A Comparison of the Number of Hours of Sleep in High School Students Who Took Advanced Placement and/or College Courses and Those Who Did Not

Article *in* The Journal of School Nursing · January 2009

DOI: 10.1177/1059840508326747 · Source: PubMed

CITATIONS
6

READS
3,456

2 authors, including:

Qian Shi
Mayo Foundation for Medical Education and Research
286 PUBLICATIONS **6,378** CITATIONS

SEE PROFILE

A Comparison of the Number of Hours of Sleep in High School Students Who Took Advanced Placement and/or College Courses and Those Who Did Not

Qiushuang Jin and Qian Shi

J Sch Nurs 2008; 24; 417
DOI: 10.1177/1059840508326747

Research Article

A Comparison of the Number of Hours of Sleep in High School Students Who Took Advanced Placement and/or College Courses and Those Who Did Not

Qiushuang Jin and Qian Shi, PhD

This study investigated the association between sleep deprivation and enrollment in Advanced Placement (AP) and/or college courses among high school students. Approximately 4,000 surveys were distributed, and 2,197 completed surveys were returned from students in Grades 9 to 12 at 15 high schools in Iowa. Findings indicated the majority of high school students were sleep deprived. Sleep deprivation was significantly associated with enrollment in AP/college courses. Results indicated that enrollment in AP/college courses had a greater impact on younger students than older students. Compared with non–AP/college course takers, AP/college course takers slept approximately 20 minutes less per night. Specifically, 9th- and 10th-grade AP/college course takers slept approximately 1 hour less and 40 minutes less, respectively. In addition, students enrolled in two or more AP/college classes received 1 hour less and 30 minutes less among 10th and 11th graders, respectively. These results provide useful information on adolescent sleep patterns for school nurses.

Keywords: sleep deprivation; sleep time; adolescents; advanced placement courses; college courses taken by high school students

Sleep deprivation among adolescents is a serious health issue that the public has become increasingly concerned about. Unfortunately, sleep deprivation is common due to the high expectations and demands of today's society (Drake, Roehrs, & Roth, 2003). Sleep deprivation refers to a lack of the necessary amount of sleep. It can have a negative impact on physical, mental, and social health (Sadeh, 2007; Smaldone, Honig, & Byrne, 2007). According to the National Sleep Foundation (NSF; 2006), a minimum of 9 hours of sleep per night is vital for physical and mental development in adolescents. However, the 2006 Sleep in America poll (NSF, 2006) showed that

Qiushuang Jin is a senior at West High School, Iowa City, IA.

Qian Shi, PhD, is a research associate, Division of Biomedical Statistics and Informatics, Mayo Clinic, Rochester, MN.

Authors' Note: Ms. Jin would like to thank Professor Mary Kathryn Cowles from the University of Iowa for her advice in analyzing the data and for her constant support. She would also like to thank the students, teachers, principals, and schools who participated in this study. This project was a Division 1 winner at the Eastern Iowa Science and Engineering Fair, March 2008, and was 1 of 12 finalists in the Youth Epidemiology Scholars Competition in Washington, D.C., April 2008. The project also won first place in the 2008 American Statistical Association Student Project and Poster Competition.

JOSN, Vol. 24 No. 6, December 2008 417-424
DOI: 10.1177/1059840508326747

the average amount of sleep adolescents received per night was 7.6 hours, short of the 9 hours recommended for optimal health and functioning.

Physical and mental development in teens occurs mainly during sleep. Therefore, without sufficient sleep during the night, the body will automatically try to compensate for the lack of rest by signaling the brain to shut down unexpectedly (Drummond et al., 1999). In addition, sleep deprivation results in reduced metabolism of the prefrontal cortex of the cerebrum, the area of the brain responsible for decision making and judgment, significantly reducing executive function (Crowley, Acebo, & Carskadon, 2007; Killgore, Balkin, & Wesensten, 2006). Venkatraman, Chuah, Huettel, and Chee (2007) found that two nights of sleep loss increased risk-taking behavior in the Iowa Gambling Task, a game that mimicked real-world judgment situations. This study showed that those who were sleep deprived were more likely to make riskier decisions.

Another study showed that participants who had been awake for 17 to 19 hours performed much worse than those with a blood alcohol concentration of .05% in a test of cognitive and motor performance (Williamson & Feyer, 2000). Furthermore, adolescents and young adults were more likely to be affected by fatigue than older adults and were more often involved in sleep-related accidents. According to the National Highway Traffic Safety Administration (2002), drowsiness and fatigue causes more than 100,000 traffic accidents each year, and young drivers are behind the wheels in more than half of these accidents.

The lack of sleep also results in impairment of daytime performance. Examples include falling asleep in class, lack of energy, and inattentiveness (Smaldone et al., 2007; Wolfson & Carskadon, 2003). It is also linked to obesity (Landis & Parker, 2007) and poorer academic performance in school (Curcioa, Ferrara, & De Gennaro, 2006; Wolfson & Carskadon, 2005). Teens who are sleep deprived are more likely to experience negative psychological symptoms such as depression, aggression, difficulty relating to peers and parents, and use of alcohol and illegal drugs (Ireland & Culpin, 2006; Selvi, Gulec, Agargun, & Besiroglu, 2007).

Although numerous studies have described the negative impact of insufficient sleep among adolescents, few have explored the nonmedical factors related to sleep deprivation. Therefore, this study was designed to compare high school students who were and were not enrolled in Advanced Placement (AP) courses and/or college courses with respect to the amount of sleep they received on average per night.

METHOD

This was a statewide study conducted among high school students. Beginning in August 2007, e-mails were sent to approximately 400 high school principals in the state of Iowa to explain the purpose and procedures of this study. Permission to conduct this study was received from 15 high school principals, and participants were informed that this survey was completely voluntary and confidential. The instructions on the questionnaire stated, "This is a voluntary survey in which information provided would be kept with complete confidentiality. Participants will not be questioned or identified in any way."

Data collection was conducted in August and September of 2007. Approximately 4,000 surveys were sent to the designated high schools along with the return mailing address and prepaid return envelopes or boxes. The schools were asked to distribute the surveys in the most random manner possible and to return the completed surveys in the prepaid return envelops or boxes provided. The method each school used to distribute the surveys varied. Nine of 15 schools distributed the surveys to all four grades (Grades 9-12), three schools administered the surveys to 10th and 11th graders, two schools selected only 12th graders, and one school distributed the surveys only to 9th graders. A total of 2,197 completed surveys were received.

The questionnaire contained four parts. The first part included demographic questions on ethnicity, gender, grade, and age. The second part included questions regarding sleep. Information about the participants' sleep time was collected via the participants' self-report on the average amount of sleep received per night. In addition, participants were asked if they were satisfied with the amount of sleep they received on average. Considering possible family influences on sleep time, students were asked to report the average

nightly sleep time of their parents and teen siblings. To examine the effect of academic workload, in the third part of the questionnaire, the students were asked if they were enrolled in any AP or college courses. If the student reported "Yes," further information was requested regarding the number of AP and/or college courses the student took each trimester. The same questions applied to enrollment in honors courses and regular courses.

The last part of the questionnaire requested information on the time spent on after-school activities. For instance, participants were asked if they played any musical instruments or were involved in any athletic activities, after-school clubs, part-time jobs, or volunteer activities. Furthermore, data estimating the time expenditure each participant allotted for entertainment (e.g., watching TV, playing video games, using the Internet, and/or partying with friends) were collected.

Data Management

To avoid ambiguity, the directions on the questionnaire were phrased as clearly and directly as possible. However, when asked to give a specific number of hours of sleep per night, some students provided a range of hours instead of a specific number. In such cases, the midpoint of the range was used in the analyses. For example, if the student reported 7 to 8 hours, 7.5 hours was used for the analyses.

To examine the impact of academic workload on sleep time, the participations were first classified as the non–AP/college group (students who did not take any AP or college courses) and the AP/college group (students who took one or more AP or college course). Participants were also classified into a three-level category to determine whether the number of courses taken influenced sleep: the non–AP/college group, those who took only one AP or college course, and those who took two or more AP or college courses.

To adjust for the overall effect of after-school activities, the total time spent on all after-school activities was combined and analyzed to detect any association with sleep time. Assuming the average time spent in classes was 6 hours per day (30 hours per week), data entries with combined hours of classes, time spent on after-school activities, and sleep time that exceeded 24 hours per day were considered invalid and excluded from the analyses. Data containing other unreasonable responses, such as a reported age of 300, reports with missing values of the average amount of sleep, and/or reports with missing information regarding AP/college courses, were also excluded.

Data Analysis

All analyses were conducted using SAS Version 9.1.3 with an alpha of .05 to determine statistical significance. To determine if students received the recommended 9 hours of sleep per night, a one-sample *t* test was used to compare the average sleep time among the surveyed students with the suggested 9 hours of optimal sleep. A two-sample *t* test was used to compare the average sleep time between two study groups. For instance, this method was used to compare the average sleep time between the AP/college group and the non–AP/college group to examine the possible association between enrollment in AP/college courses and reduced sleep time. Analysis of variance with the Bonferroni correction was used to compare the regular sleep time among multiple groups (three or more groups). Regression approaches were conducted for testing interactions between enrollment in AP/college courses and other variables, including gender, race, enrollment in honors courses, enrollment in early-bird courses, total time of after-school activities, and grade. Multiple regression was used to evaluate the adjusted association between enrollment in AP/college courses and sleep time.

RESULTS

A total of 2,197 high school students from 15 high schools participated in this study. Of those, 137 (6.2%) reports contained ambiguous, invalid, and/or missing information. Therefore, 2,060 (93.8%) completed reports were included in the analyses.

Of the completed reports, the percentage of female participants (52.0%) was slightly higher than male participants (47.9%). The majority of the participating students were White (82.1%), and the number of participants from each grade was approximately evenly distributed. Compared

TABLE 1. Distribution by Gender, Grade, Race, and Enrollment in Early-Bird Classes

	All Participants	*Enrollment in AP/College Courses*	
Characteristic Variables	*(N = 2,060)* n *(%)*	*Yes* (n = *352)* n *(%)*	*No* (n = *1,708)* n *(%)*
Gender			
Female	1,072 (52.0)	198 (56.2)	874 (51.1)
Male	986 (47.9)	154 (43.8)	832 (48.7)
Missing[a]	2 (0.1)	0 (0.0)	2 (0.2)
Grade			
9th	617 (30.0)	10 (2.8)	607 (35.5)
10th	519 (25.2)	25 (7.1)	494 (28.9)
11th	408 (19.8)	94 (26.7)	314 (18.4)
12th	514 (25.0)	223 (63.4)	291 (17.0)
Missing[a]	2 (0.1)	0 (0.0)	2 (0.1)
Race			
White	1,692 (82.1)	311 (88.4)	1,381 (80.9)
Black or African American	103 (5.0)	9 (2.6)	94 (5.5)
Asian	46 (2.2)	15 (4.3)	31 (1.8)
Hispanic or Latino	114 (5.5)	10 (2.8)	104 (6.1)
Other race	97 (4.7)	6 (1.7)	91 (5.3)
Missing[a]	8 (0.4)	1 (0.3)	7 (0.4)
Early-bird			
Yes	304 (14.8)	118 (33.5)	186 (10.9)
No	1,724 (83.7)	228 (64.8)	1,496 (87.6)
Missing[a]	32 (1.5)	6 (1.7)	26 (1.5)
	M ± SD	M ± SD	M ± SD
Total time spent on after-school activities (per week)	34.1 ± 19.7	40.7 ± 18.5	32.6 ± 19.6

a. Missing values were not included in the analyses.

with non–AP/college course takers, more AP/college course takers were juniors or seniors, White or Asian, and early-bird course takers. Moreover, the AP/college course takers tended to spend more time on after-school activities than non–AP/college course takers (Table 1).

On the 2006 poll, the American Sleep Foundation defined 9 or more hours of sleep as optimal, between 8 and 9 hours as borderline, and less than 8 hours as insufficient. According to the above criteria, 64.6% of the participants in this study received an insufficient amount of sleep, 25.3% received a borderline amount of sleep, and only 10.1% of the participants reported the optimal amount of sleep. Moreover, the results indicated that the percentage (76.4%) of participants who received an insufficient amount of sleep in the AP/college group was significantly higher than that of the non–AP/college group (62.2%; $p < .0001$, chi-square test; see Figure 1). In addition, as many as 80.6% of the students who took two or more AP/college courses did not get a sufficient amount of sleep, which was significantly greater than for the non–AP/college course takers.

The unadjusted and adjusted means of sleep time are shown in Table 2. These results indicated that the average sleep time among participants remained the same after adjusting for potential confounders. Of all the surveyed high school students, the adjusted mean of regular sleep time in the AP/college group (6.7 ± 0.10 hours) was significantly less than that of the non–AP/college group (7.0 ± 0.07 hours, $p = .0029$; see Table 2). The adjusted mean of sleep time among the students who took two or more AP/college courses was approximately 25 minutes less per night than that of non–AP course takers ($p = .001$; see Table 2).

Strong interactions were found between enrollment in AP/college courses and grade ($p = .006$) and between the number of AP/college courses and grade ($p = .005$). Table 3 shows the comparisons of adjusted means of sleep time between the AP/college group and the non–AP/college group stratified by grade. The results revealed that the effect of

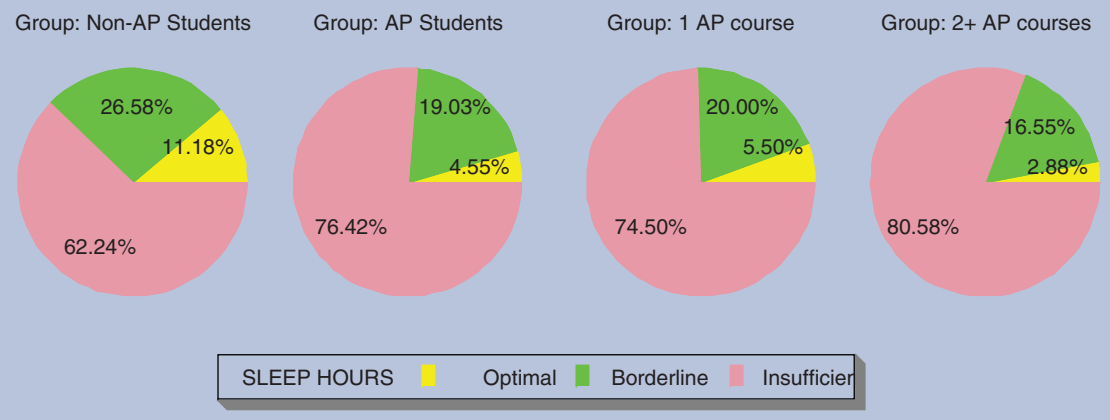

Figure 1. Average Sleep Time by Enrollment in AP/College Courses and the Number of Courses Taken

TABLE 2. Comparison of Unadjusted and Adjusted Means of Regular Sleep Time Between AP/College Courses Takers And Non–AP/College Courses Takers

		Unadjusted Comparison		*Adjusted Comparison*[a]	
Study Load Variables	*n*	M ± SE	*p Value*[b]	M ± SE	*p Value*[c]
AP/college courses[a]					
No	1,708	7.1 ± 0.03	Reference	7.0 ± 0.07	Reference
Yes	352	6.8 ± 0.06	<.0001	6.7 ± 0.10	.0029
Number of AP/ college courses[a]					
0	1,708	7.1 ± 0.03	Reference	7.0 ± 0.07	Reference
1	200	6.9 ± 0.08	.024	6.8 ± 0.10	.14
2+	139	6.7 ± 0.09	.0002	6.6 ± 0.13	.001
Missing[d]	13				

a. Adjusted for gender, race, honors courses, early-bird courses, average sleep time of parents and teen siblings, and total time of after-school activities.
b. Two-sample *t* test for comparison between two groups; analysis of variance for comparison between more than two groups.
c. Multiple regressions.
d. Missing values were not included in the analyses.

AP/college courses on sleep time varied by grade. Among high school freshmen, AP/college course takers slept approximately 1 hour less than non–AP/college course takers. Moreover, among the high school sophomores, the students who were enrolled in AP/college courses slept about 40 minutes less than those who were not enrolled in AP/college courses. However, differences of the average sleep time between the AP/college group and the non–AP/college group were not seen among high school juniors and seniors.

The effect of the number of AP/college courses taken on sleep time was also examined. The findings indicated that average sleep time was significantly less in students enrolled in two or more AP/college courses. Among 10th graders, those who took two or more AP/college courses slept approximately 1 hour less than the 10th-grade non–AP/college course takers. The 11th graders who took two or more AP/college courses slept about 30 minutes less than the 11th-grade non–AP/college course takers. No significant difference was observed among 12th graders. Because only one freshman in this study took two or more AP/college courses, there was not enough power to detect any association between the

TABLE 3. Adjusted Means of Sleep Time by Enrollment in AP/College Courses Stratified by Grade

	Non–AP/College Takers[a]			*AP/College Takers*[a]		
	n	M	*95% CI*	n	M	*95% CI*
All participants	1,708	7.0	6.9, 7.1	352	6.7	6.6, 6.9
Grade 9	607	7.2	7.0, 7.4	10	6.3	5.5, 7.1
Grade 10	494	7.1	6.9, 7.2	25	6.5	6.0, 7.1
Grade 11	314	6.7	6.5, 6.9	94	6.7	6.5, 7.0
Grade 12	291	6.6	6.5, 6.9	223	6.6	6.5, 6.9

a. Adjusted for gender, race, honors courses, early-bird courses, average sleep time of parents and teen siblings, and total time of after-school activities.

TABLE 4. Adjusted Means for Number of AP/College Courses Taken Stratified by Grade

	Non–AP/College Course Takers[a]			*One AP/College Course Takers*[a]			*2+ AP/College Courses Takers*[a]		
	n	M	*95% CI*	n	M	*95% CI*	n	M	*95% CI*
All participants[b]	1,708	7.0	6.9, 7.1	200	6.8	6.6, 7.1	139	6.6	6.3, 6.8
Grade 9	607	7.2	7.0, 7.3	7	6.0	5.0, 7.0	1	nc	
Grade 10	494	7.1	6.9, 7.3	19	6.7	6.1, 7.3	5	6.0	4.8, 7.1
Grade 11	314	6.7	6.5, 6.9	70	6.9	6.6, 7.3	24	6.2	5.6, 6.7
Grade 12	291	6.6	6.5, 6.9	104	6.8	6.5, 7.1	109	6.7	6.4, 7.0

a. Adjusted for gender, race, honors courses, early-bird courses, average sleep time of parents and teen siblings, and total time of after-school activities.
b. Number of missing reports are as follows: Grade 9 = 2; Grade 10 = 1; Grade 11 = 0; Grade 12 = 10.

numbers of AP/college courses and sleep time among 9th graders (Table 4).

DISCUSSION

The purpose of this study was to compare high school students who were and were not enrolled in AP courses and/or college courses with respect to the amount of sleep they received on average per night. The results demonstrated a strong association between enrollment in AP/college courses and sleep deprivation after adjusting for potential confounders.

One way to examine the effect of AP/college courses on sleep time was by comparing the percentage of students who received an insufficient amount of sleep in the AP/college group with that of the non–AP/college group. Results demonstrated that among the AP/college course takers, 76.4% reported having an insufficient amount of sleep, whereas among the non–AP/college course takers, 62.2% reported having an insufficient amount of sleep. This suggested that students who were enrolled in AP/college courses tended to sleep less than those who were not enrolled in any AP/college courses; however, students in both groups received less than the optimal hours of sleep nightly. In addition, students who were enrolled in two or more AP/college courses tended to receive the least amount of sleep. For instance, only 2.9% of the students who took two or more AP/college courses received an optimal amount of sleep, and more than 80% of those students received an insufficient amount of sleep. These results indicated that the likelihood of sleep deprivation was considerably higher among AP/college course takers than non–AP/college course takers.

Another way to show this association was by comparing the mean sleep time of the AP/college group with that of the non–AP/college group. The average sleep time in the AP/college group was significantly less than that of the non–AP/college group. Specifically, among 9th and 10th graders,

the average sleep time in the AP/college group after adjusting for potential confounders was significantly less than that of the non–AP/college group. One possible explanation of these observations was that a heavy study load may put more pressure on younger students, thus causing them to sacrifice more sleep time. These findings indicated that enrollment in rigorous courses may result in an increased risk of sleep deprivation, and this risk tended to increase as the number AP/college courses taken increased.

Although this study was conducted in one state, the results showed consistency with previous nationwide surveys and studies. First, the average amount of sleep per night according to this study (7.1 hours) was very close to the average sleep time (7.2 hours) from Grade 9 to Grade 12 according to the Sleep in America poll (NSF, 2006). This nationwide poll consisting of 1,602 youths in Grades 6 to 12 (ages 11-17) was conducted by the NSF to investigate the sleeping habits of adolescents and children. In addition, the sleep pattern distribution in this study was very similar to the findings in the Sleep in America poll. The 2006 poll showed the percentage of students who had insufficient sleep, borderline sleep, or sufficient sleep to be 62%, 25%, and 9%, respectively. The results from the current study indicated 64.6% of the students reported having an insufficient amount of sleep, 25.3% reported a borderline amount of sleep, and only 10.1% reported having an optimal amount of sleep. Findings from this study also were consistent with Harris Poll #24, which found the majority of students did not receive enough sleep (Taylor & Markow, 2003). This nationwide study polled 2,308 students from Grades 7 to 12 and examined the effect of grade, gender, race, size of place, and region of the country on sleep time.

It is important to note that although 9 hours of sleep per night was recommended for adolescents, the need for sleep varied among individuals. For instance, 9 hours of sleep per night may be insufficient for certain people, but sufficient or excessive for others. A Yale Child Health Research Center study reported that the specific amount of sleep required for each person depends on individual sleeping habits, innate circadian clocks, and hormone production (Rivkees, 2003). Considering this, it was important to examine the self-assessment of the surveyed individuals. Approximately 58% of the participants in the present study reported being dissatisfied with the amount of sleep they received, and 66% of the AP/college course takers were not satisfied with the amount of sleep they received. These findings were similar to the Harris Poll, in which 64% of the participants reported being dissatisfied with the amount of sleep they received.

Although previous studies have investigated potential causes of sleep deprivation, no studies were found that specifically addressed the association between AP and college course enrollment and sleep deprivation. That was the unique contribution of this study.

Limitations

Several factors implied that the results of this study should be interpreted cautiously. First, although a large sample size was obtained and the findings suggested findings similar to previous national studies, the data were obtained from one state and samples were not randomly selected. Instead, sample selection was based on the participants' willingness to participate. Therefore, sampling error could have resulted from the nonrandom selection of participants. Second, the data on the average sleep time were based on the students' self-reports. Thus, inaccurate reporting and recall bias must be considered. Finally, because participation rates in each school were unknown and the sampling population and procedures varied among schools, the data obtained may not represent the population as a whole. Future studies should address these limitations.

Implications for School Nursing Practice

School nurses are heath care professionals whose goal is to promote the health and academic success of students. They play an important role in educating students and families about various health-related topics, including the importanceof sleep to physical health and academic success. This study and other national studies have found that America's adolescents are sleep deprived. For today's students, there are many factors that contribute to sleep deprivation, including homework, after-school jobs, extracurricular activities,

or time spent with media such as television, the Internet, or video games. Taking challenging AP and college courses or a large number of classes may also contribute to sleep deprivation. Many students are under pressure to take challenging classes, perform well in their classes, and participate in a myriad of extracurricular activities to meet the requirements for college admission.

School nurses may see students with sleep deprivation in the health office with complaints of being tired, needing to take a brief nap, or stress-related symptoms. They may also hear concerns from teachers that students are having difficulty concentrating or falling asleep in class. School nurses need to visit with these students about their health behaviors, including sleep patterns. In addition, they need to ask about their class schedule and number and types of courses taken as well as extracurricular activities or after-school jobs that may put students at risk for sleep deprivation.

School nurses need to promote awareness of the importance of sleep in all populations, but particularly for adolescents. They also could educate students, families, teachers, and administrators about the consequences and dangers of sleep deprivation. School nurses can assist in encouraging teens to seek a balance between school coursework and activities and health. This is particularly important for younger students taking AP and/or college courses, who were found in this study to receive less sleep than those not taking these courses.

REFERENCES

Crowley, J. S., Acebo, C., & Carskadon, A. M. (2007). Sleep, circadian rhythms, and delayed phase in adolescence. *Sleep Medicine*, *8*, 602-612.

Curcioa, G., Ferrara, M., & De Gennaro, L. (2006). Sleep loss, learning capacity and academic performance. *Sleep Medicine Reviews*, *10*, 323-337.

Drake, C. L., Roehrs, T., & Roth, T. (2003). Insomnia causes, consequences, and therapeutics: An overview. *Depression and Anxiety*, *18*, 163-176.

Drummond, S. P., Brown, G. G., Stricker, J. L., Buxton, R. B., Wong, E. C., & Gillin, J. C. (1999). Sleep deprivation-induced reduction in cortical functional response to serial subtraction. *Neuroreport*, *10*, 3745-3748.

Ireland, J. L., & Culpin, V. (2006). The relationship between sleeping problems and aggression, anger, and impulsivity in a population of juvenile and young offenders. *Journal of Adolescent Health*, *38*, 649-655.

Killgore, W. D., Balkin, T. J., & Wesensten, N. J. (2006). Impaired decision making following 49 hours of sleep deprivation. *Journal of Sleep Research*, *15*, 7-13.

Landis, A. M., & Parker, K. P. (2007). A retrospective examination of the relationship between body mass index and polysomnographic measures of sleep in adolescents. *Journal of Adolescent Health*, *40*, 89-91.

National Highway Traffic Safety Administration. (2002). *National Survey of Distracted and Drowsy Driving Attitudes and Behavior: 2002*. Retrieved May 2, 2008, from http://www.nhtsa.dot.gov/people/injury/drowsy_driving1/survey-distractive03/HS809566v1.pdf

National Sleep Foundation. (2006). *Sleep in America poll*. Retrieved March 2, 2008, from http://www.sleepfoundation.org/atf/cf/%7BF6BF2668-A1B4-4FE8-8D1A-A5D39340D9CB%7D/2006_summary_of_findings.pdf

Rivkees, A. S. (2003). Time to wake-up to the individual variation in sleep needs. *Journal of Clinical Endocrinology & Metabolism*, *88*, 24-25.

Sadeh, A. (2007). Consequences of sleep loss or sleep disruption in children. *Sleep Medicine Clinics*, *2*, 513-520.

Selvi, Y., Gulec, M., Agargun, M. Y., & Besiroglu, L. (2007). Mood changes after sleep deprivation in morningness–eveningness chronotypes in healthy individuals. *Journal of Sleep Research*, *16*, 241-244.

Smaldone, A., Honig, J. C., & Byrne, M. W. (2007). Sleepless in America: Inadequate sleep and relationships to health and well-being of our nation's children. *Pediatrics*, *119*(Suppl. 1), S29-37.

Taylor, H., & Markow, D. (2003). *Many high school students do not get enough sleep— and their performance suffers. The Harris Poll® #24*. Retrieved February 23, 2008, from http://harrisinteractive.com/harris_poll/printerfriend/index.asp?PID=372

Venkatraman, V., Chuah, Y. M., Huettel, S. A., & Chee, M. W. (2007). Sleep deprivation elevates expectation of gains and attenuates response to losses following risky decisions. *Sleep*, *30*, 603-609.

Williamson, A. M., & Feyer, A. M. (2000). Moderate sleep deprivation produces impairments in cognitive and motor performance equivalent to legally prescribed levels of alcohol intoxication. *Occupational and Environmental Medicine*, *57*, 649-655.

Wolfson, A. R., & Carskadon, M. A. (2003). Understanding adolescent's sleep patterns and school performance: A critical appraisal. *Sleep Medicine Reviews*, *7*, 491-506.

Wolfson, A. R., & Carskadon, M. A. (2005). A survey of factors influencing high school start times. *NASSP Bulletin*, *89*(642), 47-66.