Investigating the interactional effects of socio-demographic factors and sleep quality on academic achievement among Malaysian undergraduate students

Mengkaji Kesan Interaksi Faktor Sosio-Demografik dan Kualiti Tidur Ke Atas Pencapaian Akademik dalam Kalangan Pelajar Pra-Siswazah Malaysia

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Sleep is one of the vital aspects of our life. Its importance however, often receives a lack of attention especially amongst university students who would commonly replace some hours of night sleep with alternative activities. Whilst most studies have reported that sleep disturbances could bring harm to a person's life, there is still a lack of studies that examine the interaction effects of socio-demographic factors and sleep quality on academic achievement. Hence, this study aimed to identify: (1) the relationship between sleep quality and academic performance based on the Cumulative Grade Point Average (CGPA) of university students, (2) differences in the academic performance of these students based on their study programmes, year of study, gender, ethnicities and quality of sleep, and (3) the interaction effects of these demographic variables and quality of sleep on the students' academic performance. A sample of 107 undergraduate students from a public university in Sabah, Malaysia, voluntarily participated in this study by completing a set of questionnaires. The results revealed a positive correlation between sleep quality and academic performance. Those who were 'good-sleepers' showed the tendency of low academic achievement when they reached senior year, whilst 'poor-sleepers' were more likely to have higher academic achievement at the later year of studying. The findings imply that having a 'high quality of longer waking hours' in fulfilling academic commitments is probably a worthwhile effort in maintaining good grades during the final year of studying. The findings support the social learning theory that a person could alter his behaviour in order to fit with the demands of the environment.

Keywords: sleep quality, socio-demographic factors, Malaysian undergraduate students, academic performance

Tidur adalah salah satu aspek yang penting dalam kehidupan. Bagaimanapun, ia kerap kurang diberikan perhatian, terutamanya dalam kalangan pelajar universiti yang biasanya akan menggantikan beberapa jam tidur pada waktu malam dengan aktiviti alternatif. Banyak kajian melaporkan bahawa gangguan tidur boleh mendatangkan kemudaratan kepada hidup seseorang, namun kajian yang menilai kesan interaksi faktor sosio-demografik dan kualiti tidur ke atas pencapaian akademik masih lagi sangat terhad. Justeru, kajian ini adalah bertujuan untuk mengenalpasti: (1) hubungan antara kualiti tidur dan prestasi akademik berdasarkan Purata Nilaian Gred Kumulatif (PNGK) dalam kalangan pelajar universiti, (2) perbezaan dalam prestasi akademik pelajar-pelajar ini berdasarkan program pembelajaran, tahun pengajian, gender, etnik dan kualiti tidur, dan (3) kesan interaksi pemboleh ubah demografik ini dan kualiti tidur ke atas prestasi akademik pelajar. Seramai 107 orang pelajar prasiswazah dari satu universiti awam di Sabah, Malaysia, secara sukarela telah menyertai kajian ini dengan melengkapkan satu set soal selidik. Dapatan kajian menunjukkan terdapat korelasi positif antara kualiti tidur dan prestasi akademik. Mereka yang 'cukup tidur' menunjukkan kecenderungan pencapaian akademik yang rendah apabila tiba di peringkat 'senior', manakala mereka yang 'kurang tidur' cenderung mendapat pencapaian akademik yang tinggi pada peringkat tahun pengajian yang seterusnya. Penemuan ini menunjukkan yang memiliki 'waktu jaga lebih panjang yang berkualiti' dalam melaksanakan komitmen akademik adalah mungkin satu usaha yang berguna dalam mengekalkan gred yang baik pada tahun akhir pengajian. Keputusan ini menyokong teori pembelajaran sosial yang mana seseorang itu boleh mengubah tingkah laku untuk menyesuaikan dengan tuntutan persekitaran.

Kata kunci: kualiti tidur, faktor sosio-demografik, pelajar prasiswazah Malaysia, prestasi akademik

Sleep is an inseparable part of human health and life and is pivotal for learning and as well as physical and mental health. Sleep deprivation of various events and durations will substantially impair physical, cognitive, and emotional functions. Young adults these days are among those who are affected by sleep disturbances and probably the least of getting a good sleep due to a lot of constraints at their phase of life. Most of them are attending tertiary education or at their early stage of career path, which requires them to spend more time and attention into tasks related to their studies or work. According to a study done by Lund, Reider, Whiting and Prichard (2010), about 60% of university students undergo poor sleep quality.

Apart from academic burden, the explanation for poor sleep quality among university students may also include occasional tea intake, overuse of the internet and different social media, and also the use of sleep medications (Schlarb, Friedrich & Claßen, 2017). For students missing valuable sleep would impact their academic performance (e.g. Okano, et al, 2019). If not treated, other serious issues which require medical attention may arise such as depression, chronic sleep deprivation, narcolepsy, cataplexy, and sleep disorder (Philibert, 2005).

Literature Reviews

Sleep Quality and Academic Performance

Previous studies have shown that how good sleep matters to academic achievement of students. In a study among non-clinical sample students, students who had clinically poor sleep quality turned to have poor academic results (Gilbert & Weaver, 2010). In this study, it is also found that the sleep habits of many students are quite poor, highlighting the need to consider sleep quality as well as quantity. A similar study by Mirghani, Mohammed and Almurtadha (2015) revealed a strong relationship between good sleep quality and high academic performance among the Sudanese medical students. Seun-Fadipe, and Mosaku (2017) continued to show a similar pattern in their study among Nigerian university students whereby students with good sleep quality had higher score than those with poor quality of sleep. There are also studies that has been conducted in Malaysia on the sleep quality and academic performance. Aung, Nurumal, and Zainal (2016) for example, conducted a survey on 105 nursing students from International Islamic University of Malaysia. They found that sleep quality had impacted academic performance of the students. These students were reported to experience daytime symptoms, poor restoration after sleep, problems initiating and maintaining sleep, difficulty waking, and poor sleep satisfaction which affected them in their studies.

On the contrary, although many research show that sleep quality is largely correlated with academic performance or CGPA of the respective subjects, there are also research that show contrasting results to it. For example, a study by Jalali et (2020) on 102 medical science students at Kermanshah University in Iran did not find any significant difference between those who received good sleep and those who did not. Sometimes, not only sleep quality alone aids in better cognitive functioning which eventually results in better academic performance, sleep duration and sleep consistency also help students to score better in their exams (Okano et al, 2019). According to Okano et al. 's (2019) study, longer sleep duration, better sleep quality, and greater sleep consistency affects better academic performance among the

students.

Gender and Quality of Sleep

Gender differences in sleep quality have been documented in previous studies. Fatima et al 's (2016) study found a higher prevalence of poor sleep quality in females than males (65.1% vs. 49.8%). They ran the study among 3,778 young adults in from 21 years of follow-up data from the Mater–University of Queensland Study of Pregnancy (MUSP) with an average age of 20 years. They found that gender difference in poor sleep is independent of depression, socio-demographics, and lifestyle factors, suggesting a strong biological explanation which might stem from the distinguished feminine traits.

Another study by Madrid-Valero, et al (2017), among 2,144 participants aged between 43 and 71 years in Spain revealed similar result, whereby female adults mostly reported having poor quality of sleep. The findings also showed that the quality of sleep gets deteriorated as one is getting older, which was found to be more consistent in female adults.

Ethnic and Quality of Sleep

Ethnic differences were also evidenced in sleep quality (e.g. Grandner, et al., 2010). Socio-economic status has been a popular indicator of ethnic groups, especially in the USA. Grandner, et al. (2010) revealed that Asian respondents reported the least complaints, and Hispanic/Latino and Black/African-American individuals reported fewer complaints than Whites. Those with lower socio-economic status background, i.e. receiving lower income and educational attainment were those who complained the most of having problems with sleep.

Academic Background and Quality of Sleep

Past research has showed that students from different disciplines are susceptible for a different reaction towards their sleeping routines. A study by Preišegolavičiūtė , Leskauskas , and Adomaitienė (2010) found that medical students experienced the worst in sleep disturbances compared to law and economics students. They ran a study on 405 randomly selected students from the first and fourth years of studies from 4 different universities in Lithuania. More than half (59.4%) of the students showed the proneness towards having sleep disorders. Apart from medical students being the least of having a good sleep, results continued to show that there was a significant correlation between quality of sleep and subjective evaluation of quality of life, especially among medical students. Students who were involved in studying before going to sleep, spending more time studying, and having less leisure time had worse quality of sleep. Further results revealed that of all the three study profiles, medical students continued to score highest in anxiety and satisfaction.

From the literature review, it has been well-documented that quality of sleep affects academic performance. Socio-demographic factors such as gender, ethnicities, and study disciplines have also been highlighted as potential factors in explaining the quality of sleep of a person. However, these literature reviews have been based on studies that are looking on single relationships. Combination effects of quality of sleep and these socio-demographic variables on academic performance present a gap in this line of research. Therefore,

the objectives of this study are: (1) to identify the relationship between sleep quality and academic performance in a sample of university students and (2) to investigate the mean effects of, and (3) the interaction effects of sleep quality and socio-demographic factors, specifically, gender, ethnicities and academic or study programmes on academic performance of these students.

Method

Study Design

The study design for this research was an online survey. A set of questionnaires had been prepared using the Google form and uploaded to an online platform through the link created.

Sampling

A total of 107 undergraduate students from a public university in Sabah participated in the study. They were randomly selected from 8 faculties through the enrolment list of students, obtained from the university's academic affairs department. These students were then contacted through emails or mobile numbers. The average age of these students were between 22-23 years old.

Background of Participants

We divided our participants into two study programmes, namely the Arts and Social Sciences (N=52) and Sciences (N = 55), involving 38 males and 69 females. For year of study, 36 students were categorized as 'Junior' (first to second year of studies) and 71 were in the category of 'Senior' (third to fourth year of studies).For ethnicity background, 33 identified themselves as Malay, 26 Chinese, 18 Indian, 22 Bumiputera Sabah and 8 Bumiputera Sarawak. Fifty-three of them were identified as 'poor-sleepers' and 56 of them as 'good-sleepers'.

Measurement

A set of questionnaires that comprised of three parts, i.e., socio-demographic (i.e., gender, ethnicities, study background of the respondents including year of study, study programmes, Sleep Quality Scale (SQS) (Yin, Shin & Shin, 2006) and academic performance (measured by Cumulative Grade Point Average [CGPA]) was prepared in the google form and uploaded through a link.

Study Procedure

After identifying respondents through a random selection process, they were contacted through their emails or mobile numbers. After agreeing to be involved in the study, all participants were provided a link to the study. Before answering the questionnaires, they were initially asked to fill up a consent form as to indicate their voluntary involvement in the study. The participants were given 2 weeks to complete the survey.

Data Analysis

Data were analyzed through the Pearson correlation and two-way ANOVAs.

Results

Correlation Results

The result revealed a positive correlation between the sleep quality and academic performance among UMS students ($r = 0.342$, $p < .001$). This study reported that the greater the student's sleep quality was, the higher the academic performance was. However, the r value indicated a rather weak correlation.
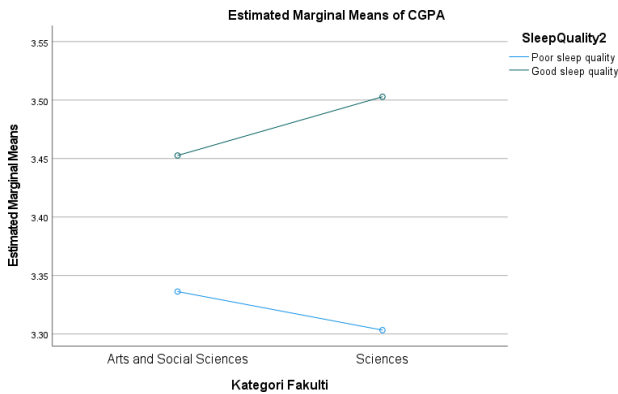
Interaction Between Sleep Quality and Study Programmes

A two-factor (2×2) Analysis of Variance (ANOVA) was conducted to evaluate the effects of sleep quality on academic performance of undergraduate students from different study programmes. The two independent variables in this study are sleep quality (categorised as 'poor sleep' and 'good sleep') and study programmes ('Arts and Social Sciences' and 'Sciences'). The dependent variable is the score on the academic performance measure, with higher scores indicating higher levels of academic performance.

The test for homogeneity of variance was not significant, Levene $F_{(3, 103)} = .868$, $p = .460$, indicating that this assumption underlying the application of the two-way ANOVA was met. An alpha level of .05 was used for the initial analyses. The results for the two-way ANOVA indicated a significant main effect only for quality of sleep, $F_{(1, 103)} = 10.693$, $p = .001$. Whilst the main effect of study programme was not significant ($F_{(1, 103)} = .032$, $p = .858$. Additionally, the interaction between quality of sleep and study programme was insignificant ($F_{(1, 103)} = .741$, $p = .391$) (see Table 1). Whilst, Figure.1 demonstrates the graph for the interaction results.

Table 1

Main Effects Quality of Sleep and Study Programme and Their Interaction on Academic Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.729[a]	3	.243	4.309	.007
Intercept	1117.928	1	1117.928	19808.113	.000
FakultiBaru	.002	1	.002	.032	.858
SQual	.603	1	.603	10.693	.001*
FakultiBaru * SQual	.042	1	.042	.741	.391
Error	5.813	103	.056		
Total	1247.750	107			
Corrected Total	6.543	106			

*p < .01

Figure 1

The Interaction Graph Between Sleep Quality and Study Programme on Academic Performance

Interaction Between Sleep Quality and Year of Study

A two-factor (2 × 2) ANOVA was conducted to evaluate the effects of sleep quality on academic performance of undergraduate students from different year of study. The two independent variables in this study are sleep quality (categorised as 'poor sleep' and 'good sleep') and year of study (categorised as 'junior' and 'senior').

The test for homogeneity of variance was not significant, Levene $F_{(3, 103)} = 2.032$, $p = .114$, indicating that this assumption underlying the application of the two-way ANOVA was met. An alpha level of .05 was used for the initial analyses. The results for the two-way ANOVA indicated a significant main effect only for quality of sleep, $F(1, 103) = 15.88$, $p = .000$.

Whilst the main effect of year of study was not significant ($F(1, 103) = .113$, $p = .738$). Additionally, the interaction between quality of sleep and year of study was found to be slightly significant ($F(1,103) = 4.043$, $p = .047$) (see Table 2 and Figure 2 for the graph). From the graph, those 'good sleepers' when they reached senior years, had the tendency to achieve lower CGPA results, compared to those of 'poor sleepers'.

Table 2

Main Effects Quality of Sleep and Year of Study and Their Interaction on Academic Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.907[a]	3	.302	5.529	.001
Intercept	1071.802	1	1071.802	19590.724	.000
Squal	.870	1	.870	15.899	.000
Studyyear	.006	1	.006	.113	.738
Squal * Studyyear	.221	1	.221	4.043	.047
Error	5.635	103	.055		
Total	1247.750	107			
Corrected total	6.543	106			

R Squared = .139 (Adjusted R Squared = .114)

Figure 2

Interaction Graph Between Quality of Sleep and Year of Study
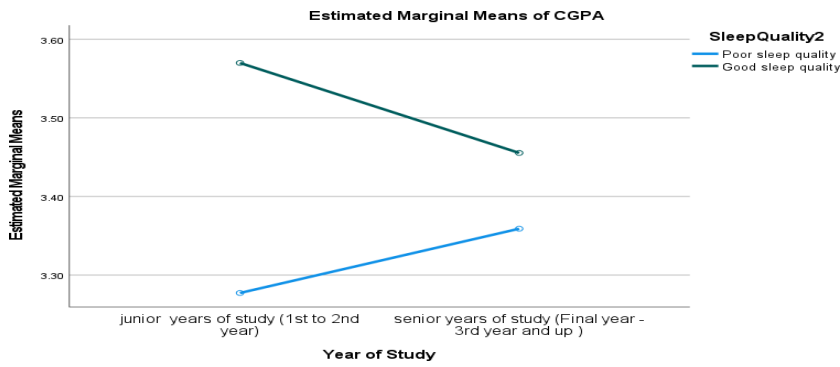
Interaction Between Sleep Quality and Gender

A two-factor (2 × 2) Analysis of Variance was conducted to evaluate the effects of sleep quality on academic performance of undergraduate students from different gender. The two independent variables in this study are sleep quality (categorised as 'poor sleep' and 'good sleep') and gender (female and male students').

The test for homogeneity of variance was not significant, Levene F (3, 103) = .646, p = .588, indicating that this assumption underlying the application of the two-way ANOVA was met. An alpha level of .05 was used for the initial analyses.

The results for the two-way ANOVA indicated a significant main effect only for quality of sleep, $F(1, 103) = 11.595$, p = .001. Whilst the main effect of gender was not significant ($F(1, 103) = .015$, p = .903). Additionally, the interaction between quality of sleep and year of study was found to be insignificant ($F(1, 103) = .090$, p = .765) (see Table 3). Whilst, Figure 3 demonstrates the graph for the interaction.

Table 3

Main Effects of Quality of Sleep and Gender and Their Interaction on Academic Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.692[a]	3	.231	4.058	.009
Intercept	1134.830	1	1134.830	19977.394	.000
SQual	.659	1	.659	11.595	.001
Gender	.001	1	.001	.015	.903
SQual * Gender	.005	1	.005	.090	.765
Error	5.851	103	.057		
Total	1247.750	107			
Corrected Total	6.543	106			

R Squared = .106 (Adjusted R Squared = .080)\

Figure 3

Interaction Graph Between Quality of Sleep and Gender
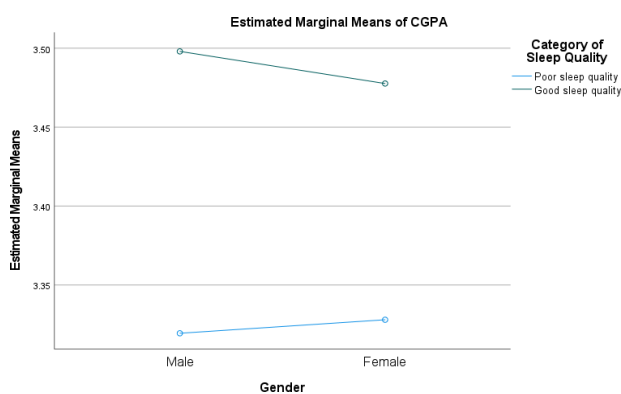
Interaction Between Sleep Quality and Ethnicity

A two-factor (2 × 3) ANOVA was conducted to evaluate the effects of sleep quality on undergraduate students' academic performance from different ethnicities. The two independent variables in this study are sleep quality (categorised as 'poor sleep' and 'good sleep') and ethnicities (Malay', 'Chinese', 'Indian', 'Bumiputera Sabah', 'Bumiputera Sarawak'). The test for homogeneity of variance was not significant, Levene F (9, 97) = 3.544, p = .001, indicating that this assumption underlying the application of the two-way ANOVA was met. An alpha level of .05 was used for the initial analyses.

The results for the two-way ANOVA indicated significant main effects for both quality of sleep, $F(1, 97) = 7.804$, p = .006, and ethnicity ($F(4, 97) = 5.14$, p = .001. However, the interaction between quality of sleep and ethnicity was found to be insignificant ($F(4, 97) = 1.444$, p = .225) (see Table 4). Whilst, Figure 4 demonstrates the graph for the interaction results.

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Table 4

Interaction Between Quality of Sleep and Ethnicity on Academic Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.917[a]	9	.213	4.466	.000
Intercept	851.979	1	851.979	17865.082	.000
SQual	.372	1	.372	7.804	.006
Ethnic	.981	4	.245	5.141	.001
SQual * Ethnic	.275	4	.069	1.444	.225
Error	4.626	97	.048		
Total	1247.750	107			
Corrected Total	6.543	106			

R Squared = .293 (Adjusted R Squared = .227)

Figure 4

Interaction Graph Between Quality of Sleep and Ethnicity
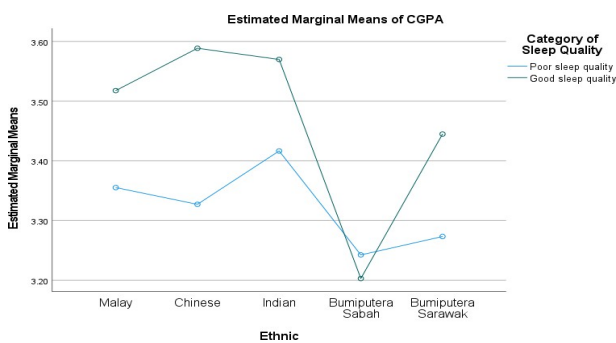
Discussion

This study has once again established the results of previous research that sleep quality of a student is positively associated with her or his academic performance. This finding is coherent with the findings of past research (see Mirghani, Mohammed & Almurtadha 's (2015) and Aung, Nurumal & Zainal's (2016) studies). According to Maheshwari and Shaukat (2019), students experience poor sleep quality as they face high academic stress and pressure most of the time. They force themselves to study with stress in order to score well in exams. In addition, adequate sleep is essential to refresh them every day and help in learning and memory processing. Because of having adequate and good quality of sleep are crucial in meeting physiological needs of a human body, the absence of these would potentially reduce the ability to function well as a person.

Not just in academic, sleep disturbances could go far in creating hazards to a person and also to other peoples' lives. Insufficient sleep would lead into excessive body weight, obesity and would increase the risks of developing Type2 Diabetes, cardiovascular related problems, such as

hypertension, and mood disorder, including depression (Wu, Zhai & Zhang, 2014). Sleep deprivation may also lead to serious motor accidents whereby ones who have lacked of sleep may not be able to control their vehicles and hit someone else. Inadequate sleep may also create mishaps at workplace. A worker who is under serious state of drowsiness may cause injuries whilst handling or operating heavy machineries.

In this study, eventhough the relationship between sleep quality and academic performance was proven to be significant, the correlation was rather weak, indicating, that there were other factors that were not measured in this study which could explain better the consequences on academic performance of these students. Psychological attributes, for instance, play a significant role in impacting students' academic performance. High academic self-efficacy, personality trait Openness, and motivation are among psychological features that are often found in the past to have significant impact on academic achievement.

Further results also displayed significant interaction of sleep quality and year of study. In this study, those who seemed to have problems with sleep were more likely to achieve better in academics when they were at senior years, and those with high quality of sleep were not doing well in the academic when they reached senior years of their studies. This situation could be explained that subjects or courses offered at junior years are not as tough as courses offered at the senior years. Hence, the junior students were probably enjoying their 'honeymoon' studying stage; whereas, their seniors might have already realised that they did not have much time to play around and need to be really working hard in achieving good results. Whilst, the interaction between sleep quality and other variables, i.e. gender, study programmes and ethnicities, were found to be insignificant.

Apart from sleep quality, ethnicity happened to have main effect on the students' academic performance. The post-hoc analysis of LSD revealed that students of Bumiputera Sabah scored the lowest in their CGPAs, and were significantly lower than other ethnic groups. As internet access in some parts of Sabah is still limited, it could lend explanation as to why the Sabahan Bumiputeras in this study were not doing well in their studies. With the impose of the Movement Control Order in the country, online distant learning continued to be more challenging. Another point that could be associated with low academic performance of students of Bumiputera Sabah is that they could come from a low social

economic status (SES) background. Low SES has consistently been associated with lower achievement of students.

In terms of implication to theory, the findings of this study have lend supports to the social learning theory by Bandura whereby a person would alter his behaviour in order to fit well with the demands of the environment. In this study, senior students could have been staying up late at night for studying.

Conclusions

In summary, this study raised important issue that high quality of sleep is crucial for a student in order to stay focused in her or his studies and eventually perform better in academic. This study also revealed the reality of the university's life whereby disturbances in sleep are often experienced among senior students, who might be at the final stage of their study period. Finally, the difference between ethnicities in education attainment flags for a special research among educationists.

The sample size of this research is notably small; hence, adding to the limitations of the study. For future researchers, examining combination effects of psychological attributes and sleep quality could probably provide a better explanation to the impact on academic performance.

References

Aung, K., Nurumal, M., & Zainal, S. (2016). Sleep quality and academic performance of nursing students. *Journal of Nursing and Health Science*, *5*(6), 145–9 . Retrieved from https://doi.org/10.9790/1959- 050601145149

Fatima, Y., Doi, S. A., Najman, J. M., & Mamun, A. A. (2016). Exploring Gender Difference in Sleep Quality of Young Adults: Findings from a Large Population Study. *Clinical Medicine & Research*, *14*(3-4), 138–144. https://doi.org/10.3121/cmr.2016.1338.

Gilbert, S. P., & Weaver, C. C. (2010). Sleep quality and academic performance in university students: A wake-up call for college psychologists. *Journal of College Student Psychotherapy*, *24*(4), 295–306. Retrieved from https://doi.org/10.1080/87568225.2010.509245

Grandner MA, Patel NP, Gehrman PR, Xie D, Sha D, Weaver T, Gooneratne N. (2010). Who gets the best sleep? Ethnic and socioeconomic factors related to sleep complaints. *Sleep Med., 11*(5), 470–8. doi:10.1016/j.sleep.2009.10.006. PMID: 20388566; PMCID: PMC2861987.

Jalali, R., Khazaei, H., Paveh, B. K., Hayrani, Z., & Menati, L. (2020). The effect of sleep quality on students' academic achievement. *Advances in Medical Education and Practice*, *11*, 497. Retrieved from https://doi.org/10.2147/AMEP.S261525

Lund, H. G., Reider, B. D., Whiting, A. B., & Prichard, J. R. (2010). Sleep patterns and predictors of disturbed sleep in a large population of college students. *Journal of Adolescent Health*, *46*(2), 124–132. Retrieved from https://doi.org/10.1016/j.jadohealth.2009.06.016

Madrid-Valero, J.J., Martínez-Selva, J. M., & Ordoñana, J.R. (2017), Sleep quality and body mass index: A co-twin study. *Journal of Sleep Research, 26*, 461–467. https://doi.org/10.1111/jsr.12493

Maheshwari, G., & Shaukat, F. (2019). Impact of poor sleep quality on the academic performance of medicalstudents. *Cureus*, *11*(4). Retrieved from https://doi.org/10.7759/cureus.4357

Mirghani, H. O., Mohammed, O. S., Almurtadha, Y. M., & Ahmed, M. S. (2015). Good sleep quality is associated with better academic performance among Sudanese medical students. *BMC Research Notes*, *8*(1), 1–5. Retrieved from https://doi.org/10.1186/s13104-015-1712-9

Okano, K., Kaczmarzyk, J. R., Dave, N., Gabrieli, J. D., & Grossman, J. C. (2019). Sleep quality, duration, and consistency are associated with better academic performance in college students. *NPJ Science of Learning*, *4*(1), 1–5. Retrieved from https://doi.org/10.1038/s41539-019-0055-zbetes.

Philibert, I. (2005). Sleep loss and performance in residents and nonphysicians: A meta-analytic examination. *Sleep*, *28*(11), 1392–1402. Retrieved from https://doi.org/10.1093/sleep/28.11.139

Preišegolavičiūtė E, Leskauskas D, Adomaitienė V. (2010). Associations of quality of sleep with lifestyle factors and profile of studies among Lithuanian students. *Medicina (Kaunas)*, *46*(7), 482–9. PMID: 20966622.

Schlarb, A. A., Friedrich, A., & Claßen, M. (2017). Sleep problems in university students–an intervention. *Neuropsychiatric Disease and Treatment*, *13*. Retrieved from https://doi.org/10.2147/NDT.S142067

Seun-Fadipe, C. T., & Mosaku, K. S. (2017). Sleep quality and academic performance among Nigerian undergraduate students. *Journal of Systematic Integrative Neuroscience*, *3*(5),1–6. Retrieved from https://doi.org/10.15761/JSIN.1000179

Wu, Y., Zhai, L., & Zhang, D. (2014). Sleep duration and obesity among adults: A meta-analysis of prospective studies. *Sleep Medicine, 15*(12), 1456â€"1462. Retrieved March 19, 2019, from https://www.ncbi.nlm.nih.gov/pubmed/25450058

Yi, H., Shin, K., & Shin, C. (2006). Development of the sleep quality scale. *Journal of Sleep Research, 15(3)*,309–316. Retrieved from https://doi.org/10.1111/j.1365-2869.2006.00565