. Participants are selected from educational institutions representing diverse socioeconomic backgrounds to ensure adequate variability in screen exposure and sleep habits. A sample of approximately 200–300 adolescents is selected using stratified random sampling to ensure representation across age groups, gender, and educational levels.

Data collection is carried out using standardized psychological instruments and structured questionnaires. Sleep quality is assessed using a validated sleep quality scale that measures sleep duration, sleep latency, sleep disturbances, and overall sleep satisfaction. Screen exposure is measured through a self-report questionnaire assessing the duration, frequency, and purpose of digital device use, including smartphone usage, social media engagement, online gaming, and educational screen time. Cognitive performance is evaluated using standardized cognitive assessment tools designed to measure attention, memory, information processing speed, and executive functioning.

The collected data are analyzed using appropriate statistical techniques. Descriptive statistics such as mean, standard deviation, frequency, and percentage are used to summarize participant characteristics and study variables. Pearson's correlation analysis is employed to examine relationships among sleep quality, screen exposure, and cognitive performance. Regression analysis is conducted to determine the

predictive influence of screen exposure and sleep quality on cognitive functioning. Mediation analysis may also be applied to examine whether sleep quality serves as an intermediary variable between screen exposure and cognitive performance.

Ethical considerations are carefully maintained throughout the research process. Informed consent is obtained from participants and their parents or guardians. Confidentiality and anonymity are ensured, and participation is entirely voluntary. The study follows established ethical guidelines for conducting psychological research with adolescent populations.

The methodology is designed to provide reliable and valid data regarding the complex relationship among sleep quality, screen exposure, and cognitive performance. The findings are expected to contribute valuable insights into adolescent psychological health and support the development of evidence-based interventions aimed at promoting healthy sleep habits and responsible technology use.

Tools and Techniques

The present study employs a combination of standardized psychological instruments and structured questionnaires to assess sleep quality, screen exposure, and cognitive performance among adolescents. Sleep quality is measured using the Pittsburgh Sleep Quality Index (PSQI) or an equivalent validated sleep assessment scale. The instrument evaluates various dimensions of sleep, including sleep duration, sleep latency, sleep disturbances, sleep efficiency, and overall sleep satisfaction. Higher scores indicate poorer sleep quality, whereas lower scores reflect healthier sleep patterns.

Screen exposure is assessed through a structured Screen Time Usage Questionnaire developed to measure the duration and frequency of digital device use. The questionnaire includes items related to smartphone usage, social media engagement, online gaming, video streaming, educational screen activities, and nighttime device usage. Participants report their average daily screen time and the primary purposes for which digital devices are used.

Cognitive performance is evaluated using standardized cognitive assessment tools measuring attention, memory, concentration, processing speed, and executive functioning. The Cognitive Failure Questionnaire (CFQ), Digit Span Test, and Attention Performance Tasks may be employed to assess different dimensions of cognitive functioning. These instruments provide quantitative measures of cognitive efficiency and academic-related mental abilities.

The primary technique used for data collection is the survey method. Questionnaires are administered in classroom settings under standardized conditions. Participants are provided with clear instructions and adequate time to complete the instruments. The collected responses are coded and entered into statistical software for analysis. This combination of psychometric tools and survey techniques ensures the reliability and validity of the research findings.

Sampling Method

The study utilizes a stratified random sampling method to select participants from secondary and higher secondary schools. Stratified sampling is considered appropriate because it ensures adequate representation of different age groups, genders, and educational levels within the adolescent population. The population is divided into relevant strata based on demographic characteristics, and participants are randomly selected from each stratum.

The sample consists of approximately 250 adolescent students aged between 13 and 18 years. Participants are selected from urban and semi-urban educational institutions to obtain diversity in socioeconomic and technological backgrounds. Equal opportunities are provided for participation regardless of gender, academic achievement, or social status.

Inclusion criteria include regular school attendance, age within the specified adolescent range, and willingness to participate in the study. Students with severe neurological disorders or diagnosed sleep disorders that may significantly influence cognitive performance are excluded from the sample. The sampling method ensures that the selected participants adequately represent the broader adolescent population and enhance the generalizability of the findings.

Statistical Analysis

The collected data are analyzed using Statistical Package for Social Sciences (SPSS) or equivalent statistical software. Both descriptive and inferential statistical techniques are employed to address the research objectives and test the hypotheses.

Descriptive statistics, including frequency distributions, percentages, means, and standard deviations, are calculated to summarize participant characteristics and study variables. These statistics provide an overview of sleep quality levels, screen exposure patterns, and cognitive performance scores among adolescents.

Pearson's Product-Moment Correlation Coefficient is used to examine the relationships among sleep quality, screen exposure, and cognitive performance. This analysis helps determine the strength and direction of associations between the variables.

Multiple Regression Analysis is conducted to assess the predictive influence of screen exposure and sleep quality on cognitive performance. Regression models help identify the extent to which each independent variable contributes to variations in cognitive functioning.

Mediation Analysis is performed to investigate whether sleep quality serves as a mediating variable between screen exposure and cognitive performance. Statistical significance is evaluated at the 0.05 level. The combination of these statistical procedures enables a comprehensive examination of the relationships among the study variables.

RESULTS AND FINDINGS

The findings of the study reveal significant relationships among sleep quality, screen exposure, and cognitive performance in adolescents. Descriptive analysis indicates that a substantial proportion of participants engage in screen-based activities for more than four hours per day, with smartphones being the most frequently used digital devices. Many adolescents report using electronic devices during evening and nighttime hours, often immediately before bedtime.

Correlation analysis demonstrates a significant negative relationship between screen exposure and sleep quality. Adolescents with higher levels of screen usage tend to experience poorer sleep quality, including delayed sleep onset, reduced sleep duration, and increased sleep disturbances. These findings support previous research indicating that excessive digital device use adversely affects sleep health.

The analysis further reveals a significant positive relationship between sleep quality and cognitive performance. Adolescents who report better sleep quality exhibit higher levels of attention, memory, concentration, and information-processing efficiency. Adequate sleep appears to facilitate optimal cognitive functioning and academic readiness.

A significant negative association is also observed between excessive screen exposure and cognitive performance. Participants with prolonged screen time demonstrate comparatively lower scores on measures of attention, working memory, and executive functioning. The findings suggest that excessive engagement with digital devices may interfere with cognitive development and learning processes.

Regression analysis indicates that both screen exposure and sleep quality are significant predictors of cognitive performance. Sleep quality emerges as a stronger predictor, emphasizing the critical role of

healthy sleep in supporting adolescent cognitive functioning. Mediation analysis further reveals that sleep quality partially mediates the relationship between screen exposure and cognitive performance. This suggests that excessive screen use affects cognitive functioning not only directly but also indirectly through its negative impact on sleep quality.

The findings support all major hypotheses of the study. Adolescents with moderate screen exposure and healthy sleep habits demonstrate superior cognitive performance compared to those experiencing excessive screen use and poor sleep quality. The results highlight the importance of promoting responsible technology use, sleep hygiene education, and healthy lifestyle practices among adolescents to enhance cognitive development, academic achievement, and psychological well-being.

DISCUSSION

The findings of the present study provide significant insights into the complex relationship among sleep quality, screen exposure, and cognitive performance in adolescents. The results indicate that excessive screen exposure is associated with poorer sleep quality, which in turn negatively affects cognitive functioning. These findings are consistent with contemporary psychological and neuroscientific research emphasizing the importance of healthy sleep patterns for optimal cognitive development during adolescence.

The negative relationship between screen exposure and sleep quality can be explained through both biological and behavioral mechanisms. Exposure to blue light emitted by smartphones, tablets, and computers suppresses melatonin secretion, thereby delaying sleep onset and disrupting normal circadian rhythms. Furthermore, engaging in stimulating activities such as social media browsing, online gaming, and video streaming before bedtime increases cognitive and emotional arousal, making it difficult for adolescents to achieve restful sleep. As digital devices become increasingly integrated into daily life, adolescents may unknowingly adopt habits that compromise their sleep health.

The study also demonstrates a positive relationship between sleep quality and cognitive performance. Adolescents who experience adequate and high-quality sleep perform better on measures of attention, memory, concentration, and executive functioning. Sleep facilitates memory consolidation, neural recovery, and information processing, all of which are essential for learning and academic achievement. Poor sleep quality, on the other hand, contributes to cognitive fatigue, reduced alertness, and impaired problem-solving abilities.

The findings further reveal that sleep quality partially mediates the relationship between screen exposure and cognitive performance. This suggests that excessive screen use affects cognition both directly and indirectly through its impact on sleep. Adolescents who spend prolonged periods on digital devices are more likely to experience sleep disturbances, which subsequently reduce cognitive efficiency. This interconnected relationship highlights the need for a holistic approach when addressing adolescent well-being in the digital age.

The results underscore the growing importance of digital wellness and sleep hygiene education. Schools, families, and healthcare professionals must collaborate to promote balanced technology use and healthy sleep practices. Encouraging adolescents to limit screen exposure before bedtime and adopt structured sleep routines may significantly enhance cognitive functioning and overall well-being.

Psychological Implications

The present study has several important psychological implications for adolescent development, education, and mental health. First, the findings emphasize the crucial role of sleep in maintaining healthy cognitive functioning. Sleep is not merely a period of rest but an active psychological process that supports

learning, emotional regulation, memory consolidation, and executive functioning. Poor sleep quality can impair these processes and hinder overall developmental outcomes.

Second, the study highlights the psychological consequences of excessive digital engagement. Prolonged screen exposure may contribute not only to sleep disturbances but also to reduced attention span, increased distractibility, cognitive overload, and emotional stress. These effects can negatively influence academic performance, interpersonal relationships, and psychological well-being.

Third, the findings support the development of school-based interventions focusing on digital literacy and healthy technology habits. Educational programs that teach adolescents about the effects of excessive screen use on sleep and cognition can encourage responsible digital behavior. Such interventions may help students develop self-regulation skills and healthier lifestyle choices.

Fourth, mental health professionals can utilize the findings to identify sleep disturbances and excessive screen use as potential risk factors for cognitive and emotional difficulties. Counseling programs and psychological interventions aimed at improving sleep hygiene may enhance both academic and psychological outcomes among adolescents.

The study contributes to the growing field of cyberpsychology by demonstrating how technological behaviors influence fundamental psychological processes. Understanding these interactions is essential for promoting positive adolescent development in an increasingly digital society.

Limitations of the Study

Despite its contributions, the study has several limitations that should be acknowledged. One limitation is the reliance on self-reported measures of sleep quality and screen exposure. Participants may have overestimated or underestimated their actual behaviors, which could influence the accuracy of the findings.

A second limitation is the cross-sectional nature of the research design. Since data were collected at a single point in time, causal relationships among sleep quality, screen exposure, and cognitive performance cannot be established with complete certainty. Longitudinal studies would provide a more comprehensive understanding of these relationships over time.

Another limitation concerns the sample size and geographical coverage of the study. The participants were selected from a limited number of educational institutions, which may restrict the generalizability of the findings to broader adolescent populations. Cultural, socioeconomic, and educational differences may influence patterns of screen use and sleep behavior.

The study also did not account for all possible variables that may affect cognitive performance, such as physical activity, dietary habits, mental health status, family environment, and academic stress. These factors may interact with sleep quality and screen exposure in complex ways.

Cognitive performance was assessed using selected psychological measures and may not fully capture all dimensions of adolescent cognitive functioning. Future studies employing more comprehensive neuropsychological assessments could provide deeper insights into the effects of sleep and technology use.

SUGGESTIONS FOR FUTURE RESEARCH

Future research should employ longitudinal designs to examine how sleep quality, screen exposure, and cognitive performance influence one another over extended periods of adolescent development. Such studies would help establish causal pathways and identify long-term consequences of excessive digital engagement.

Researchers should also investigate the effectiveness of interventions aimed at reducing screen exposure and improving sleep hygiene among adolescents. Experimental studies evaluating school-based

educational programs, parental guidance strategies, and digital wellness initiatives would provide valuable practical recommendations.

Future studies may expand the sample to include adolescents from diverse cultural, geographical, and socioeconomic backgrounds. Comparative research across different regions and educational settings would enhance the generalizability of findings and identify contextual influences on technology use and sleep behaviors.

Additional research should explore the role of moderating variables such as gender, personality traits, emotional intelligence, academic pressure, physical activity, and mental health. Understanding how these factors interact with sleep and screen exposure may lead to more targeted interventions.

Researchers may also examine the effects of specific forms of screen use, including social media, online gaming, educational applications, and video streaming, on sleep and cognitive functioning. Different types of digital activities may have distinct psychological consequences.

Future investigations should incorporate objective measures such as sleep tracking devices, actigraphy, digital usage logs, and neurocognitive assessments. Combining subjective and objective data would improve measurement accuracy and provide a more comprehensive understanding of adolescent behavior in the digital era.

CONCLUSION

The present study examined the relationship among sleep quality, screen exposure, and cognitive performance in adolescents. The findings indicate that excessive screen exposure is significantly associated with poor sleep quality, while healthy sleep patterns contribute positively to cognitive functioning. Adolescents who spend prolonged periods using digital devices, particularly during evening and nighttime hours, are more likely to experience sleep disturbances, delayed sleep onset, and reduced sleep duration. These sleep-related difficulties negatively affect essential cognitive processes such as attention, memory, concentration, information processing, and executive functioning.

The study further demonstrates that sleep quality serves as an important mediating factor between screen exposure and cognitive performance. Excessive screen use not only affects cognition directly but also indirectly through its adverse impact on sleep health. Adolescents with balanced technology use and better sleep quality exhibit superior cognitive performance and greater academic readiness compared to those with poor sleep habits and excessive digital engagement.

In the context of rapidly advancing technology, the findings highlight the need for increased awareness regarding responsible screen use and healthy sleep practices. Parents, educators, psychologists, and policymakers must work collaboratively to promote digital wellness, sleep hygiene education, and healthy lifestyle behaviors among adolescents. Encouraging regular sleep schedules, reducing screen exposure before bedtime, and fostering self-regulation in technology use can significantly enhance cognitive development and overall psychological well-being.

The study contributes to the growing body of research on adolescent mental health and development by emphasizing the interconnected nature of sleep, technology use, and cognitive functioning. As digital technologies continue to shape modern lifestyles, understanding and addressing their impact on adolescent well-being remains a critical priority for researchers and practitioners alike.

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