Systematic Review Article

The Correlation Between Sleep and Academic Performance: A Literature Review

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ABSTRACT

Sleep is a fundamental biological function experienced by everyone. Sleep occurs every night, but it is far more than just a period of rest. Sleep is an important function that supports both physical and mental health. This review examines the effects of sleep on academic performance, and the correlation between sleep and school performance. Specifically, how the quality of sleep, quantity of sleep, and sleepiness during the day affect a student's academic performance. How sleep contributes to in-class performance, and whether lack of sleep or gain in sleep can affect exam scores or grade point average (GPA). At the end, this review discusses whether a change in school start time is necessary, and the benefits and disadvantages of a later school start time on students' sleep. The results show that sleep does have an effect on school performance. Whether it be maintaining focus in class, memory stabilization, or the ability to transcribe information studied into memory, sleep plays an important role in these functions. Most research supports a positive association between sleep and higher GPA, as well as better school performance. These findings underscore the importance of sleep as a foundation for learning and cognitive development during childhood and adolescence. At the same time, important uncertainties remain. Some studies report weak or inconsistent links between sleep duration and standardized test scores, suggesting that academic outcomes may depend on additional factors. Moreover, the relative contributions of sleep duration, sleep quality, and timing are not yet fully disentangled, leaving open questions about which aspects of sleep are most influential for academic success. More work should examine how sleep interventions, such as delayed school start times, or digital media restrictions affect both sleep patterns and academic outcomes. Overall, this body of research highlights sleep as an educational priority. Improving adolescent sleep habits has the potential to enhance academic performance.

Keywords: adolescence; academic performance; educational performance; grade point average; hours of sleep; sleep

INTRODUCTION

Everyone sleeps. From the most primitive of fishes to the roaring tigers in the jungle to us, humans. Some animals sleep with their eyes open to protect from danger, some sleep in different times to avoid predation, so what makes sleep so important? In truth, sleep is not yet comprehensively defined. According to Johns Hopkins Medicine, during the 1900s, sleep was

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Accepted September 29, 2025
https://doi.org/10.70251/HYJR2348.35541548

considered a time when the brain was dormant (1), but as it turns out, quite the opposite is true. Instead, sleep is a period where the brain is active and engaged in a variety of activities. Similarly, the Division of Sleep Medicine at Harvard Medical School defines sleep with its characteristic brainwave patterns and physiological functions (2). Perhaps taking a closer look, sleep has to do with neuronal activity (3), or it could be defined as a reversible and repeatable state of perceptual disengagement from the environment (4). Whatever sleep is, what is important to most is the impact sleep has on people.

Sleep is associated with cognitive development throughout a human's life. In a fetus or preterm infant, sleep is critical to the development of sensory systems. With sleep deprivation, the development of the visual, auditory, somesthetic, olfactory, and limbic system are disordered (5). In young children, an increase in napping is associated with cognitive improvements, such as enhanced memory or higher vocabulary (6). In teenagers, sleep is even more important, as the adolescent must go to school, prepare for university, and still live their life, all while maintaining a healthy amount of sleep. A loss of sleep during this period shows lapse in sustained attention and reaction time, alongside worse performance in school (7). Furthermore, there is evidence of association between sleep and cognitive performances in abstract reasoning and creative processing (4), a very important process for a child in school.

According to the Centers for Disease Control and Prevention (CDC), children of 8 to 10 years should sleep 9 to 12 hours, while children between the ages of 13 to 18 should sleep 8 to 10 hours (8). Despite this, many children fail to get the amount of sleep they need. In the 2015 Youth Risk Behavior survey, students age 13 to 18 reported getting less than 8 hours of sleep. Moreover, a survey conducted by the National Sleep Foundation (NSF), found that 69 % of children experience one or more sleep problems during a week (9). This lack of sleep has a profound effect on children's performance in their studies and academic performance. This paper presents a literature review on the correlation between the duration of students' sleep and their academic performance.

METHODS AND MATERIALS

A lack of sleep has many consequences. In the academic context, insufficient sleep can significantly influence academic outcomes, leading to either improve or diminish performance. In recent years, many problems such as sleep deprivation, sleep disorders, and the consequences of lack of sleep have come to light. As more and more people put more focus on their health, more attention has been directed to the amount and quality of sleep individuals receive.

A systematic search was conducted across academic databases including Google Scholar, PubMed, and the American Psychological Association's PsycInfo, using the keywords: *sleep, academic performance, educational performance, grade point average (GPA), hours of sleep,* and *adolescence*. Inclusion criteria were: 1) studies focusing on sleep and its relationship to academic performance; 2) participants aged between childhood and adolescence; 3) publications in English. We excluded studies primarily examining clinical populations with diagnosed sleep disorders. We considered studies published between 1995 and 2023. A total of 25 studies met the criteria and were included in this review, as summarized in Table 1. All the article resources and references are listed in citations.

This review focuses on three main topics, sleep and its effects on grades, sleep and its effects on grade point average (GPA), and sleep and its effects on in-class performance. Definition of sleep here does not include the influence of sleep disorder on academic performance. Results are mainly associated with studies on students with normal sleeping habits. Any mention of sleep disorders will be explained as its own reason for influence over academic performance, as a separate topic from sleep, sleepiness, sleep quality, and sleep duration. Other topics included in this review are the correlation between the process of sleep and its effects on student performance in school. Distractions and other problems that cause students to lack sleep during school days. Ways to improve sleep for adolescent students, ways to improve sleep for students in general. And current solutions to lack of sleep in students, and whether gaining sleep affects the students' performance in school.

RESULTS

Sleep and Memory

Sleep problems have been linked to low attendance rates, poor concentration and difficulty focusing, and memory capacity (10, 11). Probably the most impacted function that lack of sleep has is memory. Sleep plays a crucial role in memory stabilization, making it difficult

Table 1. Summary of studies examining the correlation between sleep and academic performance

Reference	Grade point average (GPA)	Other academic performance	Additional relevant findings
Johns Hopkins medicine (Ref 1)	-	-	Explains that sleep is an active process important for health
Harvard Faculty of Medicine (Ref 2)	-	-	Defines sleep using brainwave patterns and physiological functions
Kreuger *et al*., 1999 (Ref 3)	-	-	Describes how sleep functions through neuronal activity
Dewald *et al*., 2010 (Ref 4)	-	Cognitive performance in abstract reasoning and creative processing associated with sleep Reported small-to-moderate correlations between sleep quality and school performance	Defines sleep as reversible disengagement from environment
Graven, 2006 (Ref 5)	-	-	Sleep deprivation disrupts body functions
Mason *et al*., 2021 (Ref 6)	-	Increased napping associated with improved memory and vocabulary	-
Sharman *et al*., 2020 (Ref 7)	-	Restricted sleep led to lapses in sustained attention and reaction time with worse performance in school	-
Centers for Disease control and Prevention (Ref 8)	-	-	Recommended sleep duration for different age groups
American Psychological Association (Ref 9)	-	-	Survey showing high percentage of children experience sleep problems
Cousins, 2019 (Ref 12)	-	Demonstrated that one night of total sleep deprivation can reduce contextual memory	-
Mitru *et al*., 2002 (Ref 13)	-	Sleep deprivation associated with poorer task performance and reduced effectiveness in completing complex tasks	-
Alfonsi *et al*., 2020 (Ref 14)	No significant differences in final exam scores between early and late sleepers	Students waking later performed better in school than earlier risers	-
Eliasson *et al*., 2010 (Ref 15)	No correlation found between sleep time and self-reported GPA	-	-
Wolfson and Carskadon, 1998 (Ref 16)	Longer sleep duration and earlier bedtimes linked to higher GPA	-	-

Continued Table 1. Summary of studies examining the correlation between sleep and academic performance

Reference	Grade point average (GPA)	Other academic performance	Additional relevant findings
Link and Ancoli-Israel, 1995 (Ref 17)	Students with higher GPA reported longer and better-quality sleep	-	-
Wolfson and Carskadon, 2003 (Ref 18)	Later weekend bedtimes correlated with poorer grades	-	-
Sivertsen *et al*., 2013 (Ref 20)	-	DSPS is linked with insomnia and strongly associated with school non-attendance	DSPS had a prevalence of ~3.3%, higher among girls than boys
Sivertsen *et al*., 2015 (Ref 21)	Students with DSPS reported lower GPA	-	-
Dexter *et al*., 2003 (Ref 22)	-	Identified link between school start times and student sleepiness	-
Matricciani *et al*., 2011 (Ref 23)	-	-	Documented long-term decrease in sleep duration among youth
Meltzer *et al*., 2021 (Ref 24)	Later school start times associated with better GPA, attendance, and graduation rates	-	-

This table provides an overview of the literature reviewed in this article. It includes the source, the type of academic outcomes measured (GPA, test scores, in-class performance), and the main findings or conclusions of each study.

to retain learned information. Adolescents who obtain fewer than 6 hours of sleep per night report significantly greater difficulties with concentration and retention of learned material than those sleeping 8–9 hours (10). Controlled laboratory studies demonstrate that three to four consecutive nights of restricted sleep can reduce memory capacity by up to 30% compared to rested controls (12) The Academy of Sleep and Medicine recommends 8 to 10 hours of sleep for children between the age of 13 to 18, and there is evidence to show that children and adolescents require an average sleep time of 9 hours/night. One reason proposed of why sleep is so important for education is that sleep is related to overnight brain processes that influence cognitive, physical, and emotional performances (4).

Sleep and School Performance

When it comes to adolescents, evidence shows that physiological delayed sleep phase syndrome plays a large role in adolescent life. Where a teenager is more likely to stay awake in bed waiting for sleepiness. This is because the oscillation period of the intrinsic circadian rhythm lengthens during puberty, meaning an adolescent is more likely to want to go to bed later. Late bedtimes lead to less sleep, which leads to poorer school performance due to lack of sleep during school days which start early. Sleepiness on school days are common, and the average sleep time for students was 6.7 hours. In a survey of one thousand high school and two hundred middle school students, 80% thought they were not receiving enough sleep.

There is evidence indicating that lack of sleep is correlated with worse in-school performance. A survey conducted by The National Sleep Foundation shows that 15% of children admitted to falling asleep in school. There are many causes for this sleepiness in school resulting from insufficient sleep. These include academic expectations such as completing homework, lack of parental control on a student's bedtime, and distractions such as using the internet. These factors all lead to worse performance in school as, when students sleepy, they present fatigue and sleepiness. The consequences are memory loss, mental lapse in class, and less participation. Completing complex tasks

also become a problem. Mitru *et al*. demonstrated that adolescents restricted to 5 hours of nightly sleep for one school week showed progressive declines in sustained attention and dual-task performance (13). Similarly, Sharman *et al*. found that adolescents experiencing chronic sleep restriction had slower reaction times and more lapses of attention, impairing classroom engagement (7). These results highlight that sleep loss degrades in-class functioning and learning processes.

There is evidence to support that sleep does correlate to academic performance, but not in terms of testing. As sleep has correlations to processing information and turning them into long-term memories, a lack of sleep would impair an adolescents mind, making them unable to retain learned information. This directly impacts a students ability in class as not only does the student rely on memory for classwork and exams, but also for remembering schedules and homework. Despite this, another study shows that when students with a lessened amount of sleep hours takes a test, there is no correlation between sleep and quiz score. Even though the student may show signs of lapses of attention, quiz scores do not seem to be affected by the amount of sleep a student receives (7). Alfonsi *et al*. studying 2,100 Italian adolescents, found no significant differences in final exam scores between early and late sleepers, although students who woke later performed better in coursework and class participation (14). This suggests that while acute testing outcomes may not always reflect sleep deficits, the cumulative impact of sleep loss is evident in everyday academic functioning.

Sleep and Grade Point Average (GPA)

Eliasson *et al*., in a college student cohort, found no significant association between sleep duration and self-reported GPA, suggesting that other factors, such as study habits, motivation, or environment, may mediate the relationship (15). Nevertheless, studies that directly measure GPA reveal clearer associations. Wolfson & Carskadon, in a survey of 3,000 U.S. high school students, found that those obtaining ≥8 hours of sleep had significantly higher GPAs (mean 3.2) than those with <6 hours of sleep (mean 2.7), representing a moderate effect size (16). Similarly, a survey study of 150 high school students by Link & Ancoli-Israel found that later weekend bedtimes and shorter weekday sleep were associated with poorer self-reported grades, even after controlling for socioeconomic variables (17).Moreover, students with better grades reported less sleepiness than students with lower grades as well. Nevertheless, the primary factor in the correlation between sleep and GPA appears to be the time at which students wake up. Students with a higher GPA wake up later than students with a lower GPA (17). Finally, a study comparing school start time for 12th grade students showed that all students with later weekend bedtimes had poorer grades (18). Collectively, These findings suggest that both sleep duration and timing influence GPA, though variations in methodology and sample size may explain some of the inconsistent results.

Sleep Disorders and Academic Performance

In terms of sleep disorders, there is one noteworthy disorder that contributes to sleep and academic performance, that is Delayed Sleep Phase Syndrome (DSPS) (19). DSPS is a sleep disorder that affects the internal clock which is the circadian rhythm, making it so that the person cannot fall asleep, causing sleep to be delayed. DSPS is more common in adolescents and teenagers due to their change in circadian rhythm during puberty. Delayed time of sleep can contribute to lower hours of sleep, which leads to sleepiness during the day and during school. Problems such as tardiness and worsened GPA could arise from DSPS. Sivertsen *et al*. examined 10,220 adolescents (16–18 years old) in Norway who provided self-reported data on a range of sleep parameters. They found that DSPS had a prevalence of ~3.3%, higher among girls (3.7%) than boys. Over half of adolescents who met DSPS criteria also met criteria for insomnia. DSPS was strongly associated with school non-attendance: after adjusting for sociodemographic variables, insomnia, and depression. Boys with DSPS had over three times the odds of missing school days, and girls had nearly twice the odds. The findings suggest that DSPS is not uncommon in late adolescence and is meaningfully linked with insomnia and school attendance problems (20). In another large population-based Norwegian study of 8,347 adolescents (ages 16-19), those with DSPS were nearly three times more likely to have GPAs in the lowest quartile compared to those without DSPS (OR ≈ 2.95), after controlling for age and gender. Adjusting for school non-attendance reduces this association, indicating that absence may mediate part of the effect (21). These studies highlighting the need for clinical awareness and intervention of this syndrome.

Sleep Quality and School Outcomes

The last study approached shows the correlation between school performance and sleep duration, sleep

quality, and sleepiness. All three are correlated with better school performance, where longer sleep duration, better sleep quality, and low levels of sleepiness show better academic performance. However, this correlation is very small, and all three results have little effect on the performance of the student. In addition, the results show that there is little correlation between sleep duration and school performance. However, the quality of sleep affects academic performance more than sleep duration, and sleepiness affects academic performance the most. In a meta-analysis of 16 studies including over 35,000 participants, Dewald *et al*. reported small-to-moderate correlations between sleep quality and school performance ($r = 0.20$) and between daytime sleepiness and academic outcomes ($r = –0.27$), whereas the association with sleep duration was weaker ($r = 0.07$). Moreover, children of younger ages have a higher correlation between sleep duration, sleep quality, and sleepiness to school performance than adolescents. This can be attributed to the adolescents' reduced sensitivity to sleep deprivation and prolonged wakefulness (4). These findings indicate that not only the quantity but also the quality and timing of sleep are critical for optimal academic outcomes.

DISCUSSION

This review highlights the complex relationship between sleep and academic performance, revealing both consistent trends and areas of disagreement. Overall, these results suggests that sleep, or rather lack of sleep, has an effect on academic performance, though the strength of these associations varies depending on methodology and population studied.

Studies consistently show that inadequate sleep impairs memory, attention, and classroom performance (6, 7, 13). However, there is conflicting evidence supporting the idea that sleep has an effect on GPA. While Wolfson & Carskadon (16) and Link & Ancoli-Israel (17) observed positive associations, Eliasson *et al*. (15) reported no correlation. These discrepancies may reflect differences in study design, sample size, and reliance on self-reported GPA. Nevertheless, the majority of studies support the conclusion that sleep does have an effect on GPA, and students with longer sleep durations, higher sleep quality, and little to no sleepiness during school produce better results. With this in mind, there are many ways to tailor education to benefit the students through sleep. A simple example of this is changing the school start time to start later in the day. Studies show that students gain less sleep with early school start times (22). By making school start later, students are more likely to gain more hours of sleep, and therefore perform better and get better grades. This is especially effective for adolescent students who stay up longer and sleep later. Despite evidence supporting this approach, it has not been widely implemented in educational settings.

A study on sleep data from around 690,000 children and adolescents found that sleep duration has consistently decreased over the past century (23). So rather than giving students more time to sleep, students have been getting less sleep all along. A problem found in delaying school start time is the concern that students may end up going to sleep later if they start later in the day. However, this is not true. Studies have shown that later school times do not make students sleep later. Moreover, later school times have been associated with better GPA, increased attendance, and even increased graduation rates (24). Furthermore, a study between two groups of students who wake up at different times show that the group of students that woke up later performed better in school than the group of students that woke up earlier (14).

Perhaps another issue for increasing school start time is a concern for the younger students. Children below the age of 13, or primary school children, tend to fall asleep earlier and have earlier bedtimes. There are split viewings on this case, as some studies show that later school start time does not affect younger students (25), however other studies show that students may benefit from earlier school start times. Despite this, the one thing in common is that changing school start time does change the amount of time a student sleeps. Whether it's a small increase or a large one. With this in mind, it seems that changing school start time to be later may be more beneficial after all.

CONCLUSION

This review demonstrates that sleep plays a central role in supporting students' academic performance. Sleep does have an effect on school performance. Whether it be maintaining focus in class, memory stabilization, or the ability to transcribe information studied into memory, sleep plays an important role in these functions. Most research supports a positive association between sleep and higher GPA, as well as better school performance. These findings underscore the importance of sleep as a foundation for learning

and cognitive development during childhood and adolescence. At the same time, important uncertainties remain. Some studies report weak or inconsistent links between sleep duration and standardized test scores, suggesting that academic outcomes may depend on additional factors. Moreover, the relative contributions of sleep duration, sleep quality, and timing are not yet fully clear, leaving open questions about which aspects of sleep are most influential for academic success. More work should examine how sleep interventions, such as delayed school start times, or digital media restrictions affect both sleep patterns and academic outcomes. Overall, this body of research highlights sleep as an educational priority. Improving adolescent sleep habits has the potential to enhance academic performance.

CONFLICT OF INTERESTS

The author declares that there are no conflict of interests related to this work

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