

RESEARCH BRIEF: SCHOOL START TIMES AND ADOLESCENT STUDENTS

INTRODUCTION

During puberty, biological circadian changes occur, causing teens to develop a preference for staying up and sleeping in later.¹ According to the National Sleep Foundation, widespread chronic sleep deprivation among adolescents is “largely driven by a conflict between teens’ internal biological clocks and the schedules and demands of society.”² While the American Academy of Sleep Medicine recommends that adolescents sleep from eight to 10 hours per night, national surveys indicate that *68 percent of teens receive seven or fewer hours of sleep per school night.*³

In 2014 the American Academy of Pediatrics (AAP) endorsed a school start time of 8:30 a.m. or later for adolescents in order to improve students’ health, safety, and academic outcomes.⁴ In the years following this policy statement, professional associations including the National Association of School Nurses (NASN) and the American Medical Association (AMA) similarly endorsed delayed school start times for adolescents.⁵ In contrast, however, the Centers for Disease Control and Prevention (CDC) reported that, in 2013-14, 93 percent of high schools started before 8:30 a.m. and, in 2011-12, the national average start time for public schools serving adolescents was 8:03 a.m. The CDC supports the AAP recommendation for later school start times, reiterating that the widespread lack of sleep among adolescent students is a “substantial public health concern.”⁶

 **7:59 A.M.**
Average national high school start time (2011-2012)


 **8:04 A.M.**
Average national middle school start time (2011-2012)

 **8:30 A.M. OR LATER**
Recommended start time for adolescent students

OVERVIEW OF RESEARCH FINDINGS

The following subsections briefly summarize existing research literature on the impact of school start times on adolescent students. When examining the findings, it is important to consider that the methodologies typically used in such studies complicate efforts to demonstrate causality. Most studies are correlational in nature and, thus, are unable to provide empirical proof that changes in start times lead to differences in student outcomes.⁷ Likewise, some studies on school start times examine a single school or community, making it difficult to generalize the results.⁸

ACADEMIC OUTCOMES

 Research on the relationship between school start times and student achievement is inconclusive, with different studies indicating positive, mixed, or no statistically-significant effects.

- **Edwards (2012)** determined that starting school one hour later was associated with an increase in standardized test scores equal to 1.8 percentile points in mathematics and 1.0 percentile point in reading. The benefits of later start times were more pronounced among low-performing students, as the effects were twice as large for students who scored in the bottom third than for those who scored in the top third of test takers.⁹
- **McKeever and Clark (2017)** examined the effects of a delayed high school start time on over 30,000 students across eight districts in seven different states. Pre-delay times ranged from 7:30 to 8:30 a.m. and post-delay times from 8:35 to 9:15 a.m. The authors found that a significant increase in the graduation rate (equal to a nine-percentage point increase, on average) corresponded with the delayed start times.¹⁰
- **Wahlstrom et al. (2014)** observed the impact of later start times on 9,000 high school students across five districts and found mostly positive but some inconsistent effects on academic performance. Grade point averages in core

courses increased following the start time delay in most schools included in the analysis, though three high schools experienced both increases and decreases in student grades.¹¹

- **Hinrichs (2011)** observed the relationship between high school start times and student achievement across three states and ultimately concluded that school start times did not have a statistically significant effect on ACT scores or performance on state standardized tests.¹²

ATTENTIVENESS, MOOD, AND BEHAVIOR



The literature indicates that delayed start times have positive impacts on students' attentiveness, concentration, mood, and behavior due to the increased amount of sleep that students receive.

- **Wheaton, Chapman, and Croft (2016)** conducted a research review on the effects of school start time which included 38 U.S.- and foreign-based studies published since 1998. The authors noted that four of these studies linked delayed start times to reduced symptoms of depression. They also note that "sleep is strongly linked with many psychiatric disorders, including depression and anxiety" and that there is "evidence of a causal relationship between insufficient sleep and depression as, well as mood in general."¹³
- **Boergers, Gable, and Owens (2014)** examined changes in student moods following a 25-minute delay in start times and found that inadequate sleep was associated with greater levels of depression, sleepiness, and caffeine consumption. After the delay in start times, outcomes in each of these areas improved as more students reported longer durations of sleep.¹⁴
- **Owens, Belon, and Moss (2010)** observed lower rates of self-reported depression, decreased Health Center visits for fatigue-related complaints, and increased self-reported motivation to participate in activities following a 30-minute delay in start time at an independent boarding and day high school.¹⁵
- **Arlington Public Schools (2005)** measured self-reported perceptions of various conditions that support academic achievement among middle school and high school students before and after

the district's bell schedule changes. While high school students' perceptions of class preparedness, school readiness, and alertness did not change substantially following the start time delay, class participation rates increased. In contrast, self-reported rates of school readiness, class preparedness, alertness, and participation all decreased among middle school students after the start time was moved from 8:10 a.m. to 7:50 a.m.

STUDENT SLEEP



With respect to sleep, much of the literature suggests that later school start times result in more sleep for adolescent students.

- **Boergers, Gable, and Owens (2014)** evaluated the sleep-wake behaviors of high school students following a 25-minute delay in school start time from 8:00 a.m. to 8:25 a.m., and found that while students' bedtimes remained largely unchanged, sleep duration increased by an average of 29 minutes as a result of later wake times. In addition, the percentage of students receiving eight or more hours of sleep each night increased from 18 to 44 percent after implementing the delay.¹⁶
- **Owens, Belon, and Moss (2010)** observed the impact of a 30-minute high school start time delay, from 8:00 a.m. to 8:30 a.m., and found that the average amount of reported sleep on school nights increased by 45 minutes. In addition to later wake times, bedtimes averaged 18 minutes earlier after implementing the delay, and the percentage of students who achieved at least eight hours of sleep per night increased from 16.4 percent to 54.7 percent.¹⁷
- **Danner and Phillips (2008)** consider the effects of a district-wide delay in middle and high school start times from, respectively, 8:00 a.m. and 7:30 a.m. to 9:00 a.m. and 8:30 a.m. Pre- and post-delay survey responses from approximately 10,000 secondary students indicate that high school students slept from 12 to 30 minutes longer per school night in the preceding year. The percentage of students sleeping at least 8 hours on a weeknight also increased from 35.7 to 50 percent.¹⁸

ATTENDANCE AND TARDINESS



While studies have found that later school start times may reduce tardiness, findings are somewhat mixed with respect to attendance.

- **McKeever and Clark (2017)** examined the effects of a delayed high school start time of 8:30 a.m. or later on over 30,000 students across eight districts in seven different states and found that a delay in start time corresponded with a significant increase in attendance rates equal to four percentage points, on average, across schools.¹⁹
- **Wahlstrom et al. (2014)** examined high school attendance rates and tardiness following school start time changes. While attendance rates improved during the year in which the start time change was implemented, attendance rates decreased among the same students in the following year. Meanwhile, the majority of schools experienced a decrease in tardiness, with the schools with the greatest start time delays having the largest declines in student tardiness.²⁰
- **Wolfson et al. (2007)** found that a later school start time had no impact on attendance among middle school adolescents, but concluded that tardiness was almost four times more likely in early-starting schools than in late-starting schools.²¹
- **Hinrichs (2011)** concluded that school start times have no effect on overall student attendance at the high school level.²²

AUTOMOBILE ACCIDENTS



The majority of studies find that communities with later high school start times have lower crash rates among teenage drivers.

- **Danner and Phillips (2008)** examined motor vehicle crashes among 17- and 18-year-olds before and after a start time change in a Kentucky school district. The number of car crashes per 1,000 drivers in the age range decreased by 16.5 percent in the two years following the start time change, despite rapid population growth in the area.²³
- **Vorona et al. (2011)** compared the teen crash rates of two cities in Virginia with different high school start times and concluded that crash rates among drivers between the ages of 16 and 18 were significantly higher in the city with the earlier start time.²⁴
- **Wahlstrom et al. (2014)** studied automobile crash data for 16- to 18-year-old drivers in Minnesota and Wyoming. While crash rates dropped by 65 to 70 percent in two communities, a third district experienced only a slight decrease and a fourth saw a modest increase in car crashes. There are a number of possible contributing factors that should be considered in interpreting these results, including geographic characteristics, driving distance, and length of start time delay.²⁵

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² "Backgrounder: Later School Start Times." The National Sleep Foundation. <https://sleepfoundation.org/sleep-news/backgrounder-later-school-start-times>

³[1] Paruthi, S. et al. "Recommended Amount of Sleep for Pediatric Populations: A Consensus Statement of the American Academy of Sleep Medicine." *Journal of Clinical Sleep Medicine*, 12:6, 2016. p. 785. <http://www.aasmnet.org/Resources/pdf/Pediatricsleepdurationconsensus.pdf>

[2] Wheaton, A. et al. "Sleep Duration and Injury-Related Risk Behaviors Among High School Students — United States, 2007–2013." *Morbidity and Mortality Weekly Report*, 65:13, April 2016. p. 339. <https://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6513a1.pdf>

⁴ "School Start Times for Adolescents." American Academy of Pediatrics, 2014. <http://pediatrics.aappublications.org/content/pediatrics/early/2014/08/19/peds.2014-1697.full.pdf>

⁵ [1] "SPN Position Statement: Early School Start Times Consensus Statement." Society of Pediatric Nurses and National Association of School Nurses, 2016. <http://www.pedsnurses.org/d/do/923>

[2] "AMA Supports Delayed School Start Times to Improve Adolescent Wellness." American Medical Association, 2016. <https://www.ama-assn.org/ama-supports-delayed-school-start-times-improve-adolescent-wellness>

⁶ [1] "Results from the School Health Policies and Practices Study 2014." Centers for Disease Control and Prevention, 2015. https://www.cdc.gov/healthyyouth/data/shpps/pdf/shpps-508-final_101315.pdf

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⁷ Carrell, S., T. Maghakian, and J. West. "A's from Zzzz's? The Causal Effect of School Start Time on the Academic Achievement of Adolescents." University of California at Davis, October 5, 2010. p. 63. <http://www.econ.ucdavis.edu/faculty/scarrell/sleep.pdf>

⁸ Keller, P. et al. "Earlier School Start Times as a Risk Factor for Poor School Performance: An Examination of Public Elementary Schools in the

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<http://www.apa.org/pubs/journals/releases/edu-a0037195.pdf>
- ⁹ Edwards, F. "Early to rise? The effect of daily start times on academic performance." *Economics of Education Review*, 31, 2012. P. 977. <http://www.sciencedirect.com/science/article/pii/S0272775712000830>
- ¹⁰ McKeever and Clark. "Delayed high school start times later than 8:30 AM and impact on graduation rates and attendance rates." *Sleep Health*, 3, 2017. Pp. 120-123. <http://www.sciencedirect.com/science/article/pii/S2352721817300025>
- ¹¹ Wahlstrom, K. et al. "Examining the Impact of Later School Start Times on the Health and Academic Performance of High School Students: A Multi-Site Study." Center for Applied Research and Educational Improvement, 2014. pp. 40-41.
https://www.spps.org/cms/lib/MN01910242/Centricity/Domain/7352/final_version_3-11-14_start_time_report.pdf
- ¹² Hinrichs, P. "When the Bell Tolls: The Effects of School Starting Times on Academic Achievement." *Education Finance and Policy*, 6:4, Fall 2011. Pp. 492-501. <https://teensneedsleep.files.wordpress.com/2011/03/hinrichs-when-the-bell-tolls-the-effects-of-school-starting-times-on-academic-achievement.pdf>
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