Sleep Patterns and Cognitive Function in American University Freshmen

ABSTRACT:

Studies have shown that sleep deprivation can cause cognitive impairment similar to that seen in individuals with a blood alcohol content over the legal limit. Many college students are considered to be sleep deprived. The purpose of our study is to establish how sleep patterns affect college students. We hypothesize that the less a student is able to sleep, the more cognitive function decreases and if a student has less sleep, their caffeine intake will increase. To test this hypothesis, we surveyed students daily for a week about their sleeping behaviors and related questions that may affect their patterns, such as caffeine intake, overall health, stress and school. The test also included a word recall test to assess cognitive function to determine if sleep duration affects the student's ability to function.

HYPOTHESES:

If the sleep duration of a student decreases, then the cognitive function will also decrease.

If the sleep duration of a student decreases, then their caffeine intake will increase.

BACKGROUND INFORMATION:

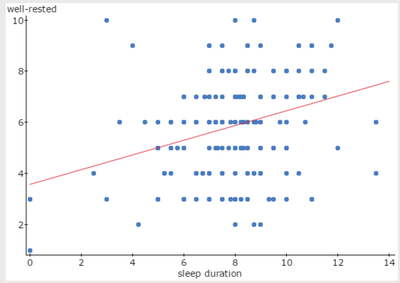
- The Stanford University Sleep Research Center has toted sleep deprivation as a "global concern".
- According to studies from the Bureau of Labor Statistics the average full time University Student spends approximately 8.7 hours per night sleeping.
- Anything less than 7-8 hours of sleep per night results in a sleep deficit for the average adult.
- Increasing sleep debts have been shown to contribute to lack of coordination and decreased cognitive ability, similar to functioning with a .1% BAC.
- Adolescent caffeine intake has remained relatively stable from 1999 to 2010, with a shift in consumption from soda towards coffee and energy drinks.
- The AU Scholars program is an intensive, academic focused community, all housed within the same floors of Letts Hall.

METHODS:

- Data was collected from a group of 30 individuals of freshman status in the AU Scholars program, over the course of seven days.
- Prior to testing, all subjects established a baseline regarding any influencing factors such as known sleep disorders, regular stimulant use, prescribed sleep aids, and credit hours.
- Each individual test was conducted as a verbal survey with the subject responding to questions and cues from the investigators.
- The exam began with the subject receiving a list of five printed words, and being allotted 30 seconds of time within which to attempt to memorize the words. Following this, subjects would return the list and answer a series of questions regarding their sleeping habits and any stimulants or impacting factors.
- Following the survey, subjects were then asked to repeat the five words they had been presented with at the beginning of the survey.
- The subjects were scored on a decreasing point scale as assistance became needed for recall. The total score for the word recall served as an indicator of the subject's ability to perform basic cognitive recall functions, and was examined in relation to the amount of sleep attained.

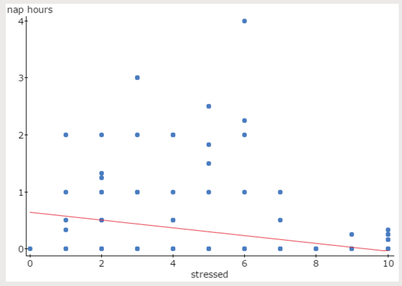
RESULTS:

Sleep Duration Has a Weak Correlation with the Perception of "Well-rested"



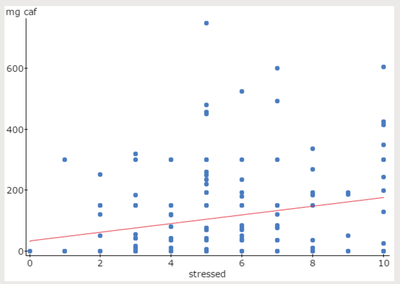
R (correlation coefficient) =0.31
R-sq = 0.05

The Perception of Stress Has a Weak Correlation with Nap Duration



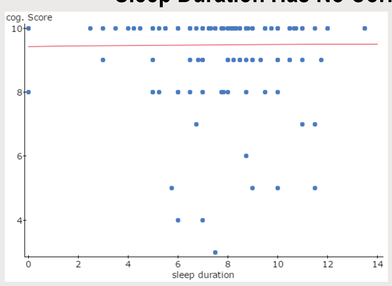
R (correlation coefficient) = -0.22
R-sq = 0.10

The Perception of Stress Has a Weak Correlation with Caffeine Consumption



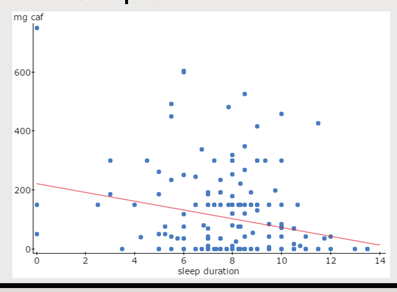
R (correlation coefficient) = 0.23
R-sq = 0.05

Sleep Duration Has No Correlation with Cognitive Function



R (correlation coefficient) = 0.01
R-sq = 0.0001

Sleep Duration Has a Weak Correlation with Caffeine Consumption



R (correlation coefficient) = -0.26
R-sq = 0.067

RESULTS:

	Mean	Std. dev.	Median	Range	Min	Max	Q1	Q3
Credit hours	16.2	.805	16	2	15	17	16	17
Bedtime	1:44A	1.81 hrs	2:00A	14 hrs	8:30P	10:30A	12:50A	3:00A
Awake time	9:47A	1.89 hrs	9:45A	11 hrs	6:00A	5:00P	8:30A	10:45A
Sleep duration (hrs)	7.95	2.14	8	13.5	0	13.5	7	9
Nap hours	.291	.686	0	4	0	4	0	0
Caffeine? 1-yes	.597	.492	1	1	0	1	0	1
Caffeine consumption (mg)	103	136	42	750	0	750	0	150
Well-rested (1-10)	5.84	1.96	6	9	1	10	4	7
Sleep through/in class 1-yes	.095	.295	0	1	0	1	0	0
Days till next test	3.89	2.67	3	10	0	10	2	5
Stressed (1-10)	5.22	2.25	5	10	0	10	4	7
Cog. Score 1-10pts	9.47	1.224	10	7	3	10	10	10

CONCLUSIONS:

- Our hypothesis, that decreased sleep duration would negatively affect subjects' cognitive function, was not reflected in our study.
  - The data showed that sleep duration had no effect on the subjects' cognitive function
- All subjects were at one point in time in AU Scholars. Perhaps these students have the ability to memorize better than most. It is also possible that the test, memorizing 5 words, was too easy.
- Our hypothesis, that caffeine intake would increase in response to fewer hours of sleep, was somewhat supported
  - The correlation of -25.8% between sleep duration and caffeine consumption means that the subjects consumed less caffeine when they recorded longer sleeping periods
  - However, the R-squared value was only 6.7%, meaning 93.3% of the decreased caffeine consumption was caused by outside forces
- Although previous reports have found sleep to be important in cognition, our results do not support these conclusions.

REFERENCES:

1 William C Dement, "A BRIEF HISTORY OF SLEEP RESEARCH," *Stanford University Sleep Disorders Clinic*, Feb. 3 1999.

2 "Time use on an average weekday for full-time university and college students," *Bureau of Labor Statistics American Time Use Survey*.

3 Mei-Yen Chen, et al, "Adequate Sleep Among Adolescents is Positively Associated with Health Status and Health Related Behaviors," *BioMed Center Public Health*, Dec. 11 2015.

4 A M Williamson, et al, "Moderate Sleep Deprivation Produces Impairments in Cognitive and Motor Performance Equivalent to Legally Prescribed Levels of Alcohol Intoxication," *Occupational and Environmental Medicine*, June 15 2000.

5 Amy M Branum, et al, "Trends in Caffeine Intake Among US Children and Adolescents," *American Academy of Pediatrics*, Nov. 26 2013.