Association of Sleep and Academic Performance

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ABSTRACT

Poor school performance by adolescent students has been attributed in part to insufficient sleep. It is recognized that a number of factors lead to diminished total sleep time and chief among these are early school start times and sleep phase delay in adolescence. Political initiatives are gaining momentum across the United States to require later school start times with the intent of increasing total sleep time and consequently improving school performance. Later school start times come with significant costs and impact other activities of families and communities. The decision to implement later school start times cannot be made lightly and deserves support of well-performed research on the impact of these changes. A study evaluating the association of academic performance and total sleep time was performed in middle school and high school students in a suburban Maryland school system. Preliminary results of this study show no correlation of total sleep time with academic performance. Before mandating costly changes in school schedules, it would be useful to perform further research to determine the effects of increasing sleep time on the behaviors of adolescent students.

KEYWORDS: School performance, sleep phase delay, adolescence, total sleep time

OBJECTIVES

Parents commonly experience a change in their children's sleeping habits as these youngsters enter adolescence.[1–5] Habitual early risers in childhood develop new schedules of staying up late and then sleeping in, especially on weekends.[6–8] The genesis of this phase-delay often seen in the teenage years is probably multifactorial and includes such causes as homework requirements, jobs, energizing effects of after-school sports, social pressures, availability of television and the Internet, drug use, and de-

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creases in parental constraints.[9–14] There is a substantial body of evidence that physiological delayed sleep phase syndrome (DSPS) also plays an important role in adolescence.[7,15–18] Simply asking teenagers to go to bed earlier may result in prolonged sleep latencies with more wake time spent in bed awaiting sleepiness. Consequences of insufficient sleep are excessive daytime somnolence, depressive mood, and impaired daytime performance, for teenagers usually poor school performance.[19–21]

At first glance, a solution to this DSPS would appear to be straightforward. Start high schools later, allowing teenagers to follow their natural circadian rhythms and sleep in later on weekdays.[19] Many school systems are doing exactly that. Numerous examples may be found across the United States.[22] Some state legislatures are considering laws to mandate this schedule change[23] and the U.S. Congress is debating a bill (called Zzz's to A's as introduced by U.S. Representative Zoe Lofgren, D-California) to encourage school districts to set later start times.[24]

However, this proposed solution is not as simple or free of controversy as it may at first appear.[22] Changes in bus schedules have an enormous ripple effect on other scheduled activities. Many high school students participate in after-school activities such as clubs, sports, or drama productions. It is already a struggle for some outdoor sports to hold practice during daylight in late fall to early spring. A later school start time would be a burden to these activities. Many adolescents are needed in after-school jobs and their loss or delayed availability to the labor pool would hurt businesses and family finances. County school budgets would be further strained by a later scheduled start time because that would necessitate increasing the school bus fleet and hiring more bus drivers.

It is apparent that before implementing costly and possibly inconvenient changes in school schedules, solid justification is needed. It would be useful to have evidence linking school start times with academic performance, objective measures of sleepiness, and psychosocial metrics such as mood or depression scores. The need for this type of information was the stimulus for research with an open trial using a simple questionnaire at public schools in suburban Maryland near Washington, D.C. It was the intent of the investigators to use their findings to influence county school administrators in their considerations of high school start times and to support future research programs.

METHODS

Investigators developed a one-page questionnaire to gather information on students' academic performance, sleep time, and subjective feelings of sleepiness. A trial field test allowed for editing of the questionnaire for clarity and brevity with the result that students could comfortably complete the survey in 3 to 5 minutes. The investigation was approved by the IRB of the county high school. Science teachers were asked to administer the questionnaire during classes of 9th through 12th graders and 50% agreed to do so. The same questionnaire was administered to a convenience sample of 200 seventh graders for comparison. Preliminary data analysis forms the basis of this report.

FINDINGS

One thousand high school students (50% of the high school student body) and 200 middle school students completed the questionnaire. Sleepiness on school days was a common complaint with 90% of students feeling groggy (40% very groggy) on waking up for school. Average sleep times for all students was 6.7 hours per night on weekdays, with total sleep time on weekdays increasing to 7.7 hours when naps were included. Students believed that 8.43 hours was the amount of sleep recommended by physicians but few students attained that amount of sleep. Eighty percent of students

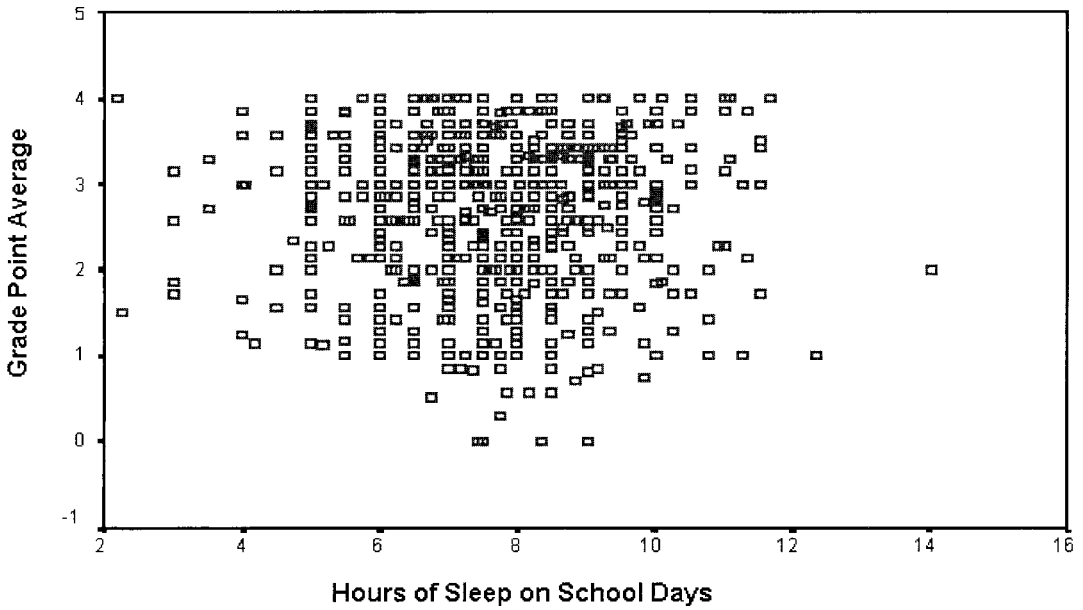

Figure 1 Grade point average plotted against hours of sleep on school days.

believed they were not getting adequate sleep. The main finding of the survey was that there was no correlation between sleep time and academic performance measured by students' self-reported grade point average (GPA)(Fig. 1). This finding was consistent from 7th through 12th grades.

The strongest predictor of GPA was homework time. The next strongest predictor was gender with females showing a mean GPA of 2.92 and males a mean GPA of 2.53. Participation in extracurricular activities did not appear to be associated with GPA.

COMMENTS

As school officials ponder the pros and cons of later start times in high schools of Maryland, they will not have the support of data linking sleep time with academic performance. Further study is needed to determine the potential impact of schedule changes on student sleepiness and moods. Perhaps similar studies could be performed at schools that have adopted later start times with the goal of performing a before-and-after analysis.

The findings of the current study differ from those of Wolfson and Carskadon who studied over 3,100 public high school students in Rhode Island.[20] Students struggling or failing school reported 25 minutes less sleep per night on average on weekdays than A and B students. Differences in the studies from Rhode Island and Maryland would be intriguing to examine. Perhaps ambient sunlight or sunrise/sunset times at different latitudes impact the effects of school start times. Would a study in Miami or San Diego clarify these issues?

Clearly many factors influence the academic performance, moods, and sleepiness of high school students. Before embarking on plans to implement later school start times, it would be useful to determine the impact of such changes on the targeted elements to be improved. It is possible that the cost of later school start times would be more wisely invested in after-school tutor/mentor programs,

homework clubs, or teacher improvement efforts. Certainly these topics warrant further research.

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