

Study on the Influence of Psychological Factors and Sleep Patterns towards Students' Academic Performance

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DOI: <https://doi.org/10.30880/ekst.2025.05.02.056>

Article Info

Received: 30 December 2024

Accepted: 18 January 2025

Available online: 19 December 2025

Keywords

Psychological Factors, Sleep Patterns, Academic Performance, DASS-21, PSQI, GPA, Frequency Analysis

Abstract

Psychological factors and sleep patterns play a major influence on how individuals carry out their personal and academic lives. Psychological health and well-being are greatly impacted by conditions like depression, anxiety, and stress, and cognitive functions that are essential for memory and learning are directly impacted by sleep quality. The purpose of this research is to investigate how psychological factors and sleep quality relate to one another and how this affects university students' academic performance. Psychological factors and sleep patterns were evaluated using the Depression Anxiety Stress Scales (DASS-21) and Pittsburgh Sleep Quality Index (PSQI) questionnaires. The data was gathered from 150 respondents from Faculty of Applied Sciences and Technology (FAST) at Universiti Tun Hussein Onn Malaysia (UTHM), and the analysis included frequency analysis, chi-square independence testing, and Spearman correlation. The findings showed that a significant number of students suffered from mild to extremely severe stress, anxiety, and depression, even though majority reported normal psychological symptoms. Furthermore, poor sleep quality was reported by 59% of respondents. Additionally, chi-square tests showed an association between anxiety and GPA, as well as anxiety and PSQI. These results were further analysed by correlation analysis, which revealed low correlations between psychological factors and PSQI and high positive correlations among the psychological factors. However, the relationship between academic performance and psychological factor or PSQI was not significant, implying that other factors may influence students' GPA.

1. Introduction

Academic performance plays an important role in creating a student's future, reflecting both current knowledge and long-term academic goals. This involves grades, Grade Point Averages (GPA) or Cumulative Grade Point Average (CGPA), and degrees, with a focus on exam results and regular evaluations. High expectations for academic performance can lead to a stressful environment that could negatively impact students' mental health if not taken care of.

Undergraduates face increasing academic stress due to assignments, personal issues, and environmental factors, which can lead to low self-esteem, personality disorders, and difficulties in coping academically [1]. Poor mental health can lead to significant issues, particularly in Malaysia, where mental health conditions are alarmingly prevalent among young adults, including depression and anxiety [2].

Children face significant challenges that lead to anxiety and despair, with depression often resulting in low self-esteem, demotivation, and apathy [3][4]. Anxiety disorders, which can worsen over time and disrupt daily activities, manifest through physical symptoms and cognitive fears, affecting individuals' overall well-being [5]. Additionally, stress driven by high academic expectations and factors like packed schedules and poor organization, leads to emotional and behavioural changes, resulting in irritability, mood swings, and declining academic performance. Sleep patterns significantly impact academic performance, with research showing that students who get adequate sleep with 9.5 hours for third graders and 8.5 hours for ninth graders, perform better academically [6].

Student achievement can be influenced by a variety of factors that are not related to their educational skills. This research focuses on students at FAST UTHM, where there is a great deal of concern about the potential influence of sleep patterns and psychological factors on academic performance. The influence of psychological factors such as anxiety, depression, stress, and sleep patterns on the academic performance of FAST UTHM students is currently uncertain. Insufficient awareness in this field restricts the capacity to identify specific therapies or support networks that could improve student well-being and their academic performance. In a study on medical students in Saudi Arabia, it was found that poor sleep was significantly associated with the greater level of depression, anxiety, and stress which indicates both psychological and sleep patterns affects their academic performance [7].

The aim of this research was to evaluate the level of psychological factors, including depression, anxiety, and stress, among FAST UTHM students using DASS-21. The research also measured the sleep patterns of these students through PSQI. Lastly, the research analysed the relationship between psychological factors, sleep patterns, and academic performance to understand how these factors influence students' academic performance.

2. Methodology

2.1 Sampling Method

Determining a sample size is essential for ensuring that the research analysis is statistically significant and representative of the population. Cochran's formula was utilized in this research to determine the required sample size based on the desired precision level, confidence level, and estimated proportion of the attribute within the population [8]. The formula in equation (1) was used to determine sample size, n .

$$n = \frac{z^2 p(1 - p)}{e^2} \quad (1)$$

Where z^2 indicates z-score depending on the confidence level chosen, p is the estimated proportion of an attribute that is present in the population, and e represents margin error of confidence interval.

This research used the confidence level of 95% and proportion of 0.5, resulting in a sample size of approximately 267 participants in FAST UTHM being approached to answer the Microsoft survey form. However, due to time constraints and lack of student participation, 155 responses were initially collected. After data cleansing, the final sample size was reduced to 150, accounting for 56.18% of the required sample size.

This research applied convenience sampling and focused on Faculty of Applied Sciences and Technology (FAST) students in UTHM Pagoh as the participants. Convenience sampling is a technique in which units chosen for the sample are the ones the researchers can access quickly [8]. They were easily reachable on or off campus as the survey distributed through channels like Telegram and WhatsApp. This research has an easy access to UTHM students as the researcher is already engaged with the university. This reduced the need for substantial planning and travel to reach potential participants.

2.2 Questionnaire

The survey aims to collect valuable insights on academic performance prediction by focusing on the influence of psychological factors and sleep patterns among FAST UTHM students. An online survey conducted using the Microsoft Form, with undergraduate students from seven programs in the FAST as respondents, including Mathematics Technology (BWA), Applied Physics (BWC), Food Technology (BWD), Industrial Chemistry (BWK), Industrial Statistics (BWQ), Computational Data Analytics (BWS) and Biodiversity & Conservation (BWW).

The questionnaire was divided into four sections. Section A collects the demographic details, including gender, age, course of study, and year of study. Next, Section B examines the prevalence of psychological factors among FAST UTHM students using the DASS-21, which consist of 21 standard questions formatted on a Likert scale from 0 to 3, reflecting the impact over the past month. Each of the DASS-21 scales covers 7 components [9].

Section C assesses sleep patterns using the Pittsburgh Sleep Quality Index (PSQI), which includes 19 self-reported items across 7 components, with total scores ranging from 0 to 21, scores above 5 indicates poor sleep

quality [10]. Finally, Section D gathers data on academic performance, focusing on GPA, academic satisfaction, and engagement levels to provide insights into the participants' academic performance.

2.3 Pilot Study

A pilot study is the primary preliminary phase in research since it analyses the feasibility of methods and procedures before carrying out the full research [11]. A pilot study was conducted with 30 FAST UTHM students to ensure that participants clearly understood the questions, allowing for any necessary refinement before the main data collection.

2.4 Frequency Analysis

A frequency analysis conducted to examine the distribution of responses related to psychological factors, sleep patterns, and academic performance among FAST students, highlighting potential patterns and trends in the data [12]. This analysis assesses how often respondents experience varying levels of depression, anxiety, stress, and sleep patterns, which is essential for determining the prevalence of these factors. Demographic data were presented in a table, while DASS-21, PSQI, GPA ranges were illustrated using charts to visually represent the frequency of each response option chosen by participants.

2.5 Chi-Square Test of Independence

The Chi-Square test was used to analyse associations between categorical variables, including depression, anxiety, stress, sleep quality (PSQI), and GPA categories. The analysis focused on cross-tabulations to determine the frequency and percentage of demographic responses [13]. The chi-square test of independence evaluates a null hypothesis and alternative hypothesis, which relates between the categorical variables.

H0 : There is no association between the categorical variables.

H1 : There is an association between the categorical variables.

A contingency table created to calculate expected frequencies [14]. Pearson's chi-square test, χ^2 was computed using the formula in equation (2), where O is the observed value and E is expected value.

$$\chi^2 = \sum \frac{(O - E)^2}{E} \quad (2)$$

2.6 Spearman Correlation

Spearman's correlation coefficient utilized in this research to assess the strength and direction of monotonic associations between academic performance, psychological factors, and sleep patterns [15]. It evaluates whether the relationship between two variables consistently increases or decreases. The Spearman, ρ formula is given in the equation (3), where d_i is the difference between the two ranks of each observation and n is the number of observations.

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)} \quad (3)$$

The Spearman correlation ranges from +1 to -1, where +1 indicates a perfect positive association, 0 indicates no association, and -1 indicates a perfect negative association. This analysis determines the degree of correlation among the variables, offering valuable insights into the factors influencing academic outcomes for FAST UTHM students.

3. Results and Discussion

3.1 Frequency Analysis

This frequency analysis provides an overview of the demographic distribution and key categorical variables in the dataset. A total of 155 responses were initially collected. Following data cleansing procedures, which involved identifying and removing incomplete or inconsistent entries, only 150 valid responses were retained, resulting in a final response rate of 56.18%. the demographic characteristics of the respondents were summarized in Table 1. Furthermore, the severity of levels of DASS-21, PSQI scores, and GPA ranges were illustrated in Fig. 1.

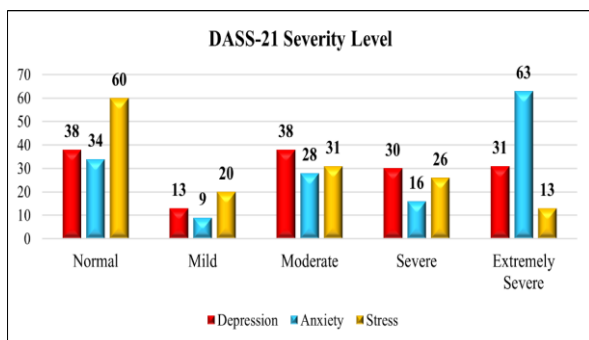
Table 1 Demographic Profiles

Diversity	Category	Frequency (%)	Diversity	Category	Frequency (%)
Gender	Female	113 (75.00%)	Year of Study	Year 1	4 (2.67%)
	Male	37 (25.00%)		Year 2	18 (12%)
Age	18 to 20 years	9 (6.00%)		Year 3	39 (26.00%)
	21 to 23 years	114 (76.00%)		Year 4	89 (59.33%)
	24 and above	27 (18.00%)	Academic: Satisfaction Level	Very Dissatisfied	3 (2.00%)
Course of Study	BWW	10 (6.67%)		Somewhat Dissatisfied	24 (16.00%)
	BWS	2 (1.32%)		Neither	50 (33.33%)
	BWQ	38 (25.33%)		Somewhat Satisfied	57 (38.00%)
	BWK	4 (2.67%)	Very Satisfied	16 (10.67%)	
	BWD	73 (48.67%)	Academic: Engagement Level	Rarely	16 (10.67%)
	BWC	7 (4.67%)		Sometimes	73 (48.67%)
	BWA	16 (10.67%)		Often	49 (32.67%)
		Always		12 (8.00%)	

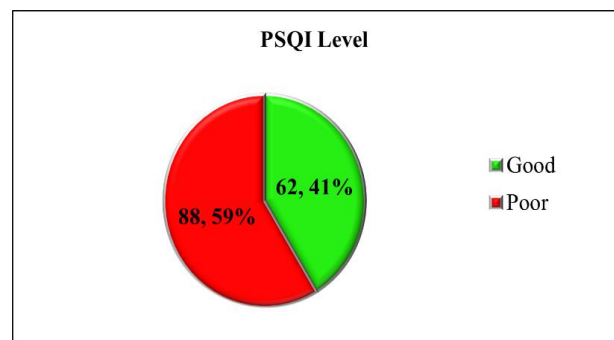
Based on the Table 1, the research had a majority of female respondents (75%), with male respondents accounting for 25%. In terms of age distribution, most participants fell between the ages of 21 to 23 with 114 (76%) students, indicating sample primarily consisted of students in their early twenties. Moreover, among the different courses, the 73 students from Food technology (BWD) program had the highest presentation, followed by Industrial Statistics (BWQ) (25.33%) and Mathematic Technology (BWA) (10.67%). In addition, the majority of respondents were in Year 4 (59.33%), indicating that final-year students made up the largest percentage of the sample.

In terms of academic satisfaction, 38% of students stated that they were somewhat satisfied with their academic. A significant portion (33.33%) maintained a neutral opinion while a small a smaller percentage (16%) expressed some level of dissatisfaction. The higher percentage of neutral responses might indicate that students have mixed experiences or that their satisfaction is influenced by various factors like workload, curriculum structure, or faculty support.

Regarding academic engagement, 48.67% of the students indicated that they engage in their studies sometimes, whereas 32.67% detailed engaging often. This suggests that while many students effectively take an interest in academic activities, there are fluctuations in their level of engagement. Only 8% of students detailed always being engaged, which may reflect challenges such as academic burnout, motivation levels, or outside commitments. Meanwhile, 10.67% of students admitted rarely engaging in their studies, which can be part of fundamental factors such as the need of interest, time constraints, or trouble in managing coursework.



(a)



(b)

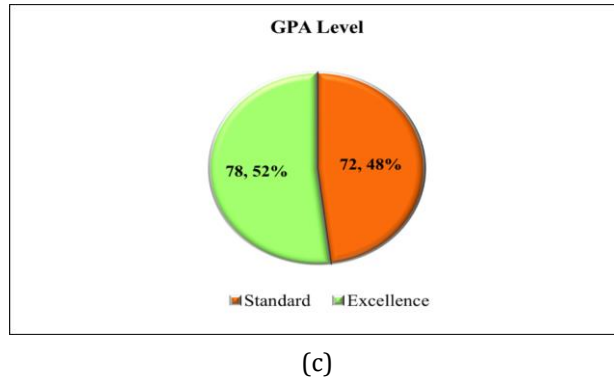


Fig. 1 Demographic of respondents (a) DASS-21 severity level; (b) PSQI level; (c) GPA range

Fig. 1(a) illustrates the bar chart of severity levels of DASS-21 for depression, anxiety, and stress among respondents. The findings indicate that a substantial portion of students experience psychological distress at varying levels. For depression, 38 students (25.33%) reported normal and moderate levels, while 39 students (26.00%) experienced severe depression, and 31 students (20.67%) fell into the extremely severe category. This suggests that a significant number of students struggle with emotional distress, potentially due to academic pressure, workload, and personal challenges. For anxiety, only 34 students had normal levels, whereas 63 students (42.00%) experienced extremely severe anxiety, making it the most prevalent psychological concern. The high proportion of students in this category highlights the urgent need for mental health awareness and support systems to help manage academic and personal stressors effectively. In terms of stress, 60 students reported normal levels, indicating that many can cope with their responsibilities. However, 26 students experienced severe stress, and 13 students were categorized under extremely severe stress, signifying that some struggle with burnout and time management issues.

Overall, anxiety is the most critical concern, with 42% experiencing extreme levels, while 66% of students fall within moderate to severe depression categories. Though stress levels are comparatively lower, they remain notable. These findings emphasize the need for mental health interventions and stress management strategies to improve students' well-being.

Fig. 1(b) shows a doughnut chart of PSQI level. According to the findings, 88 students (about 59%) fell into poor sleep quality category, whereas 62 students (about 41%) indicated to have good sleep quality. Given the majority of them have poor sleep pattern, this distribution could affect their general well-being and academic performance. Poor sleep quality is associated with increased stress levels, poor memory retention, and decreased productivity. In addition, sleep-deprived students may have difficulty managing their time, which may lead to decreased academic engagement, increased emotional distress, and further impact psychological well-being.

A bar chart in Fig. 1(c) illustrates the GPA range of the students. The dispersion of students' academic performance is shown where 78 students in about 52% achieved excellence with GPAs ranging from 3.50 to 4.00, whereas 72 students about 48% achieved standard with GPAs ranging from less than 3.50. This suggests that these respondents performed well academically. The difference between standard and excellence categories highlights the difference in achievement level. While most students perform well academically, a significant number still fall within the average range, as seen by the little difference between the two ranges. This could be due to variations in study habits, academic pressure, or additional commitments which affect performance.

3.2 Association Analysis

The research analyse the association among the FAST students' academic performance (GPA), gender, sleep quality (PSQI), and psychological factors (depression, anxiety, and stress).

Table 2 Chi Square test between Psychological Factor, PSQI, Gender and Academic Performance

Association between Psychological Factor and PSQI				Association between Gender, Psychological and GPA			
Variables	χ^2	p-value	Decision	Variables	χ^2	p-value	Decision
Depression and PSQI	6.895	0.142	Accept H_0	Gender and GPA	2.584	0.108	Accept H_0
Anxiety and PSQI	16.565	0.002	Reject H_0	Depression and GPA	5.675	0.225	Accept H_0

Stress and PSQI	4.173	0.383	Accept H_0	Anxiety and GPA	13.334	0.010	Reject H_0
PSQI and GPA	0.064	0.801	Accept H_0	Stress and GPA	2.889	0.577	Accept H_0

Based on the Table 2, the analysis revealed a significant association between anxiety and PSQI ($p = 0.002$), as well as between anxiety and GPA ($p = 0.010$). Both p -values were below 0.05 significance level, leading to the rejection of H_0 . This suggests a connection between higher anxiety levels, poorer sleep quality, and lower academic performance. Additionally, students experiencing higher anxiety tend to have worse sleep, and related to lower academic performance, which were reflected in their GPA. These findings highlight the importance of addressing anxiety-related issues, as they appear to impact both students' sleep patterns and effects on overall academic performance.

Conversely, the analysis did not find significant associations for several other variable pairings. For depression and PSQI ($p = 0.142$), stress and PSQI ($p = 0.383$), PSQI and GPA ($p = 0.801$), Gender and GPA ($p = 0.108$), Depression and GPA ($p = 0.225$), and Stress and GPA ($p = 0.0577$), the p -values exceeded the 0.05 significance level, leading to accepting H_0 . This concludes that there is sufficient evidence to conclude that there is no association between these categorical variables.

Overall, the findings from this study underscore the significant impact of anxiety on both sleep quality and academic performance among university students. Anxiety was found to have a clear association with poorer sleep quality and lower academic achievement. However, no significant associations were found between depression, stress, gender, and the academic and sleep outcomes in this sample. These results suggest that while anxiety is a key factor influencing students' well-being and academic success, other psychological and demographic factors may not play as significant a role in the studied population.

3.3 Correlation Analysis

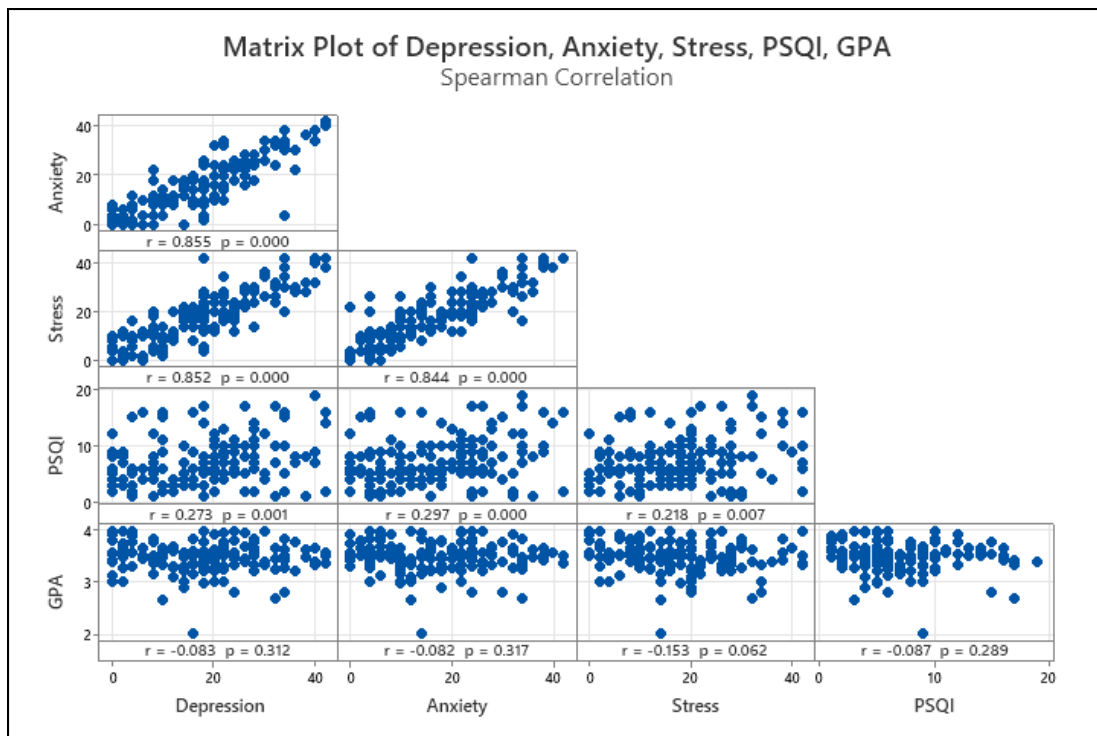


Fig. 2 The matrix plot of psychological factors, PSQI, and Academic Performance

Fig. 2 shows the matrix plot of the Spearman Correlation Analysis between psychological factors, sleep patterns, and academic performance. Significant strong positive correlations were found among psychological factors, with Anxiety and Depression showing a correlation of 0.855 ($p = 0.000$), followed by Anxiety and Stress at 0.852 ($p = 0.000$), and Depression and Stress at 0.844 ($p = 0.000$). These findings indicate a strong interrelationship between psychological distress variables. Additionally, PSQI exhibited weak positive correlations with Depression ($r = 0.273, p = 0.001$), Anxiety ($r = 0.297, p = 0.000$), and Stress ($r = 0.218, p = 0.007$), suggesting that poorer sleep quality is linked to increased psychological distress, though the associations are weaker than those among psychological factors.

When assessing the correlation between psychological factors, sleep patterns, and academic performance, weak negative correlations were observed. GPA showed an inverse relationship with Depression ($r = -0.083, p = 0.312$), Anxiety ($r = -0.082, p = 0.317$), Stress ($r = -0.153, p = 0.062$), and PSQI ($r = -0.087, p = 0.289$), but none of these correlations were statistically significant. This suggests that while psychological distress and poor sleep quality are interrelated, their direct impact on academic performance is minimal, implying that external factors may have a stronger influence on students' GPA.

4. Conclusion

The analysis indicated that while the majority of students reported normal levels of psychological well-being, a significant number of students exhibited mild to extremely severe levels of depression, anxiety, and stress. Descriptive statistics showed that 59% of students experienced poor sleep quality, raising concerns about its impact on cognitive function and learning abilities. Chi-square tests revealed significant association between anxiety and PSQI, as well as between anxiety and GPA. Correlation analysis demonstrated strong positive relationships between depression, anxiety, and stress, along with low correlations between these psychological factors and PSQI. However, the relationships between these variables and GPA were weak, indicating that academic performance is influenced by additional external factors beyond mental health and sleep patterns. These findings highlight the need for targeted institutional interventions to support students' psychological well-being and promote healthier sleep habits.

Acknowledgement

The authors would like to thank the Faculty of Applied Sciences and Technology, Universiti Tun Hussein Onn Malaysia, for its support.

Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Tarsayini Gobee, Azme Khamis; **data collection:** Tarsayini Gobee; **analysis and interpretation of results:** Tarsayini Gobee, Azme Khamis; **draft manuscript preparation:** Tarsayini Gobee, Azme Khamis. All authors reviewed the results and approved the final version of the manuscript.*

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