****

**Research and Recommendation on
Late Start of School Activities for
Students in High School
November 2016**

# **Background**

Science documents that teenagers need at least 8 hours of sleep per night, with 9 hours being better, 1 but 87 percent of teens are not getting this amount. 2 By age 15, teenagers get an average of 7 hours and 55 minutes of sleep per night and less thereafter. 3 Teenagers have a delay in the natural circadian rhythm, so that each year after 10 years of age there is an 18-minute delay in this biological marker. This results in a delay by age 17 of up to 2 hours in girls and up to 3 hours in boys. 4

There are many factors affecting a teen’s sleep hygiene that can and should be modified, such as late night screen exposure, texting, etc. 25-28 Family or social factors and stress can also be serious sleep disruptors. 29, 30 However, even if these factors are managed, early school start times contribute to sleep deprivation because they conflict with teens’ delayed sleep cycles. 1, 8, 31, 32

Effects of Sleep Deprivation

It is clearly documented that insufficient sleep is associated with *lower academic achievement*. Lack of sleep impacts one’s memory and capacity to handle complex tasks, leading to mental fatigue. Teenagers who lack sleep demonstrate increased daytime napping, weekend oversleeping, and poor sleep hygiene. 12-24

In addition, the following health effects are associated with sleep deprivation. 2, 5-8

* Increased incidence of anxiety, depression, and other mood disorders
* Increased incidence of suicidal ideation
* Increased risk for obesity
* Increased risk for school violence
* Increased incidence of hyper-sexuality
* Increased susceptibility to drowsiness while driving
* Increased susceptibility to infections 9
* Increased risk for alcohol and substance use 10
* Increased risk for sports-related injuries 11

Logistic and Other Concerns

Although available evidence supports a high school start time not earlier than 8:30 a.m. to ensure adequate sleep time for teenagers, 32, 2, 41 most states (42) report that 75-100 percent of their public schools start before 8:30.

Following are some of the main objections to later school start times.

1. They may be too disruptive to the schedules of families, teachers, and students, particularly of those with students at different grade levels (e.g., elementary school and high school). 2, 34
2. Districts have concerns of potential transportation cost increases. 8, 34
3. Teenagers would be less prepared for real-life responsibilities.
4. Research exists showing that grade point averages (GPAs) do not differ in schools that have later start times. 42, 43

District Implementation and Successes

There are two school districts in Texas that have implemented late start times: Seguin Independent School District (ISD) and Carrollton-Farmers Branch ISD, the latter having both rural and urban school campuses.

It has been demonstrated that a delayed school start time can result in the following.

* Improved academic performance 32, 2, 33
* Improved mood, energy, and motivation 2, 35, 36, 37
* Less drowsiness and sickness
* Decreased violence 8, 34
* Decreased substance use
* Decreased motor vehicle crashes 38, 39, 1, 40
* Fewer absences and truancies 8, 13, 15, 41

Despite previous concerns related to busing, athletics, and child care, 92 percent of parents preferred a later start time after its first year of implementation. 46

In Minnesota, transportation costs have increased with the implementation of later start times and a tiered bus transportation system. 8 However, the state has also seen improved performance on standardized test scores. 44, 45

The concern about decreased athletics and extracurricular activities has been put to rest by the Stanford Basketball Study, 47 in which players who slept 10 more night hours per month boosted their 3-point throws by 9 percent. Similarly, when a district in Wilton, Connecticut, switched to a later school start time, the district won several state championships that year.

# **Recommendations**

Based on the evidence, the Texas School Health Advisory Committee (TSHAC) recommends that districts consider delaying the start of High School activities, including extracurricular activities, to at least 8:30 a.m.

One way to implement later High School start times is for districts to exchange their High School/Middle School schedule with their Elementary School schedule. Students at the elementary level can adapt better than older students to earlier bedtimes and wake times; there is no scientific evidence that contraindicates switching schedules in this manner.

The delayed start time of High School activities should also be associated with encouragement for teenagers to

1. decrease visual stimulation two hours before going to bed, particularly with videogames and television, and
2. remove distracting electronics from the sleeping area (e.g., phone, television, and computer).

# **Research**

References

1. Wahlstrom K. School start time and sleepy teens. *Arch Pediatr Adolesc Med*. 2010; 164(7): 676-7.
2. O’Malley EB, O’Malley MB. Chapter 7: School Start Time and Its Impact on Learning and Behavior. In Ivanenko, An ed. *Sleep and psychiatric disorders in children and adolescents*. CRC Press; 2008.
3. Leger D, Beck F, Richard JB, Godeau E. Total sleep time severely drops during adolescence. *PLoS One*. 2012; 7(10): e45204.
4. Carskadon. 1995, 1998; National Sleep Foundation, 2009, 2012, 2014.
5. Stea TH, Knutsen T, Torstveit MK. Association between short time in bed, health-risk behaviors and poor academic achievement among Norwegian adolescents. *Sleep Med*. 2014; 15(6): 666-71.
6. Perez-Lloret S, Videla AJ, Richaudeau A, et al. A multi-step pathway connecting short sleep duration to daytime somnolence, reduced attention, and poor academic performance: an exploratory cross-sectional study in teenagers. *J Clin Sleep Med*. 2013; 9(5): 469-73.
7. Ming X, Koransky R, Kang V, et al. Sleep insufficiency, sleep health problems and performance in high school students. *Clin Med Insights Circ Respir Pulm Med*. 2011; 5: 71-9.
8. Wahlstrom K. Changing times: Findings from the first longitudinal study of later high school start times. *NASSP Bulletin*. 2002; 86(633): 3-21.
9. Perez-de Heredia F, Garaulet M, Gomez-Martinez S, et al. Self-reported sleep duration, white blood cell counts and cytokine profiles in European adolescents: the HELENA study. *Sleep Med.* 2014; 15(10): 1251-8.
10. Singleton RA Jr, Wolfson AR, et al. *J Stud Alcohol Drugs*. 2009; 70(3): 355-363
11. Milewski MD, Skaggs DL, Bishop GA, et al. Chronic lack of sleep is associated with increased sports injuries in adolescent athletes*. J Pediatr Orthop*. 2014; 34(2): 129-33.
12. Harrison Y, Horne JA, et al*. J Exp Psychol Appl*. 2000; 6(93): 236-249
13. Chen MC, et al. *J Sleep Res*. 2012; 21(1): 68-72
14. Howland RH, et al. *J Psychosoc Nurs Ment Health Serv*. 2011; 49(1): 17-20
15. Lofthouse N, et al. *Child Adolesc Psychiatr Clin N Am*, 2009; 18(4): 893-916
16. Coulombe JA, et al. *J Pediatr Psychol*. 2010; 35(7): 790-799
17. Liu X., Buysee DJ, et al. *Curr Opin Psychiatry*. 2006; 19(3): 288-293
18. Leprout R, et al. *Endocr Dev*. 2010; 17: 11-21
19. Van Cauter E, et al. *Sleep Med*. 2008; 9 (suppl 1): S23-S28
20. Van Cauter E, et al. *Eur J Endocrinol*. 2008; 159 (suppl 1): S59-S66
21. Liou YM, et al. *J Adv Nurs*. 2010; 66(6): 1246-1256
22. Pack Al, Pack AM, et al*. Accid Anal Prev*, 1995; 27(6): 769-775
23. Pizza F., et al. *J Clin Sleep Med*. 2010; 6(1): 41-45
24. Loessl B, Valerius G., et al. *Child Care Health Dev*. 2008; 34(5): 549-556
25. Knutson KL, Lauderdale DS. Sociodemographic and behavioral predictors of bed time and wake time among U.S. adolescents aged 15 to 17 years. *J Pediatr*. 2009; 154(3): 426-30.
26. National Sleep Foundation. 2014 *Sleep in America* Poll. <https://sleepfoundation.org/sites/default/files/2014-NSF-Sleep-in-America-poll-summary-of-findings---FINAL-Updated-3-26-14-.pdf> Accessed February 16, 2016.
27. Polos PG, Bhat S, Gupta D, et al. The impact of Sleep Time-Related Information and Communication Technology (STRICT) on sleep patterns and daytime functioning in American adolescents. *J Adolesc*. 2015; 44: 232-44.
28. Madden M, Lenhart A, Duggan M, Cortesi S, Gasser, U. *Teens and Technology 2013*. Pew Research Center. 2013. <http://www.pewinternet.org/2013/03/13/teens-and-technology-2013>. Accessed February 16, 2016.
29. Bartel KA, Gradisar M, Williamson P. Protective and risk factors for adolescent sleep: A meta-analytic review. *Sleep Med. Rev*. 2015; 21: 72-85.
30. Matthews KA, Hall MH, Cousins J, Lee L. Getting a Good Night’s Sleep in Adolescence: Do Strategies for Coping With Stress Matter? *Behav Sleep Med*. 2015; 15: 1-11.
31. Dexter D, Bijwadia J, Schilling D, Applebaugh G. Sleep, sleepiness and school start times: a preliminary study. WUM. 2003; 102(1): 44-6.
32. Wahlstrom K, Dretzke B, Gordon M, et al. Examining the Impact of Later High School Start Times on the Health and Academic Performance of High School Students: A Multi-Site Study. 2014. <http://conservancy.umn.edu/handle/11299/162769>. Accessed February 16, 2016.
33. Miller L, Dyche J, Andrews C, Lucus T. The impact of additional sleep on test scores at U.S. Navy boot camp. *Sleep*. 2004; 27: A164.
34. Kirby M, Maggi S, D’Angiulli A. School Start Times and the Sleep-Wake Cycle of Adolescents A Review and Critical Evaluation of Available Evidence. *Educational Researcher*. 2011; 40(2): 56-61.
35. Owens J, Adolescent Sleep Working Group, Committee on Adolescence. Insufficient sleep in adolescents and young adults: an update on causes and consequences. *Pediatrics.* 2014; 134(3): e921-32.
36. Wolfson AR, Spaulding NL, Dandrow C, Baroni EM. Middle school start times: the importance of a good night’s sleep for young adolescents. *Behav Sleep Med.* 2007; 5(3): 194-209.
37. Owens JA, Belon K, Moss P. Impact of delaying school start time on adolescent sleep, mood, and behavior. *Arch Pediatr Adolesc Med*. 2010; 164(7): 608-14.
38. Danner F, Phillips B. Adolescent sleep, school start times, and teen motor vehicle crashes. *J Clin Sleep Med*. 2008; 4(6): 533-5.
39. Vorona RD, Szklo-Coxe M, Wu A, et al. Dissimilar teen crash rates in two neighboring southeastern Virginia cities with different high school start times. *J Clin Sleep Med.* 2011; 7(2): 145-51.
40. Vorona RD, Szklo-Coxe M, Lamichane R, et al. Adolescent crash rates and school start times in two central Virginia counties, 2009-2011: a follow-up study to a southeastern Virginia study, 2007-2008. *J Clin Sleep Med*. 2014; 10(11): 1169-77.
41. Hasler BP, Clark DB. Circadian misalignment, reward-related brain function, and adolescent alcohol involvement. *Alcohol Clin Exp Res*. 2013; 37(4): 558-65.
42. Eliasson A, Eliasson A, King J, Gould B, Eliasson A. Association of sleep and academic performance. *Sleep Breath*, 2002; 6(1): 45-48.
43. Carrell SE, Maghakian T, West JE. A’s from Zzzz’s? The causal effect of school start time on the academic achievement of adolescents. *American Economic Journal: Economic Policy.* 2011; 3(3): 62-81.
44. Edwards F. Early to rise? The effect of daily start times on academic performance. *Economics of* *Education Review*. 2012; 31(6): 970-83.
45. Brookings report 2011 Hamilton Project.
46. Wahlstrom K. Later school start times. Center for Applied Research and Educational Improvement (CAREI), University of Minnesota, 2013. <http://www.cehd.umn.edu/carei/documents/WahlstromPresentationHandout.pdf>
47. Mah CD, Mah KE, Kezirian EJ, Dement WC. The effects of sleep extension on the athletic performance of collegiate basketball players. *Sleep*. 2011; 34(7): 943-950. [http://dx.doi.org/10.5665/sleep.1132](http://dx.doi.org/10.5665/sleep.1132%20)

Resources

1. <https://sleepfoundation.org/sites/default/files/2014-NSF-Sleep-in-America-poll-summary-of-findings---FINAL-Updated-3-26-14-.pdf>
2. <http://www.pewinternet.org/2013/03/13/teens-and-technology-2013>
3. <http://conservancy.umn.edu/handle/11299/162769> (Reference 32)
4. <http://www.cehd.umn.edu/carei/documents/WahlstromPresentationHandout.pdf> (Reference 46)
5. <http://dx.doi.org/10.5665/sleep.1132> (Reference 47)

This document was developed by the TSHAC. For additional information about the committee, go to [www.dshs.state.tx.us/schoolhealth/shadvise.shtm](http://www.dshs.state.tx.us/schoolhealth/shadvise.shtm).

External links to other sites appearing here are intended to be informational and do not represent an endorsement by the DSHS. These sites may also not be accessible to people with disabilities. External email links are provided to you as a courtesy. Please be advised that you are not emailing the DSHS and DSHS policies do not apply should you choose to correspond. For information about any of the initiatives listed, contact the sponsoring organization directly. For comments or questions about this publication, contact the School Health Program at (512) 776-7279 or by email at schoolhealth@dshs.state.tx.us. Copyright free. Permission granted to forward or make copies in its entirety as needed.

