

Teens, Sleep, and Later High School Start Times— Research Findings

Kyla L. Wahlstrom, PhD

College of Education and Human Development
University of Minnesota



UNIVERSITY OF MINNESOTA
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Research Literature Overview

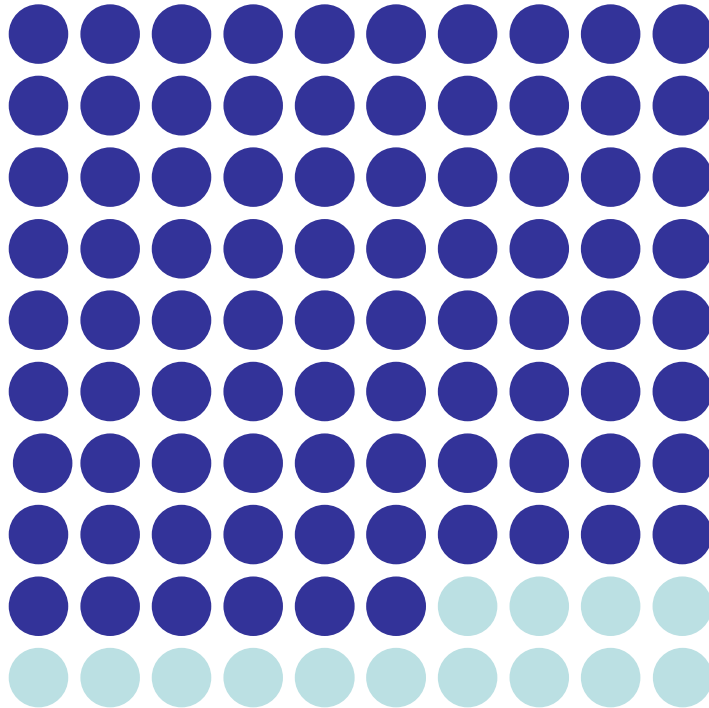
- Outcomes for insufficient sleep in teens include:
 - Increased stress; more likely to be overweight; greater use of sleeping pills, cigarettes, and alcohol (Noland et al., 2009).
 - Decreased motivation & emotional regulation (Dahl, 1999)
 - Decreased school performance; attention/performance problems (Fredriksen et al., 2004; Dewald et al., 2010).

Research Literature (cont'd)

- A computer in the bedroom is related to later bedtimes, later wake-up times, and shortened sleep duration (Shochat et al., 2010).
- More than 50% of teens who text or surf the internet at bedtime are more likely to have problems falling asleep, plus mood, behavior and cognitive problems during the day (Polos et al., 2010).
- High daytime caffeine users experienced more interrupted sleep (Pollak & Bright, 2003).

Research Literature (cont'd)

- Average crash rate for teenage drivers dropped 16.5% in one county in the two years after the school start time was changed to about one hour later for those area high schools, while crash rates throughout the rest of the state *increased by 8.9%* during the same time period. (Danner & Phillips, 2008).
- 18.5 hours of wakefulness produces changes equivalent to 0.05% blood alcohol concentration
- 21 hours of wakefulness produces changes equivalent to 0.08% blood alcohol concentration (Arnedt, 2001).



86%

Of all US high schools start before 8:30am*

*The start time recommended by the American Academy of Pediatrics

A Clash of Strong Forces

Biological
Demand of
Teen Brain
(to be asleep
from 10:45pm
-8:00am)

High
Schools
Historically
Start First

Earliest Research Completed in 1996-2001 by Univ. of MN*

- Edina, MN school district in 1996 was first in U.S. to shift to a later start, based on medical research about sleep phase shift in teens:

7:20 → 8:30

- Minneapolis School District in 1997 also shifted start time, based on findings in Edina:

7:15 → 8:40

*Wahlstrom et al., 1997

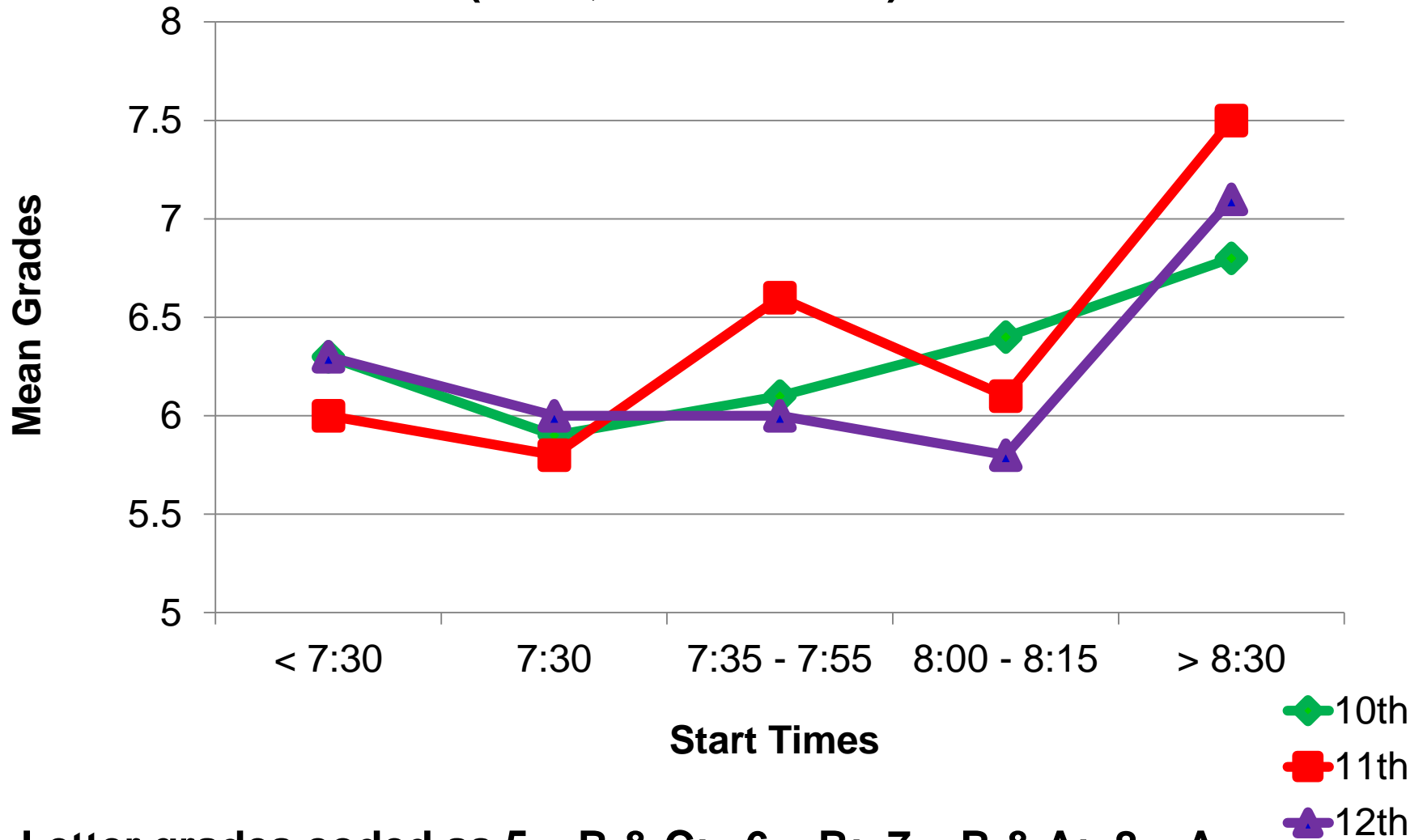
Initial Findings in Edina

- Students reported statistically significant less depression.
- Principal noted fewer discipline referrals, a more calm cafeteria, and quieter passing times in the halls.
- Nurses and counselors had fewer students self-referring for peer problems and physical complaints.
- Coaches reported students remembering plays better with later start time.

Initial Findings in Minneapolis

- Significant increase in attendance rates for grades 9-11.
- Graduation rates significantly improved over the three years.
- Minneapolis elementary teachers reported the earlier start benefitted their students, who now were “ready for learning”, especially those whose day care began at 6:30 or 7 AM.

Mean Grades Earned X Start Times (n = 7,168 students)



Letter grades coded as 5 = B & C; 6 = B; 7 = B & A; 8 = A

Most Recent Research Study (2009-2013) funded by CDC

- Five school districts
- Eight high schools:
 - 5 schools in three Minnesota districts
 - 2 schools in Colorado district
 - 1 high school in Wyoming district
- Grades 9-12 (N = 9,395 students)
- Start times ranged from 8:00 AM to 8:55 AM

Data Collection Methods

- Written student surveys
- Analysis of achievement and attendance data
- Analysis of car crash data
- Interviews with decision-makers

Attendance & Tardiness

- Significant positive increases in attendance rates were noted for 11th & 12th graders. (Note: 9th & 10th graders have compulsory attendance.)
- Statistically significant decreases in ‘tardiness to class’ were obtained for all grades 9 - 12 in the school districts that had instituted the latest school start times (8:35 and 8:55 AM).

GPA Outcomes

- Statistically significant increases in 1st period GPA in one or more core courses of English, math, social studies, and science in three districts with start times from 8:00-8:35 AM.
- Significant increases in GPA in all 1st period core courses for all semesters in all grades in Jackson Hole HS with start time of 8:55 AM.

Standardized Test Performance: Late Start Pre-Post Comparisons

- A statistically significant positive increase occurred for one district for math scores on state achievement tests.
- All districts provided ACT scores and one of the districts' had a statistically significant increase.

Secondary Teachers' Opinion of Optimal Start Time for First Class Period for Most Students

<7:30	382	12.8%	
7:45	162	5.5	
8:00	1062	35.2	68.5
8:15	294	9.8	
8:30	707	23.5	35.7
8:45>	371	12.2	
No Opinion	<u>36</u>	<u>1.0</u>	
TOTAL	3,014	100.0%	

Summary of Academic Outcomes with Later Start*

Significantly...

- Improved grades
- Reduced tardiness
- Reduced absenteeism
- Improved graduation rates in schools where that is an issue

*Wahlstrom et al., 2014

Sleep and Health

Links between insufficient sleep and health-risk behaviors:

CDC Youth Risk Behavior Survey, 2007

N= 12,154 students in grades 9-12 across all states

<8 hrs vs. > 8 hrs

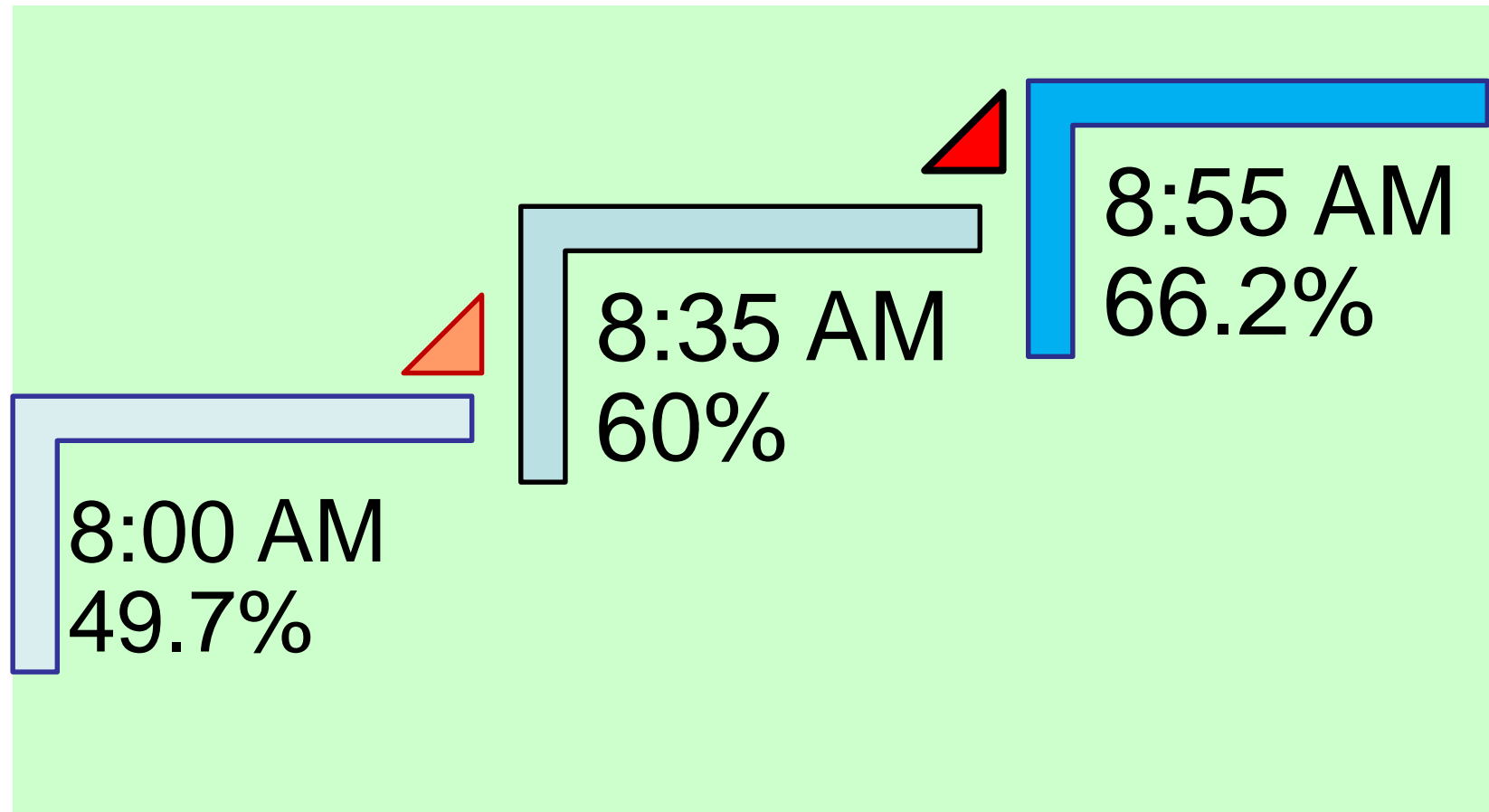
- Used 1+ cigarettes daily 24% / 15%
- Used alcohol in past 30 days 50.3% / 36.7
- Used marijuana in past 30 days 23.3% / 15.6
- Currently sexually active 39.1% / 27.8
- Felt sad or hopeless (felt daily in past 2 wks & stopped usual activities) 31.1% / 21.6

McKnight-Eily, L.R. et al., *Preventive Medicine*, 2011

Percentage of HS students sleeping ≥ 8 hours on school nights by start time

- 8:00 AM 49.7% Mahtomedi, MN
- 8:00 AM 44.5 % Boulder HS, CO
- 8:05 AM 42.5% Fairview HS, CO
- 8:35 AM 57.0% Woodbury HS, MN
- 8:35 AM 58.9% East Ridge HS, MN
- 8:35 AM 60.0 % Park HS, MN
- 8:55 AM 66.2% Jackson Hole, WY

HS students sleeping ≥ 8 hours on school nights



Health and Wellness Findings: Teen Sleep Habits Survey

Administered to 9,089 students with later start time

- School nights:
 - Mean bedtime = 11:32 PM
 - Mean wake time = 7:20 AM
 - **Average of 7.9 hours of sleep on school nights.**
- Weekend:
 - Mean bedtime = 12:56 PM
 - Mean wake time = 10:36 AM
 - **Average of 9.4 hours of sleep on weekends.**
- Average amount of time from wake up to leaving the house for school was 54 minutes.

Activities and Health

- Students who work at a job for pay or participate in clubs or other organized activities are statistically significantly more likely to get insufficient sleep (less than 8 hours per night).
- The more days per week that students spend practicing or doing sports *before* school, the lower the self-reported grades.

Health and Outside Activities (cont'd)

- Students who participate in clubs, sports, or other organized activities such as music, are statistically significantly less likely to:
 - Drink soda or energy drinks
 - Use tobacco, alcohol, and other drugs
 - Report depression

Health Findings Across All Districts*

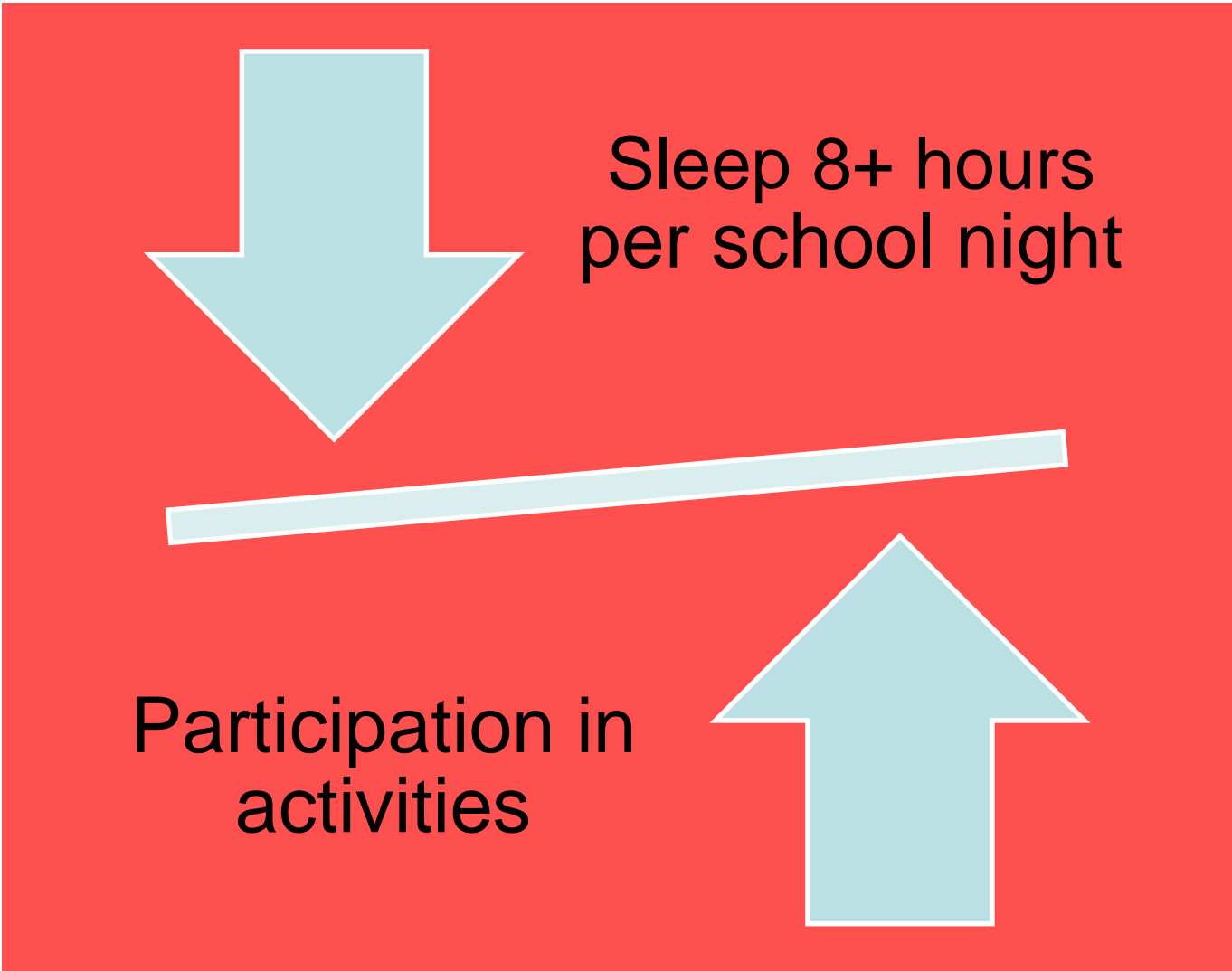
Students who slept 8+ hours were significantly less likely ($p = <.001$) to:

- Report symptoms of depression
- Fall asleep in class
- Drink caffeinated beverages
- Have a phone or computer in bedroom
- Do dangerous things without thinking

*Wahlstrom et al., 2014

Health and Outside Activities: The Dilemma

**The goal of creating a balance,
given what we know about
sleep needs versus interests
outside of school.....**



Electronics and Sleep

- Devices like laptops, iPads and iPhones emit blue and white light.
- The light suppresses melatonin, making it harder to fall asleep.
- About one hour is needed for the brain to “unwind” and enter into a sleep-compatible state after use of an electronic device.

Findings for Effects of Technology on Sleep*

- Students who reported more bedroom distractions were significantly more likely to get insufficient (less than 8 hours) of sleep on school nights.
- Device distractions included:
 - A cell phone (87.6% kept it in bedroom)
 - A computer/laptop/iPad (46.5% had one in bedroom)

*Wahlstrom et al., 2014

Sleep, Memory and Emotions

- During day, all events have both factual and emotional characteristics.
- During sleep, there is a de-coupling of events with their associated emotions, separating the action from the emotion.
- Adequate sleep allows brain to balance positive and negative memories.

Sleep and the Regulation of Emotions

- Inadequate sleep:
 - causes a dominance of negative memories to be retained.
 - reduces remembering positive and neutral memories.

M. Walker, 2009; R. Stickgold, 2005

Social/Emotional Outcomes with Later Start

- Statistically significantly less reported depression
- Principals reporting fewer discipline incidents in the halls and in the lunchroom
- Parents overwhelmingly said that their teen-agers were “easier to live with”

Sleep and Safety

Car Crash Analysis for CDC Study

- Crash data were for crashes involving 16- to 18-year-old drivers for the school year months of September through May for the school years before and after the start time delay.
- Data were obtained from the state departments of public safety.

Crash Findings*

- Jackson Hole, Wyoming, changed to start high school at 8:55am, and saw a 70% reduction in crashes in the first year after the time change.
- Reductions in other schools ranged from 6% to 65%.

*Wahlstrom et al., 2014

How Late is “Late Enough?”

- Early findings suggested that districts who made a modest move to a later start (e.g., from 7:25 to 7:55; from 7:35 to 8:05) experienced only modest benefits, but have experienced the same amount of community disruption as did the districts that made the change to start at 8:30 or later.

Research Findings: Real Issues vs. Those Not Substantiated

Real Issues

- Athletics—schedules and last class missed
- Younger children in AM darkness
- Child care schedules for younger kids before and after school
- Parents' work schedules
- Local traffic patterns

Issues Not Substantiated

- Athletics—less participation, fewer games won
- Teens choose to stay up later
- Participation decline in after-school activities
- After-school employment negatively affected
- Transportation costs increase

Districts in 44 states in the U.S. have shifted to later start time for high schools.

A sample....

- Seattle, WA
- Fairfax Co, VA
- Minneapolis, MN
- Wilton, CT
- Kansas City, MO
- Bentonville, AR
- Minnesota: 14 districts
- Plano, TX
- Davis, CA
- Holyoke, MA
- Chicago, IL
- Stillwater, OK
- Palo Alto, CA
- Florida: 22 districts
- Ohio: 10 districts

Where to begin?

- Parents becoming better informed about the importance of sleep and how to support good “sleep hygiene” at home.
- Administrators and teachers discuss how the sleep needs of students intersect with school activities and actions.
- Involving community health care providers and public safety officials.

Resources

For 2014 report of CDC-funded study:

<http://www.cehd.umn.edu/carei/Publications/>

For comprehensive information and technical assistance:

<http://www.startschoollater.net/>

Contact info:

Kyla L. Wahlstrom, Ph.D.

wahls001@umn.edu

CE+HD

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