Are sleep quality, duration, and consistency associated with better academic performance in college students?

Numerous past studies explored the relationship between sleep and cognitive function and academic performance. The results show that sleep is associated with better academic performance in school and sleep deficit has been associated with a lack of concentration and attention during class. However, these studies lack quantitative data using objective measures to directly assess the association between sleep and the academic performance of the students. To bridge the gap, the study by Kana Okano, Jakub R. Kaczmarzyk, Neha Dave, John D. E. Gabrieli, and Jeffrey C. Grossman uses a wearable activity tracker (Fitbit Charge HR) to study multiple sleep measures along with student's in-class performance and grades.

In the study process, one hundred students (47 females) were selected from 370 volunteers with their informed consent. These students are enrolled in an introductory Chemistry course at MIT. Total 12 students are excluded from the study for various reasons like not adhering to the wearing guideline, losing their wearable activity tracker, and low grades in the assessments in the class. Throughout the study, the researchers collected Fitbit's quantitative data (heart rate every 5 min; steps taken, distance traveled; floors climbed; calories burned; activity level measurements every 15 min; resting heart rate daily; sleep duration, sleep consistency, and sleep quality for every instance of sleep throughout the day). Sleep quality was determined using Fitbit's proprietary algorithm that produces a value from 0 (poor quality) to 10 (good quality). Demographic information and academic performance data were also collected.

The research shows both sleep duration (mean sleep duration throughout the semester) and sleep quality (mean sleep quality throughout the semester) have a significant positive correlation with an overall good grade and on that same note, sleep inconsistency shows a significant negative correlation with academic grade.

The study also explores the effect of sleep across the course term at various time points like one month before, and one week before the final exam. Both time points show a significant positive correlation between mean sleep duration and overall scores and mean sleep quality and overall scores.

The research shows that only sleep consistency predicts academic performance. Other features such as sleep duration and sleep quality might affect the performance but were not significant on their own.

The study shows that female students had better sleep quality, and less sleep inconsistency throughout the semester compared to male students. The strong correlation between sleep duration and sleep quality among male students suggests that it may be more important for males to get long-duration sleep in order to get good quality sleep. In addition, sleep inconsistency and sleep quality were significantly negatively correlated in males but not in females, suggesting that it may be more important for males to stick to a regular daily sleep schedule in order to get good quality sleep. Sleep inconsistency and overall score were negatively correlated in males but not in females, suggesting that it is important for males to stick to a regular sleep schedule in order to perform well in academic performance but less so for females. No other gender differences were detected between other sleep measures and overall scores.

Even though the researchers tried examining the student's academic performance with respect to the sleep measures, there are other unaccounted factors that can affect sleep, such as stress, anxiety, motivation, personality traits, gender roles, group study, teaching assistant support, educational institution (omitted variables). Maybe, being part of a prestigious educational institute brings lots of expectations, and pressure from the students which causes unnecessary stress. It's a big leap from the school environment to undergrad study. Sudden environmental and social change can overwhelm the students which can hamper their sleeping measures and thereby affect their academic performance. In the new study setting, peer pressure can offput the students which can impact their academic performance as well. Although the research finds females had better sleep quality and sleep consistency compared to males, it may be that the females are taking sleeping aids or in a study group that meets up regularly and they plan their day around it. Without a more comprehensive study and an experiment, we would not know. Also, the study was performed over a course term, generally, 12-15 weeks program which might include holidays, breaks, etc that might impact students' sleep patterns, consistencies, etc which might reflect on their academic performances.

Because of the funding constraints, the researchers could not include all the volunteers who have signed up, rather, considered only the first 100 of them. The non-random method of selecting the subject may provide results that are hard to generalize beyond the sample studied.

Therefore, establishing a causal relationship between sleep and academic performance will require experimental manipulations in randomized controlled trials, but these will be challenging to conduct in the context of real education in which students care about their grades. These findings are applicable to a particular student sample at MIT enrolled in a particular course, and future studies will need to examine the generalizability of these findings to other types of student samples and other kinds of classes.

The research study does not have any mention of any treatment and control group to understand the effect of the students' academic performance where their sleep patterns are tracked and controlled with those whose sleep patterns are not monitored. To better measure the effect of sleep measures, researchers can design a randomized control trial with a group of students studying the same subject in the same course term in the same educational institution where the treatment group will study in a controlled sleep schedule while the control group will study in a normal setting. This process can give insights at the group level, not at an individual level to see how the same student has performed with and without a controlled sleep pattern. With a limited sample, it will also be hard to measure the effect of the interventions that the researchers are looking to examine.

Also, sleep quality measures are based on proprietary algorithms. There is evidence that the use of cardiac, respiratory, and movement information from Fitbit devices can accurately estimate sleep stages, but there is no published evidence that Fitbit's 1~10 sleep quality scores represent a valid assessment of sleep quality. So, relying on the derived column of sleep quality score, the study results may not be a true representation of the actual scenario.