

Lack of quality sleep in adolescent children and correspondence with school success and personal satisfaction

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ABSTRACT

The aim of this study was to review the literature on the harmful effects of sleep deprivation in adolescents and its relationship with educational performance and personal well-being. Literature was retrieved from Google Scholar, PubMed, PEDro, and the Cochrane Library. The inclusion criteria comprised studies examining the impact of sleep quality on adolescents' educational outcomes, physical performance, and overall functioning, including systematic reviews, meta-analyses, and randomized controlled trials. Exclusion criteria were studies with sample sizes smaller than 20 participants, studies published more than 10 years ago, or studies with insufficient relevance. Nine studies were included in the final analysis, comprising a total of 28,675 participants. Study durations ranged from 3 weeks to 2 years. The findings indicate that inadequate sleep quality has a significant negative impact on adolescents' lives. **Keywords:** sleep; adolescents; educational performance; life satisfaction.

Pomanjkanje kakovostnega spanja mladih in soodvisnost njihove izobraževalne uspešnosti in zadovoljstva

POVZETEK

Namen prispevka je proučiti literaturo o škodljivih vplivih pomanjkanja spanja pri mladostnikih ter njegovi povezanosti z izobraževalno uspešnostjo in osebnim zadovoljstvom. Literaturo smo pridobili iz podatkovnih baz Google Scholar, PubMed, PEDro in Cochrane Library. Vključitveni kriteriji so zajemali študije o vplivu kakovosti spanja na izobraževalne izide, telesno učinkovitost in splošno funkcioniranje mladostnikov, vključno s sistematičnimi pregledi, metaanalizami ter randomiziranimi kontroliranimi kliničnimi raziskavami. Izključitveni kriteriji so vključevali študije z vzorcem, manjšim od 20 preiskovancev, študije, starejše od 10 let, ter študije, katerih vsebina ni bila v celoti relevantna. V končno analizo je bilo vključenih devet raziskav, ki so skupaj zajemale 28.675 preiskovancev in so trajale od 3 tednov do 2 let. Ugotovitve kažejo, da pomanjkanje kakovostnega spanja pomembno negativno vpliva na življenje mladostnikov. **Ključne besede:** spanje; mladostniki; izobraževalna uspešnost; zadovoljstvo z življenjem.

INTRODUCTION

The lack of quality sleep among adolescents is a global problem that has intensified alongside rapid technological development, increasing academic demands, and growing time pressures. Insufficient sleep adversely affects adolescents' overall health and, consequently, their educational performance (1). Chronic sleep deprivation can lead to significant impairments in daily functioning, as sleep is essential for optimal cognitive, emotional, and physical performance (2). Furthermore, inadequate sleep is associated with increased irritability and a higher risk of developing mental health disorders (3). The prevalence of poor sleep quality among adolescents continues to rise, with excessive use of electronic devices identified as one of the most prominent contributing factors (4).

The magnitude of this problem is illustrated by data from the National Institute of Public Health (NIJZ), indicating that approximately 60% of Slovenian adolescents included in the Health Behaviour in School-Aged Children (HBSC) study fail to achieve the recommended duration and quality of sleep, which negatively affects their ability to meet school-related demands (5).

The etiology of poor sleep quality in adolescence is multifactorial, encompassing biological, psychological, and social determinants (5). During puberty, adolescents experience a shift in circadian rhythm related to delayed melatonin secretion, resulting in later sleep onset and difficulty waking early for school obligations (1). Psychological contributors include prolonged stress and anxiety, which may exacerbate sleep disturbances and increase vulnerability to additional health problems. Social influences involve excessive screen use, reduced face-to-face interaction, and academic pressures (1). Common risk factors for sleep deprivation include irregular sleep schedules, academic overload, use of electronic devices before bedtime, and insufficient physical activity (4).

Several interventions have been identified as effective in improving sleep quality among adolescents. Cognitive-behavioural therapy, frequently applied within physiotherapy practice, includes relaxation techniques, breathing exercises, guided imagery, progressive muscle relaxation, and meditation, all of which have demonstrated beneficial effects on sleep quality (6). Regular physical activity, particularly aerobic exercise, positively influences circadian regulation and promotes improved sleep patterns (2). In addition, adherence to sleep hygiene principles—such as limiting screen exposure at least one hour before bedtime, avoiding stimulants in the evening, and maintaining consistent sleep–wake schedules—plays a crucial role in enhancing sleep quality (2).

The World Health Organization (WHO) recognised sleep deprivation as a global public health concern in 2012, highlighting its widespread prevalence and long-term consequences, particularly among younger populations in low- and middle-income countries (7). Lifestyle changes, urbanization, and increasing reliance on electronic devices were identified as major contributing factors. During the COVID-19 pandemic, sleep disturbances became even more prevalent due to heightened stress levels, uncertainty, and disruptions to daily routines. Evidence indicates that the pandemic significantly increased the incidence of insomnia and further deteriorated sleep quality among adolescents (8).

METHODS

A systematic literature review was conducted using the following databases: Google Scholar, PubMed, PEDro, the Cochrane Library, and the institutional library. The search was restricted to articles published within the last ten years and written in English or Slovene. Older publications were included only when more recent evidence was unavailable.

The search strategy employed the following keywords: *sleep quality, adolescents, academic performance, physical performance, sleep phases, circadian rhythm, sleep and mental health, and immune system*. Inclusion criteria comprised original research studies, systematic reviews, meta-analyses, and randomized controlled trials examining the effects of sleep quality on adolescents' educational outcomes, physical performance, and overall functioning. Studies with sample sizes smaller than 20 participants and sources lacking sufficient relevance to the research objectives were excluded.

RESULTS

The initial search yielded 166 studies, of which 67 were excluded due to insufficient relevance. A total of 99 sources were subsequently reviewed in the preparation of this paper. After applying the inclusion and exclusion criteria and assessing thematic relevance, nine studies were selected for detailed analysis.

Using the keyword *sleep* resulted in over 10,000 records across the selected databases. Combining the terms *sleep* and *adolescents* reduced the number of results to 945. Following screening and eligibility assessment, nine studies met the criteria for inclusion and are summarized in Table 1.

Table 1: Characteristics of included studies.

Title Authors and year of publication	Study objective	Results
Night-time screen-based media device use and adolescents' sleep and health-related quality of life Mireku et al., 2019	The aim of the study was to examine the impact of using electronic devices that emit artificial light in the evening on adolescents' quality of life. Data from the longitudinal SCAMP cohort study in the United Kingdom were used. A total of 6,616 adolescents reported their use of devices before bedtime, both with lights on and in the dark. Sleep quality was assessed through surveys and questionnaires, including the validated KIDSCREEN-10 index for health-related quality of life (HRQoL). Variables such as socioeconomic status, physical activity, and dietary habits were also considered.	71.5% of adolescents used electronic devices before bedtime with the lights on, and 32.2% used them in complete darkness. Using phones and TVs before sleep was associated with shorter sleep duration, later sleep onset, and poorer sleep quality. The negative effects, including insomnia and disrupted circadian rhythms, were particularly pronounced in adolescents who used devices in the dark. Poor sleep quality was also linked to lower health-related quality of life (HRQoL).
Assessment of sleep quality and its impact on the mental well-being of adolescents Anoosha et al., 2025	The aim of the study was to examine the association between sleep quality and mental health in adolescents. We sought to determine how poor sleep quality affects the prevalence of depression, anxiety, and stress among high school students. A cross-sectional study was conducted in which the researchers used the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality and the Depression, Anxiety and Stress Scale – Youth (DASS-Y) to assess symptoms of mental disorders. Data were collected using structured questionnaires, and the analysis was performed using Pearson's correlation, chi-square tests, and regression analysis. A total of 350 adolescents participated in the study.	45.79% of the participants had poor sleep quality (PSQI > 5). These adolescents showed higher levels of anxiety, depression, and stress (DASS-Y). More than 50% of adolescents with poor sleep quality exhibited symptoms of depression, indicating a strong association between inadequate sleep quality and mental health disorders. Night-time screen use, school-related stress, and irregular sleep routines were identified as the main factors contributing to low sleep quality.

Title Authors and year of publication	Study objective	Results
<p>A Comparative Study Assessing Sleep Duration and Associated Factors among Adolescents Studying in Different Types of Schools in an Urban Area of Kerala, India</p> <p>Mathew et al., 2019</p>	<p>The aim of the study was to assess sleep duration and its associated factors among adolescents attending different types of schools in an urban setting. A cross-sectional study was conducted in the Pathanamthitta district of Kerala, India. Stratified random sampling was used, with students from various types of schools completing questionnaires on demographic information, sleep duration, and sleep schedules. A total of 657 high school students participated in the study.</p>	<p>The average sleep duration was 7.2 ± 1.26 hours. These data indicated that 60% of adolescents experienced sleep deprivation. It was found that students in private schools had the shortest sleep duration and the greatest variability in their schedules. Longer commuting time to school, older age, higher parental education, and higher income were associated with shorter sleep duration.</p>
<p>Sleep Disturbance Predicts Depression Symptoms in Early Adolescence: Initial Findings from the Adolescent Brain Cognitive Development Study</p> <p>Goldstone et al., 2020</p>	<p>The aim was to examine the association between sleep disturbances and depressive symptoms in adolescents using data from the national U.S. Adolescent Brain Cognitive Development (ABCD) study. Parents reported on their children's sleep disturbances and mental health. A longitudinal analysis was conducted on a subsample of 11,670 adolescents (aged 9–10 years), which included 4,951 adolescents with one-year follow-up data.</p>	<p>Causes of greater sleep disturbances and shorter total sleep duration were associated with higher levels of depression and behavioral problems. Sleep disturbances predicted the onset of depression over the course of one year. The association was stronger in the female subgroup.</p>
<p>Neuronal Activation and Performance Changes in Working Memory Induced by Chronic Sleep Restriction in Adolescents</p> <p>Alsameen et al., 2021</p>	<p>The aim was to examine the effect of chronic sleep restriction on working memory in adolescents. Functional MRI (fMRI) and the N-back task were used to assess brain activity under different sleep conditions. A total of 36 adolescents (aged 14–17 years) participated, divided into three groups: 5 days of sleep stabilization (~9 hours/night), 5 days of sleep restriction (~6.5 hours/night), and 5 days of recovery with normal sleep.</p>	<p>Chronic sleep restriction leads to compensatory and functional responses in the brain (increased prefrontal cortex activation during easier tasks), but it underlies deficits in working memory and reduced brain activation during more difficult tasks.</p>

Title Authors and year of publication	Study objective	Results
<p>Perception of quantity and quality of sleep and their association with health-related quality of life and life satisfaction during adolescence</p> <p>Matos et al., 2017</p>	<p>The aim was to examine the association between perceived sleep duration and quality and adolescents' health, quality of life, and life satisfaction using data from the Health Behaviour in School-Aged Children (HBSC) study. Adolescents (n = 3,631; 53.1% girls; aged 13–18 years) completed questionnaires on their sleep duration and quality, as well as their health and life satisfaction.</p>	<p>Sleep duration and quality significantly affect perceived quality of life and life satisfaction. Adolescents who sleep less than 8 hours per night report poorer health and lower life satisfaction.</p>
<p>Sleep Patterns and Mental Health Correlates in US Adolescents</p> <p>Zhang et al., 2017</p>	<p>The aim was to examine the associations between sleep patterns and mental disorders in adolescents in the U.S. Data from the National Comorbidity Survey Adolescent Supplement (NCS-A) were analyzed, which included diagnostic interviews and questionnaires on adolescents' sleep habits and mental health (n = 10,123; aged 13–18 years).</p>	<p>Later bedtimes and shorter sleep duration on weekdays were associated with a higher likelihood of depression, anxiety, substance abuse, and suicidal thoughts. A greater difference in sleep schedules between weekdays and weekends had a similar negative effect.</p>
<p>Improvements in Sleep Problems and Their Associations with Mental Health Symptoms</p> <p>Darian Lawrence-Sidebottom et al., 2024</p>	<p>The aim was to examine whether sleep problems in adolescents improve during participation in a digital mental health intervention (DMHI) and whether improvements in mental health coincide with changes in sleep patterns. A retrospective data analysis was conducted on 1,219 children and adolescents (aged 5–17 years) who participated in the digital intervention. The study monitored improvements in sleep problems and their association with reductions in symptoms of anxiety, depression, and ADHD.</p>	<p>77,3% of participants with pronounced sleep problems showed improvement. Better mental health (reduced anxiety, depression, and ADHD symptoms) was associated with improvements in sleep hygiene.</p>

Title Authors and year of publication	Study objective	Results
<p>Associations between sleep duration, insomnia, depression, anxiety and registry-based school grades: A longitudinal study among high-school students</p> <p>Evanger et al., 2024</p>	<p>The aim was to examine the association between sleep duration, insomnia symptoms, depression, anxiety, and academic performance in high school students, using questionnaires on sleep (Munich ChronoType Questionnaire, Bergen Insomnia Scale), depression (Patient Health Questionnaire-9), and anxiety (Generalized Anxiety Disorder-7). Academic grades were obtained from school records. The study included 1,092 Norwegian high school students (65.1% girls, mean age 16.4 years). Follow-up lasted 2 years (2019–2021).</p>	<p>Shorter sleep duration on school days and more severe insomnia symptoms predicted poorer academic performance over the 2-year period, independent of depression and anxiety symptoms. Depression was associated with lower grades, while anxiety had no statistically significant effect.</p>

DISCUSSION

The importance of adequate sleep during adolescence is a global public health issue that has been consistently highlighted by empirical research. Multiple studies confirm that insufficient sleep is strongly associated with adverse physical, psychological, and educational outcomes in adolescents. Mireku et al., (2019) demonstrated that evening use of screen-based electronic devices significantly disrupts sleep duration and quality, with direct negative consequences for adolescents' health-related quality of life. Similarly, Anoosha et al., (2025) showed that poor sleep quality is closely linked to increased symptoms of anxiety, depression, and stress, underscoring the central role of sleep in adolescents' mental well-being. In addition, Varghese et al., (2019) identified multiple social and environmental factors influencing sleep duration among adolescents in urban settings, while Goldstone et al., (2020) provided longitudinal evidence that sleep disturbances predict the development of depressive symptoms during early adolescence. Together, these findings demonstrate that sleep quality is a critical determinant of both mental health and functional outcomes during this developmental period.

Research consistently indicates that sleep quality plays a crucial role in adolescents' educational performance. Evanger et al., (2024) conducted a two-year longitudinal study involving 1,092 Norwegian high-school students and found that shorter sleep duration and more severe insomnia symptoms were significant predictors of poorer academic achievement, independent of co-existing depression and anxiety. Adolescents sleeping fewer than eight hours per night achieved lower average grades, whereas those with longer and more regular sleep schedules demonstrated better academic outcomes. These results highlight that academic performance is not solely determined by cognitive ability or motivation but is also strongly influenced by sleep duration and quality.

Chronic sleep deprivation has also been associated with impairments in executive functioning and emotional regulation. Adolescents who regularly sleep less than six hours per night or exhibit irregular sleep-wake patterns report greater difficulty with complex problem-solving, reduced impulse control, impaired long-term planning, and increased vulnerability to stress. Such deficits directly interfere with school performance and learning capacity, thereby negatively affecting educational attainment and overall well-being. Collectively, the evidence suggests that insufficient sleep substantially limits adolescents' ability to meet academic demands and increases their risk of psychosocial difficulties. Consequently, improving sleep hygiene and limiting electronic device use before bedtime are

consistently recommended as essential strategies for promoting long-term academic success and psychological resilience (6).

Comparable findings were reported by Varghese et al., (2019), who examined sleep patterns among 657 high-school students attending government, subsidized, and private schools in urban India. The authors found that average sleep duration was below recommended levels, with students attending private schools exhibiting the shortest and most irregular sleep schedules. These adolescents often attempted to compensate for weekday sleep deprivation during weekends, resulting in pronounced circadian misalignment. Contributing factors included longer commuting times, higher academic workload, parental educational background, and increased academic pressure. Adolescents with greater variability in sleep schedules reported higher levels of fatigue, poorer concentration, and reduced life satisfaction. These findings emphasize that sleep deprivation is frequently driven by broader social and systemic factors, highlighting the need for institutional interventions such as school schedule adjustments and reduced academic pressure.

The association between sleep deprivation and mental health outcomes is further supported by large-scale longitudinal research. Goldstone et al., (2020) using data from the Adolescent Brain Cognitive Development (ABCD) study, demonstrated that sleep disturbances and shorter sleep duration predicted depressive symptoms within one year. Notably, female adolescents were more susceptible to depression, whereas male adolescents were more likely to exhibit behavioral and attentional problems. Poor sleep quality was also associated with altered brain activity in regions involved in emotional regulation and stress processing, suggesting underlying neurobiological mechanisms linking sleep deprivation to mental health vulnerability.

Experimental studies provide additional insight into the cognitive consequences of insufficient sleep. Alsameen et al., (2021) investigated the effects of chronic sleep restriction on working memory using functional magnetic resonance imaging and cognitive performance tasks. Adolescents subjected to reduced sleep exhibited impaired prefrontal cortex activation, slower reaction times, and increased error rates during complex tasks. These neurocognitive changes compromise decision-making, memory consolidation, and learning efficiency, further reinforcing the detrimental impact of inadequate sleep on academic performance.

The relationship between sleep quality and subjective well-being has also been well documented. Gaspar de Matos et al., (2017) reported that adolescents sleeping fewer than eight hours per night experienced greater fatigue, poorer perceived health, increased stress, and lower life satisfaction. In contrast, those with adequate sleep duration demonstrated better physical health, stronger peer relationships, and higher overall life satisfaction. Excessive screen use and academic pressure were identified as key contributors to insufficient sleep, reinforcing the importance of targeted preventive strategies.

Finally, emerging evidence suggests that interventions targeting mental health may simultaneously improve sleep outcomes. Lawrence-Sidebottom et al., (2024) found that participation in digital mental health interventions was associated with improvements in sleep quality, reduced symptoms of anxiety and depression, and enhanced academic functioning among children and adolescents. These findings indicate that accessible, technology-based interventions may represent a promising approach to addressing sleep problems and associated mental health difficulties in this population.

Overall, the findings reviewed in this study consistently demonstrate that sleep quality is a fundamental determinant of adolescents' mental health, cognitive functioning, academic performance, and overall well-being. Addressing sleep deprivation requires a comprehensive approach involving adolescents, parents, educators, and healthcare professionals. Increased awareness, improved sleep hygiene practices, reduced evening screen exposure, and structural changes within educational systems are essential to promote healthy sleep patterns and support optimal adolescent development.

LITERATURE

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