First year Bachelor Students' Sleep Quality: Potential Effect of Academic Stress and Sleep- related Worry

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Abstract

There is little attention on the effect of academic stress together with sleep related worry on the sleep quality of first year bachelor students in previous research. This study aimed to identify and examine the relationship between academic stress and sleep-related worry with sleep quality of first year bachelors students during non-exam and exam weeks. There were 48 participants in the non-exam week group and 32 participants for the exam week group. Online questionnaires assessing sleep quality, academic stress and sleep related worry were administered at two time points (i.e., non-exam week and exam week). It was hypothesized that the sleep quality was impacted by sleep-related worry and academic stress during both non-exam and exam weeks. The main hypothesis was whether the sleep quality was potentially impacted by sleep-related worry and academic stress during non-exam weeks. To test the main hypothesis, a multiple linear regression was conducted. In order to test the hypotheses, a simple linear regression, a multiple linear regression and two paired sample t-tests were conducted. The results of this study showed no significant relationship between academic stress and sleep quality for non-exam weeks. This study showed the importance of stress and sleep-related worry on sleep disturbances among first year bachelor students. Future studies can focus on ways to treat sleep-related worry and academic stress among this population to prevent sleep-related problems and disorders.

Keywords: Academic stress, sleep quality, sleep-related worry

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Sleep regulates hormone release, monitors cardiovascular activity and helps energy storage for day-to-day functioning (Cheng et al., 2012). Especially for adolescents, getting a sufficient amount of sleep helps with improved attention and memory span, productivity during the day, immunity boost and proper neurological activity (Banks & Dinges, 2007; Kopasz et al., 2010; Schneider, 2020;). Unfortunately, poor sleep quality has been a common issue among societies over the centuries. Poor sleep quality is associated with health problems, absenteeism from work and school, and poor academic performance (Cheng et al., 2012). The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1988) is used to assess quality and disturbances over a l-month time interval. The results from studies using PSQI showed that sleep problems are especially common among university students with the prevalence of 19.17% to 57.5% (Cheng et al., 2012). Especially for first year undergraduate students, getting a healthy amount of sleep can be a problem due to the new academic and non-academic stressors introduced to their lifestyle.

Common stressors for undergraduate students include socio-cultural adjustment to a new environment, balancing the independent lifestyle with heavy requirements from the university, peer competition, financial difficulties and managing personal and academic life (Bedewy & Gabriel, 2015). This sudden change of lifestyle of undergraduate students combined with academic factors may result in high stress levels. A study by Ong and Cheong (2003) shows that the main sources of academic stress among students are academic workload, having too many tests, lecturer characteristics, grades and difficult courses. These stressors combined can lead to escalated levels of stress resulting in anxiety symptoms that in turn results in psycho-somatic problems (Gingsberg, 2006). One of the main problems, specifically experienced by first year undergraduate students, are sleep-related problems (Cheng et al, 2016). Academic stressors can result in an increased amount of stress, which in turn can result in sleep related problems such as insomnia. Especially during the exam periods, students report an increased number of complaints about poor sleep quality and daytime dysfunction when compared to a non-exam period (Campbell et al., 2018). Besides not being able to satisfy psychological needs, the experience of sleep problems due to academic stress is also related to various neural mechanisms.

A study by Suchecki and colleagues (2009), discussed the neural mechanisms that play a role in the effect of stress on sleep related problems. Acute stressors block the serotonin synthesis of the Raphe nuclei, which induces insomnia (Suchecki et al., 2009). This mechanism in the serotonergic system and the activation of it results in sleeping problems for the person who is experiencing stress. Cox and colleagues (2016), conducted a study where a large sample (*n=341)* filled in questionnaires measuring attention, worry, depressive symptoms and sleep related problems. The results of their study showed significant associations between sleep disturbances and maladaptive repetitive thoughts that include worry (Cox et al., 2016). Repetitive thoughts are known to lead to various

psychopathological conditions including insomnia disorder where these thoughts are perpetuating and maintaining factors (Gaibati et al., 2018). Increased levels of worry is related to increased levels of wake-after-sleep onset, decreased total sleep time, decreased sleep efficiency and percentage of REM sleep (Gaibati et al., 2018). Specifically, sleep-related worry is another factor that contributes to sleep-related problems in undergraduate students. According to the study conducted by Chelappa and Aeschbach (2021), individuals who experience lack of sleep often worry about not getting enough sleep and the consequences of their lack of sleep. These sleep-related worries are likely to contribute to the maintenance of their sleep disturbance (Chelappa & Aeschbach, 2021). The study by Jansson-Fröjmark and colleagues (2010) using The Anxiety and Preoccupation about Sleep Questionnaire (APSQ) showed that poor sleep is caused partially by worries about the consequences of poor sleep and worries about the uncontrollability of sleep.

In the present study, we assessed academic stress, sleep quality and sleep-related worry experienced by first year undergraduate students of Leiden University before and during an exam week. The first aim of this study was to identify and examine the relationship between academic stress and sleep-related problems in first-year bachelors students during exam and non-exam weeks. The second aim of this study was to identify and examine the relationship between the combination of academic stress and sleep related worry with sleep related problems in first year bachelor's students. The third aim of this study is to examine whether the students experience higher levels of sleep related problems and academic stress during the exam weeks.

Sleep quality was assessed with The Pittsburgh Sleep Quality ındex (PSQI; Buysse et al., 1988); academic stress was assessed with The Perception of Academic Stress Scale (PAS; Bedewy & Gabriel, 2015); sleep-related worry was assessed using "The Anxiety and Preoccupation about Sleep Questionnaire"(APSQ; Tang & Harvey, 2004; Jansson-Fröjmark et al., 2011). We administered these questionnaires first during a regular week without examinations and secondly during an exam week since the exam week tends to be associated with increased amount of stress (Fejes et al., 2020) and inadequate amount of sleep among university students (King et al., 2019). The reason why we assessed first year university students was that they are a specific group who experiences sudden lifestyle change (Nogueira et al., 2018). The current study questions the extent to which academic stress and sleep-related worry contribute to sleep problems in first year bachelor's students. I expect higher academic stress experienced by first year bachelor's students to predict higher levels of sleep problems during non-exam weeks (hypothesis 1) and exam weeks (hypothesis 2). I also expect students who experience academic stress combined with sleep related worry to be more likely to experience sleep related problems compared to students who only experience academic stress during the non-exam week (hypothesis 3). Finally, I expect students to report higher stress and sleep related problems during the exam week compared to non-exam week (hypothesis 4).

The information obtained from this study will show the extent to which the combination of academic stress and sleep related worry potentially predict sleep problems in university students.

Based on the results, there will be implications for psychologists and that are related to taking first year college students' psychological needs into account when treating sleep related problems. There will also be implications for educators to take the students' needs into account while planning the exam periods and the curriculums in a way that is less stress provoking, which might in turn result in better sleep quality among first-year undergraduate students, which could lead to better performance due to less academic stress among these students.

Methods

Design

The study design is an analytical-observational cohort survey. The same group of respondents were followed longitudinally within the same academic semester. Each participant's data was collected first during an exam free period and secondly during an exam week. The data from the exam free period served as a baseline, while the data from the exam week was expected to show higher levels of stress. The respondents filled-in the same set of questionnaires at both of the data collection points.

Participants

The sample included first year bachelor's students studying at Leiden University who were above the age 16 and fluent in English. The mean age of the participants was 19.57 (SD = 2.35). There were 2 male and 47 female participants in the non-exam week group. There were 2 male and 30 female participants for the exam week group Participants were recruited online through the Leiden University Research Participation System (SONA), and were asked to fill-in the questionnaires using their own electronic devices. The exclusion criteria will be elaborated on in the "Procedure" section.

Measures

Sleep-related worry was assessed using "The Anxiety and Preoccupation about Sleep Questionnaire", which was designed to assess sleep-related worry among patients with insomnia (APSQ; Tang & Harvey, 2004; Jansson-Fröjmark et al., 2011). APSQ consists of 10 items such as "My worry about sleep is persistent.", "I worry about my loss of control over sleep" (Tang & Harvey, 2004). The internal reliability (Cronbach's alpha) was 0.70 (Jansson-Fröjmark et al., 2011). The Cronbach's alpha for the current sample is 0.93. The APSQ and the subscales showed convergent validity with measures on cognitive arousal, sleep-related beliefs, anxiety and depression (Jansson-Fröjmark et al., 2011). Higher scores indicate higher sleep-related worry. The responses were scored on a 10-point likert scale from "1: not true" to "10: very true".

Academic stress was assessed using The Perception of Academic Stress Scale (PAS) designed by Bedewy and Gabriel (2015) to measure perceptions of academic stress and its sources. PAS consists of 18 items such as "Competition with my peers for grades is quite intense", "I can make academic decisions easily" (Bedewy & Gabriel, 2015). Higher scores indicate higher academic stress. The responses were scored on a 5-point likert scale from "1: strongly disagree" to "5: Strongly agree".

The internal consistency reliability (Cronbach's alpha) was 0.7 for the 18 items of the PAS (Bedewy & Gabriel, 2015). Cronbach's alpha for the current study was 0.61.

Sleep quality was assessed using The Pittsburgh Sleep Quality Index (PSQI; Buysse et al.,1989). PSQI is a self-report questionnaire consisting of 19 items that assess sleep quality and disturbances experienced within a 1-month period. The seven components of PSQI (Buysse et al., 1989) are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction. When scoring PSQI, seven component scores are derived where "0: no difficulty" and "3: severe difficulty". The sum of these component scores produce a global score that ranges from 0 to 21 where higher the score, the worse the sleep quality is (Buysse et al., 1989). This questionnaire includes items such as: "During the past month, how would you rate your sleep quality overall?", and "During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?" (Buysse et al., 1989). The internal reliability (Cronbach's alpha) was 0.83 for 19 items of PSIQ (Buysse et al., 1989). The Cronbach's alpha for the current study is 0.81.

Procedure

The data was collected at two time points: 1) during an exam free period and 2) during an exam week. The respondents were asked to respond to the same set of questionnaires twice. Therefore, the following procedure was applied to both data collection points. The respondents were informed about the topic of investigation as well as the exclusion criteria at the beginning of the survey (in the information letter and the consent form). At the beginning of the Qualtrics survey, respondents were asked about their previous and current diagnoses and medication use for depressive, anxiety or sleep disorder. When the respondent answered any of the three questions as 'yes', then they were directed to the end of the survey, and were excluded from further participation. They were provided with a brief explanation for why they were excluded from further participation. The respondents who answered all of the exclusion criteria questions as 'no', were able to continue with the survey and were allowed to participate in the study.

Furthermore, they were also informed that the participation is entirely voluntary and that they can stop at any time. The approximate one-time completion of the entire questionnaire was 20 minutes, which participants were informed of at the beginning of the questionnaires. Therefore, when participants participated in both data-collection points, the total amount that they spent on the study was around 40 minutes. If only the respondents agree to the information letter provided, they were asked to click the button to be able to continue with the survey.

Firstly, participants were asked demographic questions about gender, age, nationality, education level and education status. After filling-in the demographic questions, participants continued with the questionnaires of the survey. Attentional control was assessed by using the Attentional Control Scale (ACS; Derryberry Reed, 2002). Worry was assessed by using the Penn State Worry Questionnaire (PSWQ; Meyer et al.,1990). Sleep-related worry was assessed by The

Anxiety and Preoccupation about Sleep Questionnaire (APSQ; Tang & Harvey, 2004; Jansson-Fröjmark et al., 2011). Sleep quality was assessed by using The Pittsburgh Sleep Quality Index (PSQI; Buysse et al.,1989). Rumination was assessed by using The Ruminative Response Scale (RRS; Nolen-Hoeksema & Morrow, 1991; Treynor, Gonzalez & Nolen-Hoeksema, 2003). Depression, anxiety, and stress was assessed by the Depression, Anxiety, Stress Scales (DASS; Lovibond & Lovibond, 1995). Academic stress was assessed using The Perception of Academic Stress Scale (Bedewy & Gabriel, 2015). Imposter Phenomenon was assessed using the Clance Imposter Phenomenon Scale (Clance, 1985). The order of the questionnaires that the participants will respond is; Attentional Control Scale (ACS), Penn State Worry Questionnaire (PSWQ), The Anxiety and Preoccupation about Sleep Questionnaire (APSQ), Depression-Anxiety Stress-Scale (DASS), Pittsburgh Sleep Quality Index (PSQI) ,Ruminative Response Scale (RRS) , The Perception of Academic Stress Scale (PASS).

In this study, the results from "The Anxiety and Preoccupation about Sleep Questionnaire" (APSQ; Tang & Harvey, 2004; Jansson-Fröjmark et al., 2011), "The Perception of Academic Stress Scale" (PAS; Bedewy & Gabriel, 2015) and "The Pittsburgh Sleep Quality Index" (PSQI; Buysse et al.,1989) were analyzed to assess the variables sleep related worry, academic stress and sleep quality.

At the end of the first-time participation, respondents were provided with a thank you for participation note. At the end of the second-time participation (i.e., end of the study) participants were presented with a debriefing letter including detailed information about the variables assessed in the study. Furthermore, the respondents received an ascending compensation (i.e., course credits: 0.5 if they only complete the first one, and 1.5 more if they complete the second one, so 2 course credits in total if they complete the whole study).

Statistical analyses

For the first hypothesis and second hypotheses a simple linear regression was used where academic stress served as a predictor variable. For the third hypothesis, a multiple linear regression was conducted where sleep related worry and academic stress during non-exam week were the predictor variables and sleep quality was the dependent variable. The assumption of homoscedasticity was checked by producing a scatter plot. The normality of errors was checked by a normal probability plot. Assumption of collinearity was also checked for the multiple linear regression. For the fourth hypothesis two paired samples t-tests were conducted: one for sleep quality score in non exam versus exam week and one for academic stress score in non exam versus exam week. The significance level was $p < .05$ for this study.

Results

The sample of this study is composed of first year bachelor's students. There were 2 male and 47 female students in the non-exam week sample (M_{age}: 19.57) and 2 male, 30 female participants in the exam-week sample (M_{age}: 19.44) who study at Leiden University and who are above the age 16

and who are fluent in English. The descriptive statistics of the questionnaires used in this study are presented in *Table 1*.

Table 1

Descriptive Statistics of the Questionnaires

	N	Min	Max	M	SD
PAS	49	22	65	48.6	9.76
PSQI	48	0	14	6.37	3.43
APSQ	49	10	95	43.1	20.1

Note. Min. stands for minimum. Max. stands for maximum. M stands for Mean. SD. stands for Standard deviation. PAS stands for "The perception of Academic Stress Scale" (Bedewy & Gabriel, 2015). PSQI stands for "The Pittsburgh Sleep Quality Index (Buysse et al., 1988). APSQ stands for The Anxiety and Preoccupation about Sleep Questionnaire (Tang & Harvey, 2004).

To test whether an increase in academic stress predicts a decrease in sleep quality during non-exam weeks (hypothesis 1), a simple linear regression was conducted. An analysis of standard residuals showed that the data did not contain outliers (Std. residual minimum=-1.91, Std residual maximum=2.33). The scatter plot (appendix 1) of standardized residuals showed that the data met the assumptions of homoscedasticity. The normal P-P plot (appendix 2) shows that the assumption of normality is also met. The results showed that 2.8% (R^2= 0.28) of variation in sleep quality was explained by academic stress. An increase in academic stress was not a significant predictor of a decrease in sleep quality; ($F(1) = 1.325$ $p = .256$, 95% CI [-1.501, 8.592]) The regression weight was positive and not significant b=0.058 and t = 1.15. The academic stress does not contribute statistically significant to the model.

In order to test whether the academic stress contributes significantly to sleep quality, specifically during exam weeks (hypothesis 2), a simple linear regression was conducted. The scatter plot (appendix 3) of standardized residuals showed that the data met the assumption of homoscedasticity. The normal P-P plot (appendix 4) shows that the assumption of normality was also met. The results showed that 33% of the total (R^2 = 0.33) variation in sleep quality can be explained by academic stress. The regression model showed that an increase in academic stress during exam weeks significantly predicted reduced sleep quality ($F(1) = 14.640$; $p<.001$, 95% CI [27.8, 43.4]). Academic stress was a significant predictor of a decrease in sleep quality ($p < .001$).

To test whether academic stress together with sleep related worry contributes to sleep quality during non-exam weeks (hypothesis 3), a multiple linear regression was conducted. Assumption of

collinearity indicated that multicollinearity was not a concern for this sample (PAS scores, Tolerance= 0.87, VIF= 1.15; APSQ scores, Tolerance= 0.87, VIF= 1.15). The data had approximately normally distributed errors as indicated by the histogram of standardized residuals (appendix 5). The results showed that 29% (R^2 = 0.29) of variation in sleep quality can be explained by academic stress and sleep related worry. The regression model predicted the sleep quality well $F(1, 30) = 14.640$ $p<.001$. The regression weight for sleep related worry was positive and significant $b = .055$, $t = 2.123$, $p = .04$. The regression weight for academic stress was positive and not significant $b = 0.019$, $t = .361$, $p = .720$. Increase in sleep related worry was a significant predictor of reduced sleep quality ($p = .04$). However, academic stress was not a significant predictor of a reduced sleep quality ($p = .720$).

Two paired sample t-tests were conducted to test whether students experienced higher stress problems (PAS) and sleep related problems (PSQI) during the exam week when compared to non-exam week (hypothesis 4). Cohen's *d* point estimate value for academic stress was -.055 and sleep quality was -.131. The mean difference for the academic stress variable was -.812. There is no significant difference between academic stress during non exam weeks and exam weeks since t(31) = -.312, 95% CI [-6.116, 4.491], p = .757. The mean difference for the sleep quality variable was -.581. There is no significant difference between sleep quality during non-exam and exam weeks since t(30) = -.729, 95%CI [-2.207, 1.045], p = .471. There is no significant difference in academic stress or sleep quality between the non-exam weeks and exam weeks.

Discussion

The first aim of this study was to identify and examine the relationship between academic stress and sleep-related problems in first-year bachelors students during exam and non-exam weeks. The second aim of this study was to identify and examine the relationship between the combination of academic stress and sleep related worry with sleep related problems in first year bachelor's students. The third aim of this study was to examine whether the students experience higher levels of sleep related problems and academic stress during the exam weeks.

Concerning the first hypothesis, there was no significant relationship found between academic stress and sleep quality during non-exam weeks. The finding that academic stress does not predict sleep related problems is not in line with previous research. The study conducted by Jon Ginsberg (2006), where 55 undergraduate students were provided with sleep quality and academic stress questionnaires, concluded that academic stress significantly predicts sleep related problems including low sleep length and sleep disturbances. The results of the current study could be inconsistent with the previous research due to the small sample size. It is a possibility that the sample of this group experienced stress in an adaptive way where the perceived academic stress was not as intense on exam weeks. The study conducted by Gutowski and colleagues (2018) showed that stress can serve as a motivator for youth through pressure coming from high expectations of others or strong desires to achieve a goal or escape from a situation. The sample of the current study might have experienced an

optimal amount of academic stress that boosted their productivity due to increased motivation that caused them to be tired and more prone for a healthy sleep schedule.

Results confirmed that, during exam weeks, high academic stress experienced by first year bachelors students contributed to low sleep quality (hypothesis 2). This result is in line with the hypothesis that higher stress is related to higher sleep problems during exam weeks. The participants of this study might have experienced a higher, intenser level of stress during the exam weeks, when compared to non-exam weeks. During the exam weeks students are likely to experience more sleep disturbances and use of sleep medication (Campbell, 2018). Due to the high levels of stress that is experienced by the students, serotonin synthesis gets blocked, which induces insomnia (Sucheki et al., 2009). The combination of sudden change in their lifestyle together with the pressure coming from succeeding in exams could be the reason for elevated stress levels, therefore sleep-related problems (Gingsberg, 2006; Ong & Cheong, 2003;.

The multiple linear regression conducted to investigate the effect of combination of academic stress and sleep related worry on sleep quality (hypothesis 3) indicated that only sleep related worry significantly contributed to sleep quality of first year bachelor students. The direction of the relationship between sleep-related worry and sleep quality was in line with what was hypothesized; however, unlike our expectations, an increase in academic stress did not significantly predict a decrease in sleep quality. According to previous research, academic stress and worry together contribute to the sleep related problems experienced by university students (Campbell et al., 2018; Ginsberg, 2006). The reason why academic stress did not significantly contribute to reduced sleep quality of first year bachelors students could be related to the relationship between stress and physical exhaustion. With high levels of stress comes a lot of energy loss (Rabasa & Dickson, 2016). It is likely for first-year bachelor students to feel tired and therefore have a normal pattern of sleep due to the academic stress they have been experiencing. Another reason could be the irregular hours of studying. It is common for students to study at late hours at night therefore get exhausted. It is known from previous research that an exhausted body and mind is likely to sleep better (Herring et al., 2018; Li et al., 2020). The finding that sleep-related worry among first year university students significantly predicted by reduction in sleep quality is in line with previous research. The study conducted by Jansson-Fröjmark and colleagues (2011) conducted the Anxiety and Preoccupation About Sleep Questionnaire (APSQ) on 1800 students with insomnia related problems in order to investigate the psychometric properties of this questionnaire. Their study showed that participants who had sleep related problems experienced sleep-related worry as well. A longitudinal study conducted by Xu and colleagues (2020) concluded that among 856 nursing students with the mean age of 17.8; sleep-related worry was positively associated with sleep disturbance. It was also found that emotional exhaustion and sleep-related worry mediated the sleep disturbance and depressive symptoms association (Xu et al., 2020). In line with this study, Harvey (2002) found out that patients with insomnia or other sleep disturbances suffered from excessive amounts of uncontrollable worry during the pre-sleep period,

which in turn contributed more to their reduced sleep quality. Even though this study did not have a big sample size and as much power, we still replicated the previous findings. At the first year of their bachelors, students are trying to leave their previous routine of going to school and sleep at a fixed time, while suddenly having a drastic change in their indepence. This combined with the academic workload could be leading to an emotional exhaustion that in combination with non-adaptive cognitions interfering with their sleep quality.

Current study results showed that there was no significant difference in academic stress and sleep quality between non-exam weeks and exam weeks (hypothesis 4). This finding contradicts previous research. In the study conducted by Campbell and colleagues (2018) with 121 university students were provided questionnaires for the assessment of their basic psychological need satisfaction. Sleep quality was assessed by the following six indicators: subjective poor sleep quality, sleep latency, sleep disturbances and use of sleep medication component scores from the PSQI (Buysse et al.,1989; Campbell et al,.2018). The results showed that there was a peak in the stress level of students during the exam week as well as an increase in poor sleep quality during exam weeks when compared to non-exam weeks. The reason why there was no significant difference in academic stress and sleep quality between exam and non-exam weeks could be due to the students experiencing a stable and frequent level of stress through the year that is not caused only by exams but combination of factors such as lifestyle changes, social challenges, adaptation to university life, homesickness (Bedewy & Gabriel, 2015; Thurber & Walton, 2012).

The current study brings a different perspective on the relationship between academic stress and sleep quality during the exam weeks of students, where the relationship between sleep-related worry and sleep quality was significant. This was not the case for the non-exam weeks. In addition to this, psychometrically sound instruments were used, which is important for presentation of consistent and relevant information (NQF, 2016).

Limitations and future implications

There are three main limitations of this study. The first one is the sample size. The sample size of the study was small. This leads to a wide range for confidence intervals resulting in less precise results for the target population (Hazra, 2017): first-year undergraduate students in this case. Future studies can take other universities' students into account in a longer period of time for more precise and representative results. Second limitation was that all questionnaires were self-reported, which may result in undermined validity for the measures used (Campbell et al., 2018). In order to overcome this limitation, sleep tracking tools like smart watches or lab tools can be used to assess the sleep quality next to the self-report questionnaires. Third limitation was the disproportion between male and female participants. In total there were 47 female and 2 male participants. This may result in lack of information for the male population as well as bias for the female population. Future studies could focus on a balance between the number of female and male participants to avoid gender-bias or control for gender statistically.

Conclusion and Implications

Despite the limitations, the current study adds on to the extensive research that shows interrelations between academic stress, sleep related worry and sleep quality of bachelors students. It was found that especially on exam weeks, first-year bachelors students' reduced sleep quality is a consequence of increased academic stress. The current study also found that sleep-related worry is a significant contributor to the sleep-related problems experienced by the first-year bachelors students during non-exam weeks. The findings of this study shows the importance of the role of stress on sleep disturbances. One of the biggest challenges faced by first-year bachelors students is change of lifestyle. The beginning of their university years also marks the beginning of more independence and responsibilities. Universities can implement support programs including either professional counselors or experienced students to guide the new-coming students during the start of their bachelors to minimize the amount of stress that comes with adapting to new circumstances. Universities can also work with psychologists to draw treatment plans for sleep-related worry, academic stress and other stress-based problems specifically for first-year bachelors students. This could be important for the prevention of further sleep-related complaints and disorders among first-year students, which in turn can result in a healthier lifestyle and improvements in students' overall well-being.

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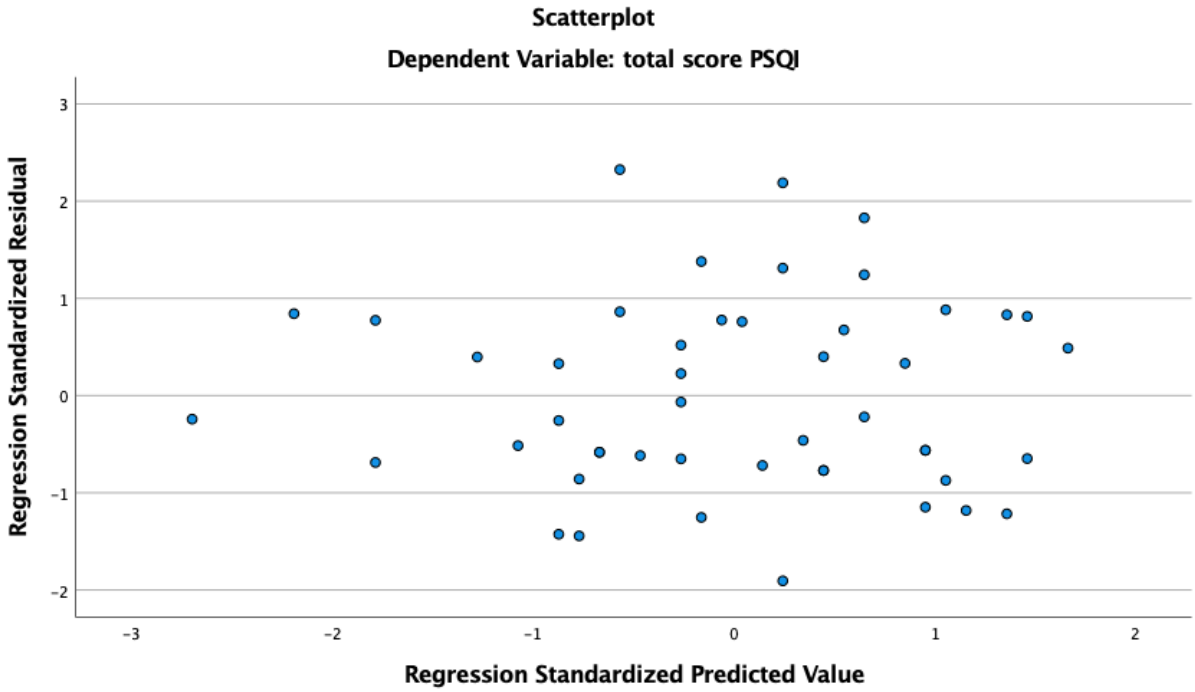
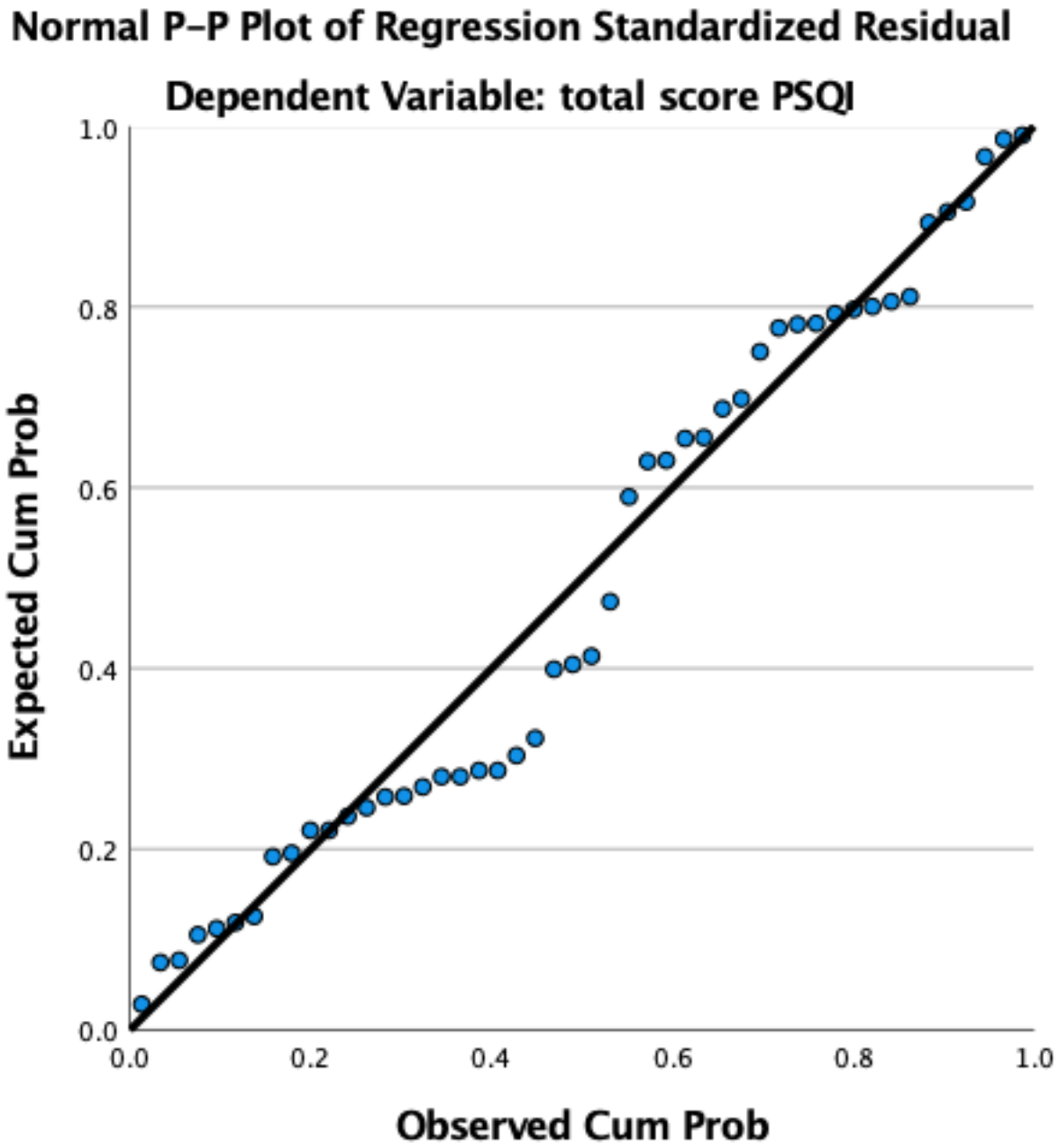
Appendix 1

The scatter plot of standardized residuals showing that the data met the assumptions of homoscedasticity for the variables of the non-exam week



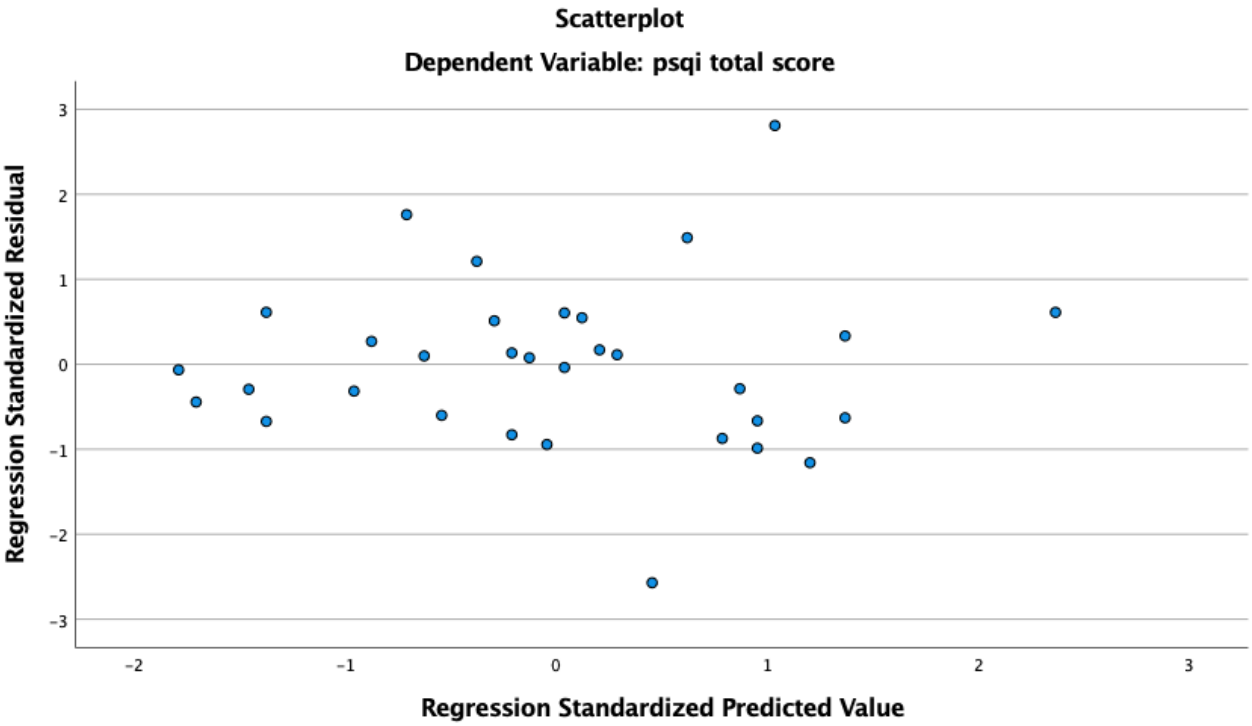
Appendix 2

The normal P-P plot shows that the assumption of normality is met for the variables of the non-exam week



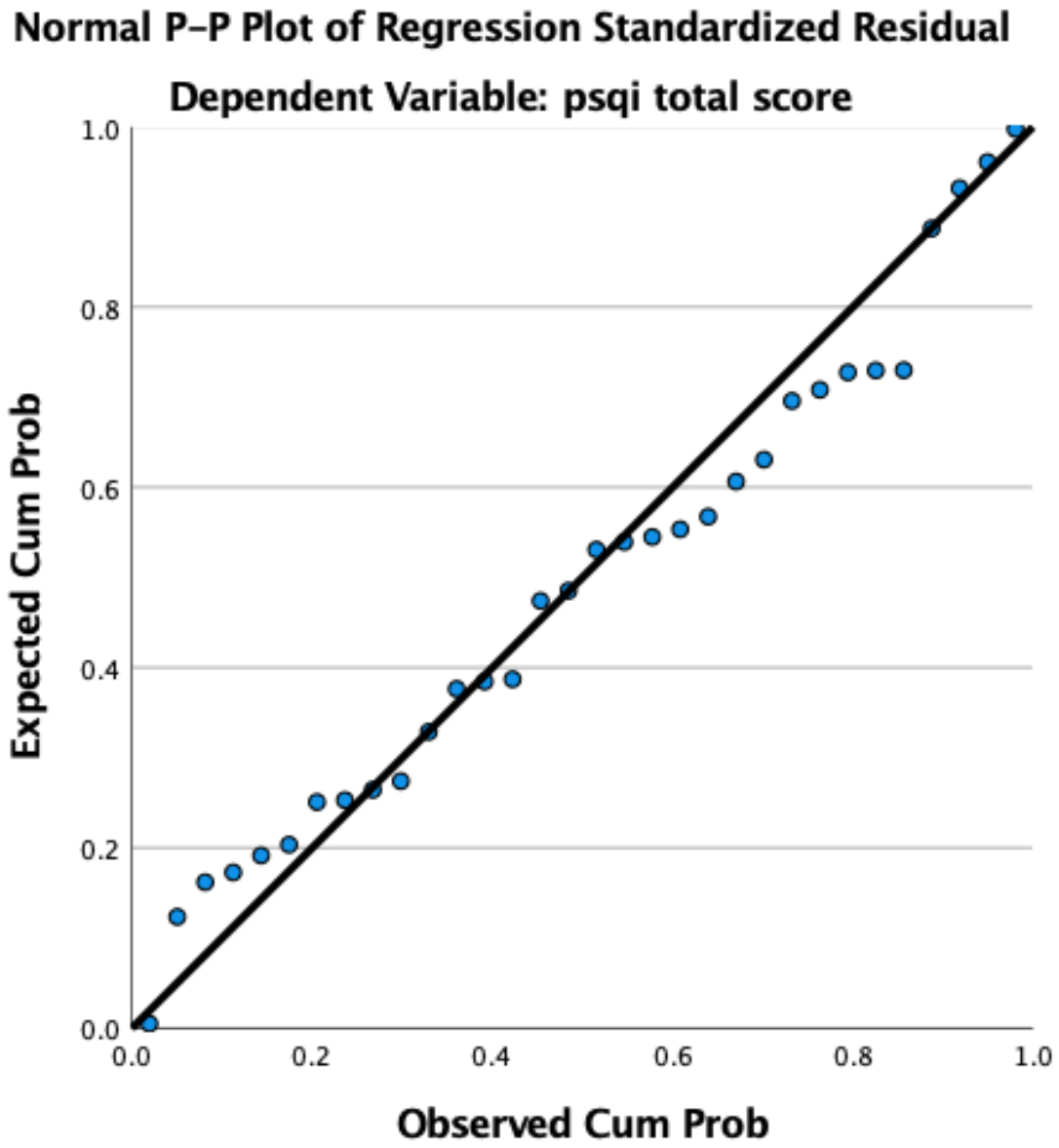
Appendix 3

The scatter plot of standardized residuals showing that the data met the assumption of homoscedasticity for the exam week sample



Appendix 4

The normal P-P plot showing that the assumption of normality was met for the exam week sample



Appendix 5

The data had approximately normally distributed errors as indicated by the histogram of standardized residuals