Nigerian Association of Clinical Psychologists (NACP)

Nigerian Journal of Clinical Psychology (NJCP)

ISSN: 0189-2304
E-ISSN: 2971-6306

2025, Vol.15, No. 1, 71 - 92
http://nacpjournal.org.ng
nacpjournals@gmail.com
DOI:

THE MEDIATING ROLE OF SLEEP QUALITY IN THE RELATIONSHIP BETWEEN ACADEMIC STRESS AND TEST ANXIETY AMONG UNIVERSITY UNDERGRADUATES

[1]**Joshua Oludare Ogunsemi, PhD**
[1]Department of Psychology, Redeemer's University, Ede, Osun State, Nigeria
(Corresponding email: ogunsemio@run.edu.ng, Mobile: +234 813 912 1197)

ABSTRACT

Test anxiety is a prevalent issue that affects university undergraduates globally. Test anxiety and academic stress are known to be related. However, the possible mechanisms behind this association need to be uncovered. This study aims to ascertain if the relationship between test anxiety and academic stress is mediated by sleep quality among University of Ibadan undergraduates. A cross-sectional survey design was adopted to select 360 students (male 176 and female 184), aged 16 to 30 years (M = 20.12, SD = 2.22), utilising a multi-stage sampling technique. Participants responded to three instruments: Perception of Academic Stress Scale, Test Anxiety Inventory-5, and Sleep Quality Scale. Descriptive and inferential statistics were performed by using SPSS and AMOS (SEM). The SEM analysis showed a good fit of the data ($\chi 2 = 11.947$, $df = 5$, $p < .05$), RMSEA = 0.062 (90% CI [0.02, 0.10]), GFI = 0.99; CFI = 0.95; TLI = 0.93; SRMR = 0.05, to the hypothesised model. Academic stress and sleep quality explained 24% of the variance in test anxiety. Academic stress and sleep quality had an inverse relationship ($\beta = -0.18$, $p < .05$). In contrast, sleep quality negatively predicted test anxiety ($\beta = -0.21$, $p < .01$). A strong direct effect ($\beta = 0.37$, $p < .01$) and low indirect effect ($\beta = 0.04$, 95% CI [-0.16, -0.075]) of academic stress on test anxiety partially mediated by sleep quality were observed. Test anxiety is influenced directly and indirectly by academic stress through sleep quality. Prioritising sleep could help improve overall mood among students with test anxiety.

Keywords: Test anxiety, Academic Stress, Sleep Quality, Undergraduates.

INTRODUCTION

Test anxiety is a form of situation-based anxiety that usually affects individuals, especially students, in an examination or other evaluative conditions (Huntley et al., 2023), and it is controlled by individuals' thought patterns, personality and locus of control (Zheng et al., 2023). It is a psychological and behavioural condition, with worry and nervousness as the primary characteristics, and come with distinctive emotional discomfort and physiological arousal. Undergraduates experiencing test anxiety are also apprehensive and tense when reading and preparing for tests or writing their exams (Adams et al., 2021; Zheng et al., 2023). Aside from its linkage with poor academic outcomes (Von Der Embse et al., 2018) and struggles adjusting to school academic and social activities (Ne Eman-Haviv & Bonny-Noach, 2019; Zheng et al., 2023), the incidence of test anxiety can also impair the physical, mental and social well-being of students and increases the risk of depression and anxiety (Leadbeater et al., 2012). Unresolved test anxiety can have harmful physical effects on people, including eating disorders, depression, sleep disturbances, and tearfulness. Suicidal thoughts and self-harm are possible outcomes of high level of test anxiety in some situations (Bentley et al., 2016; Rodway et al., 2016).

Anxiety in evaluative and testing conditions is highly prevalent in tertiary institutions due to their competitive environment; students are encumbered with the need to perform exceptionally well. This may result from the high risks of having to retake examinations or spend an extra year or more for failed courses (Ali & Mohsin, 2013; Olusa et al., 2024). In addition, given the value the society places on academic achievement, Nigerian university students may experience high cultural expectations to do well in their studies (Balogun et al., 2017; Ubaka et al., 2015). The need to perform well in school may likely impact undergraduates stress response and lead to anxiety during examination or other testing situations (Oduwaiye et al., 2017; Akinsola & Nwajei, 2013). Although test anxiety has been reported to be highly prevalent amongst Nigerian students (e.g., Akanbi, 2013; Akinsola & Nwajei, 2013; Omoyemiju, 2022; Ngwoke et al., 2013; Ugwuanyi et al., 2020) at various levels of education, only a few studies are available on the issues contributing to its prevalence among university undergraduates in the Nigerian setting. Test anxiety is influenced

by a number of factors such as locus of control (Onyekuru & Ibegbunam, 2014), stress, oral assessment, an overwhelming amount of coursework, a lack of a structured studying plan, lack of social support, first-year academic level and age (Hanfesa et al., 2020; Ngbea & Kwaghgbah, 2021), Cumulative Grade Point Average (CGPA), financial difficulties and parental educational status (Tsegay et al., 2019). It is imperative to consider other factors that could help limit the adverse effects of test anxiety on undergraduates. At the same time, considerable attention is put on developing an interventional programme that addresses the tides.

University life comes with a variety of stressors, and academic stress ranks high among them (Zheng et al, 2023). Academic stress is a widespread concern across all levels of academic endeavours (Yang et al., 2021). It encompasses everything from the pressure of writing an exam, to meeting coursework and project deadlines and the overall students' academic workload (Tus, 2020). This stress can manifest in both mental and physical symptoms, such as the feeling of being overwhelmed, sleeplessness and depressive moods (Adom et al., 2020). Academic stress can affect undergraduates' well-being and lower their academic motivation, with the likelihood of leaving school (Akgun & Ciarrochi, 2003; Sun et al., 2013; Dan et al., 2021).

Test anxiety and academic stress have been shown to be sufficiently related in some past studies (Bhat, 2017; Stankovska et al., 2018; Trigueros et al., 2020). According to Izzati et al. (2020) and Deng et al. (2022), examination related anxiety is a significant source of stress among students' population. Students who are vulnerable to test anxiety are often nervous when encountering situations where they will be evaluated or examined, hence, academic stress has been linked with marked biological and psychosocial responses (Stankovska et al., 2018). Using the deficits model of test anxiety, von der Embse et al. (2018) contends that the bodily and psychological states brought on by academic stress can lead to perceived sense of deficiencies in the skills and abilities needed to adjust or perform effectively when assessing test or examination situations, as well as affect the emergence and intensity of test anxiety. In addition, the general strain theory also suggests that individuals who are exposed to a stressful environment may develop emotional distress (Agnew, 2017), of which test anxiety is the typical anxiety of this kind of distress in the testing or evaluative

situation, which usually stems from adverse appraisals of threat and negative evaluations of academic situations.

Sleep quality is described as the degree to which an individual's sleep is restorative, revitalizing, refreshing and interruption-free (Nelson et al., 2022). The multiple stressors that university undergraduates encountered in the course of their studies could impede the quality of their sleep, leading to shorter sleep duration, which in turn leads to increased test anxiety when they are later scheduled for an examination or assessment (Hamilton et al., 2021; Carskadon et al., 2002). It has been demonstrated that exposure to academic stressors can have a detrimental impact on sleep quality by making it harder to fall asleep, stay asleep, or have a pleasant sleep (Zheng et al., 2023; Adams et al., 2022; Galambos et al., 2013; Zhang et al., 2024). Poorer sleep brought on by elevated stress levels can aggravate test anxiety by interfering with cognitive function (memory, attention, reasoning and problem-solving), increasing emotional sensitivity, and lowering self-confidence making it harder for individuals to manage anxiety effectively (Adams et al., 2022; Alotaibi et al., 2020; Nelson et al., 2022; Hamilton et al., 2021). Narmandakh et al. (2020) also suggested that test anxiety can affect sleep quality reciprocally by raising the body's arousal level and body's stress response. Undergraduates who are anxious about testing situations may suffer from excessive rumination which raises the cortisol levels, which may disrupt sleep regulation (sleep cycles and depth) and make it harder to fall or remain asleep (Hamilton et al., 2021).

Past studies have examined the association between academic stress and test anxiety (Carpi & Vestri, 2022; Zhou et al., 2022), but only few studies have evaluated the mediational role of sleep quality in the academic stress– test anxiety relation. For instance, Rianti et al. (2024) revealed that academic stress and test anxiety are positively related, but the mediating effect of sleep quality were not determined. Adams et al. (2022) assessed the moderating effect of sleep quality in the relationship among test anxiety, academic success and mood, their findings show that increasing rates of test anxiety and sleep impairment predicted negative mood among university students. It has been demonstrated that poor sleep quality has an adverse effect on students' ability to cope with academic stress (Carpi & Vestri, 2022). Students who are experiencing poor sleep quality frequently dealt with high levels of academic stress, which

subsequently led to symptoms of anxiety or depression (Lai et al., 2024; Zhang et al., 2018), impaired psychosocial functioning (Tavernier and Willoughby, 2014), and poor academic performance (Alwhaibi & Aloola, 2023).

Additionally, those who were exposed to heightened state of academic stress were more likely to experience emotional disturbances at the same time (Alhamed, 2023; Ghorbani et al. et al., 2008), and had lower sleep quality (Liu et al., 2017). Sleep quality has received considerable attention as a mediating factor for a number of psychological variables, but not for explaining how academic stress may be associated with test anxiety. For instance, other relationship pathways have also been studied, for example, Zhao et al. (2021) in their study among Chinese general population, anxiety was found to mediate the relationship between perceived stress and sleep quality, while in a study of nursing students, perceived stress mediated the associations between sleep quality and anxiety and depression (Zhang et al., 2018). In view of the outcomes of past studies, the main objective of this study is to find out the prevalence rate of test anxiety and to test a mediation model of the influence of academic stress on test anxiety mediated by sleep quality among university undergraduates.

Objectives

1. To examine the extent to which academic stress independently predicts sleep quality among students.
2. To assess the influence of sleep quality on students' test anxiety.
3. To determine whether academic stress significantly predicts test anxiety.
4. To investigate the mediating role of sleep quality in the relationship between academic stress and test anxiety.
5. To evaluate the joint predictive power of academic stress and sleep quality on test anxiety.

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

H_1: A significant proportion of university undergraduates experience moderate to high levels of test anxiety.

H_2: Perceived academic stress and sleep quality are significantly related to test

anxiety among university undergraduates.

H_{3a}: Academic stress significantly predicts poorer sleep quality among undergraduates.

H_{3b}: Sleep quality significantly predicts lower levels of test anxiety among undergraduates.

H_{3c}: Sleep quality significantly mediates the relationship between academic stress and test anxiety.

H_4: Gender significantly predicts test anxiety among undergraduates.

H_5: Age significantly predicts test anxiety among undergraduates.

METHOD

Research Design

This study employed a cross-sectional descriptive design, utilizing a self-report questionnaire to examine the mediating role of sleep quality in the relationship between academic stress and test anxiety among undergraduate students.

Participants

Participants consisted of 360 undergraduate students from the University of Ibadan located in Oyo State, Nigeria. The study site included four selected halls of residence within the university campus. Among them, 176 (48.9%) were male, and 184 (51.1%) were female, with ages ranging from 16 to 30 years (M = 20.12, SD = 2.22). In terms of academic level, 9.4% of the participants were in 100 level, 28.6% in 200 level, 18.3% in 300 level, 33.3% in 400 level, and 10.3% in 500 level. This demographic diversity provided a broad representation of the student population. A multistage sampling technique was adopted for participant selection. The process involved stratified sampling to ensure proportional representation across academic levels, followed by systematic and convenience sampling to select students from four different halls of residence. This method was chosen to increase representativeness while accommodating logistical constraints in accessing participants within their residential settings.

Research Instrument

Sociodemographic Characteristics:

The participants responded to basic demographic questions age, gender, and level of study.

Sleep Quality Scale (SQS)

This is a 28-item scale developed by Yi, Shin, and Shin (2006) used to measure sleep quality in individuals. It is measured on a 4-point Likert scale ranging from 1-Strongly Disagree, 2-Disagree, 3-Agree, to 4-Strongly Agree. It is divided into six subscales: daytime symptoms (items 1 to 7), restoration after sleep (items 8 to 11), problems initiating and maintaining sleep (items 12 to 16), difficulty waking (items 17 to 20), satisfaction with sleep (items 21 to 24), and sleep quality (items 25 to 28). Sample items for daytime symptoms include; "I feel drowsy during the day", for restoration after sleep include; "I feel refreshed after waking up", for problems initiating and maintaining sleep include; "I have difficulty falling asleep", for difficulty waking include; "I find it hard to get up in the morning", for satisfaction with sleep include; "I am satisfied with my sleep quality", and for overall sleep quality include; "Overall, I think I have good sleep quality". The scale is scored using total scores for each subscale and mean scores. Cronbach's alpha, a measure of internal consistency dependability, was 0.89 for the 28 items on the scale (Yi et al., 2006). In the present study, it was found that SQS had Omega total (ωt) coefficient of 0.89.

Perception of Academic Stress Scale (PASS)

This is an 18-item scale developed by Bedewy and Gabriel (2015) used to measure perceptions, academic stress and its sources in students. It is measured on a 5-point Likert scale ranging from 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, to 5-Strongly Agree. It is divided into four subscales inclusive of; pressures to perform (items 1 to 5), perceptions of workload (items 6 to 9), academic self-perception (items 10-13) and time restraints (items 14 to 18). Sample items for pressures to perform include; "The competition with my peers for grades is quite intense", for perceptions of workload include; "I believe that the amount of work assignment is too much", for academic self-perception include; "I am confident that I will be successful in my future career" and for time restraints include; "I have enough time to relax after academic work". The scale was scored using total scores for each subscale and mean scores. In the present study, it was found that PASS had Omega total (ωt) reliability coefficient of 0.84.

Test Anxiety Inventory-5 (TAI-5)

This is a 5-item scale developed by Taylor and Deane (2002) used to measure levels of test anxiety in students. It is measured on a

5-point Likert scale ranging from 1-Not at all, 2-Somewhat, 3-Moderately, 4-Quite a bit, to 5-Very much so. The scale assesses general feelings of anxiety and worry associated with tests and examinations. Sample items include; "I feel anxious before an important test", "During tests, I find myself thinking about the consequences of failing", and "I feel nervous and tense when I think about upcoming tests". The scale is scored using total scores and mean scores. In the present study, it was found that TAI-5 had Omega total (ωt) coefficient of 0.88.

Procedure

A total of 400 questionnaire copies were distributed to students in their respective halls of residence, with the assistance of four trained research assistants. Prior to administration, the researchers obtained permission from the hall porters and approached students in their rooms. The nature and purpose of the study were explained to the participants, and those who gave verbal consent were provided with self-administered questionnaire. Participants were also informed of their rights, including the freedom to withdraw from the study at any point without penalty. The data collection process lasted five weeks. Of the 400 distributed questionnaires, 387 were returned, but only 360 were completed accurately and deemed valid for data analysis. This resulted in a 90% response rate.

Data Analysis

Data were analysed using SPSS v. 23 and AMOS v. 27. The reliability of the measurement tools was calculated using Omega total (ωt). Participants demographic characteristics were analysed using frequency, mean, standard deviation and percentage. Pearson's correlation coefficient was utilised to assess the relationship between the study's variables. Structural equation modelling was employed to examine the suggested research model of the association between academic stress and test anxiety mediated by sleep quality. To evaluate the fitness of the hypothetical path model, the normed $\chi 2$, good- ness-of-fit index (GFI), comparative fit index (CFI), root mean square residual (RMSR), normed fit index (NFI), root mean square error of approximation (RMSEA), and Tucker–Lewis Index (TLI) were used. Normed $\chi 2$ was set as 3 or lower; the GFI, CFI, NFI and TLI were all 0.90 or greater; the RMSEA was 0.08 or lower; and the RMSR was 0.05 or lower (Bae, 2017; Hair et al., 2010). Additionally, squared multiple correlations (SMC) of the exogenous

variables on test anxiety in the path model were calculated. Bootstrapping was used to verify the significance of the standardized direct and indirect effects and the total effect of factors affecting test anxiety. The number of bootstrapping samples was 2000. Standardised beta coefficients were used because standardised regression weights can be helpful to identify the degree of relative influence between variables affecting the endogenous variables (Bae, 2017). All analyses were performed with a 95% confidence level and a 5% margin of error.

Ethical Considerations

Ethical approval for the study was obtained from the Research Ethics Panel of the Department of Psychology at Redeemer's University, Nigeria. Participants were assured of the confidentiality and anonymity of the information they provided. The study adhered strictly to ethical standards guiding research involving human participants, particularly concerning voluntary participation and informed consent.

RESULTS

There is a significant proportion of university undergraduates experiencing moderate to high levels of test anxiety.

Table 1: Frequency and Percentage Showing the Prevalence of the Test Anxiety

		Frequency	Percent
	Absence of Symptoms	64	18.9
	Low Test Anxiety	89	24.7
	Moderate Test Anxiety	165	45.8
	High Test Anxiety	38	10.6
	Total	360	100.0

Table 1 reveals that many of the university undergraduates fall within the moderate level of test anxiety (N=165; 45.8%), while those with low level of test anxiety are (N=89; 24.7%) of the sample, while those with high level of test anxiety was reported among (N=38; 10.6%) of the undergraduates. The total percentage of students experiencing moderate to high test anxiety is 56.4%.

Table 2: Proportion Test

Hypothesized Proportion (p_0)	Observed Proportion (p_1)	Z-Score	p-Value
0.50	0.564	2.42	< 0.05

The results from the proportion test reveal that more than half of the university undergraduates in the sample (56.4%) experience moderate to high levels of test anxiety. The observed proportion (0.564) is significantly different from the hypothesized proportion (0.50), as indicated by the Z-score of 2.42 and p-value less than 0.05. This proportion is significantly higher than the hypothesized 50%. Therefore, H_1 is supported, indicating that a significant proportion of students experience elevated levels of test anxiety, which could have implications for academic performance and well-being.

Hypothesis 2 (H_2): *Perceived academic stress and sleep quality are significantly related to test anxiety among university undergraduates.* The results is presented in table 3 showing the correlational Analysis between Independent Variables and Test Anxiety.

Table 2: Correlation Showing the Relationship among the Variables

variables	1	2	3	4	5	6
1. Age	1					
2. Gender	-.11*	1				
3. level of study	.15**	-.13**	1			
4. Perceived Academic Stress	-.13*	-.08	.27**	1		
5. Sleep Quality	-.02	.07	-.18*	-.18**	1	
6. Test Anxiety	-.06	.13*	.25**	.42**	-.28**	1
Mean	20.05	-	-	66.33	67.87	13.63
SD	2.25	-	-	12.06	7.28	3.15

The result in Table 3 showed the test of the relationship between variables. From the table, it was indicated that perceived academic stress had a significant relationship with sleep quality [r (360) = -.18, p <.05] and test anxiety [r (360) = .42, p <.01] which implies that an increase in perceived academic stress tends to decrease sleep quality and increase test anxiety among university undergraduates. Sleep quality had a significant negative relationship with test anxiety [r (360) =

-.28, *p* <.01]. It implies that when an individual experience poor sleep quality, their levels of test anxiety increase. The socio-demographic factors indicated that gender had a significant relationship with perceived academic stress [r (360) = -.13, p <.05] and sleep quality [r (360) = -.20, p <.01], however, there is a positive relationship between gender and test anxiety [r (360) = .25, p <.01]. Level of study had a significant relationship with perceived academic stress [r (360) = .19, p <.01] and a negative significant relationship with test anxiety [r (360) = -.11, p <.05]. Age had no significant relationship with perceived academic stress, sleep quality and test anxiety (p >.05]. Hypothesis 2 is accepted. These findings confirm that higher academic stress is associated with poorer sleep quality and greater test anxiety, while better sleep quality is associated with reduced test anxiety among university undergraduates.

Mediation Model

The structural equation modeling was utilized to examine the indirect associations between academic stress and test anxiety. The model fit was relatively good, as the hypothesized mediation model, after controlling for age and gender, demonstrated acceptable indices: ($\chi 2$ = 11.947, N = 360, df = 5, p < .05), RMSEA = 0.062 (90% CI [0.02, 0.10]), GFI = 0.99; CFI = 0.95; TLI = 0.93; SRMR=0.05. These results indicate that the model provides a good representation of the data.

Table 3: *Mediation analysis showing the effect of academic stress on test anxiety through sleep quality*

			Percentile bootstrap 95% CI	
Hypothesized paths	**Point Estimate (β)**	**SE**	**Lower Limit**	**Upper Limit**
Academic Stress → Sleep Quality	-0.18*	0.03	-0.269	-0.74
Sleep Quality → Test Anxiety	-0.21**	0.02	-0.313	-0.112
Direct Effect				
Academic Stress → Test Anxiety	0.37**	0.02	0.257	0.536
Indirect Effect				
Academic Stress → Sleep Quality → Test Anxiety	0.4**	0.02	-0.016	-0.075

*Note. All the estimates provided here are standardized estimates. CI = confidence interval. *p < .05. **p < .01.*

Hypothesis 3a (H_3a): Academic stress significantly predicts poorer sleep quality among undergraduates

The mediation model tested whether academic stress significantly predicts sleep

quality, as a precursor to its effect on test anxiety. The analysis revealed that academic stress significantly and negatively predicted sleep quality (β = –0.18, $p < .05$). This means that increases in academic stress are likely to result in a decline in students' sleep quality. The negative association suggests that undergraduates who experience high academic demands tend to report more disrupted or insufficient sleep. Therefore, the prediction made in Hypothesis 3a is supported and accepted.

Hypothesis 3b (H_3b): Sleep quality significantly predicts lower levels of test anxiety among undergraduates

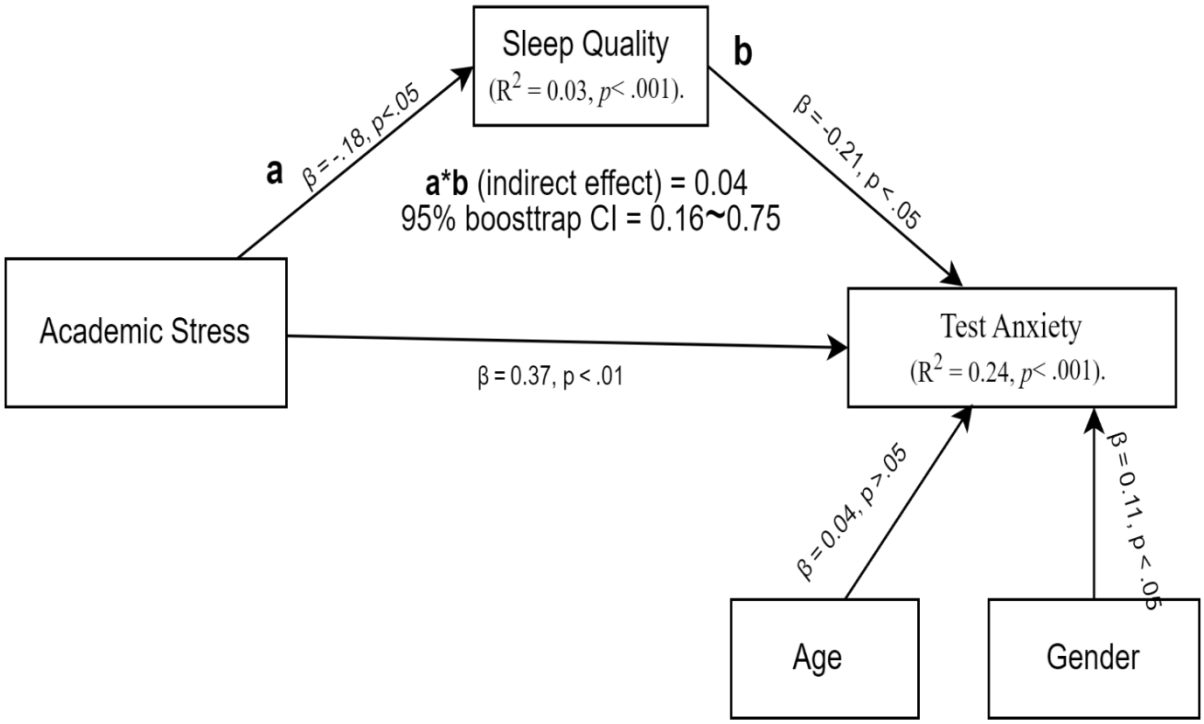
In the second part of the mediation model, sleep quality was found to significantly and negatively predict test anxiety (β = –0.21, $p < .01$). This implies that students who report better sleep quality are likely to experience lower levels of anxiety related to testing situations. The strength and direction of the relationship reinforce the notion that adequate rest and sleep hygiene can buffer against anxiety-provoking academic situations. Therefore, the predictive relationship stated in Hypothesis 3b is supported and accepted.

Hypothesis 3c (H_3c): Sleep quality significantly mediates the relationship between academic stress and test anxiety

Finally, the mediation analysis confirmed that sleep quality significantly mediates the relationship between academic stress and test anxiety. The indirect effect from academic stress to test anxiety through sleep quality was significant (β = 0.04, 95% CI [–0.016, –0.075]). This indicates that changes in sleep quality can explain part of the impact of academic stress on test anxiety. Meanwhile, the direct effect of academic stress on test anxiety remained significant (β = 0.37, $p < .01$), suggesting that while sleep quality does carry part of the predictive weight, it does not fully account for the relationship. These results confirm a partial mediation, whereby poor sleep partially explains how academic stress leads to increased anxiety in test settings. Thus, Hypothesis 3c is accepted.

Ogunsemi, J. O. (2025).
The mediating role of sleep quality in the relationship between academic stress and test anxiety among university undergraduates

Figure 1: *Path analysis diagram showing* the standardised estimates of the *relationships between academic stress, sleep quality and test anxiety.*



Covariate (Gender was dummy coded – 0 = male, 1=female)

Hypothesis 4 (H_4): Gender significantly predicts test anxiety among undergraduates

The path analysis included gender as a covariate, with gender dummy coded as 0 for male and 1 for female. The analysis showed that gender significantly predicted test anxiety among undergraduates, with a standardised path coefficient of β = 0.11, p < .05. This result suggests that female students are more likely to experience higher levels of test anxiety compared to their male counterparts. The direction and significance of this relationship indicate that gender plays a modest but notable role in predicting emotional reactions to academic testing. Therefore, Hypothesis 4 is accepted.

Hypothesis 5 (H_5): Age significantly predicts test anxiety among undergraduates

Age was also included in the model as a continuous covariate. However, the analysis revealed that age did not significantly predict test anxiety (β = –0.04, p > .05). This implies that variations in students' ages do not meaningfully influence their levels of test anxiety within the sample studied. Therefore, the predictive relationship proposed in Hypothesis 5 is not supported, and the hypothesis is rejected.

DISCUSSION

This study investigated the relationships between academic stress and test anxiety among university undergraduates, explicitly focusing on the mediating roles that sleep quality has in the relationship. This study showed a strong positive relationship between academic stress and test anxiety and an inverse relationship between academic stress and sleep quality. The outcome of the study was in line with past studies showing that university undergraduates who scored high on academic stress experience high levels of test anxiety. The link between poor sleep quality and test anxiety was established in past studies (Imdad et al., 2024; Zhang et al., 2024) and was confirmed in the present study. This study showed that academic stress and sleep quality were significantly inversely correlated. This indicates that undergraduates who are overwhelmed with academic-related stressors will experience poor sleep quality, supporting the idea that academic stressors can disrupt sleep patterns, resulting in few hours of sleep and more sleep disturbances (Galambos et al., 2013). For many students, academic stress is experienced as a result of the need to manage a demanding course load, a lack of study space, time management, deadline pressure, classroom competition, and the need to do well academically (Mofatteh, 2020; Zhang et al., 2018). According to this study, university undergraduates who are stressed about their studies may experience negative emotional states like feeling helpless and anxious, which can worsen emotional disturbances and cognitive alertness. They may also engage in excessive nighttime rumination and worry, which can disturb sleep patterns and lower the quality of their sleep and academic performance (Adams et al., 2022; Orchard et al., 2020). This result is consistent with previous research findings by Lawson et al. (2019) in Ghana on the relationship between sleep patterns and academic performance in medical students.

The relationship between test anxiety and the internal mechanism of academic stress has not been frequently examined in prior research. Academic stress not only directly impacted test anxiety but also had an impact on test anxiety via sleep quality, according to this study. Although with a smaller beta value, the result of this study showed that sleep quality is one of the mechanisms influencing the interaction between academic stress and test anxiety. Prior studies have shown that university

students face uncertainty about their academic performance, social life, and future employment opportunities (Zhang et al., 2018; Ghorbani et al., 2008), which may result in higher levels of stress.

Relatedly, this finding revealed that academic stress has the potential to both directly and indirectly impact anxiety related to examinations and other evaluative situations by influencing an individual's sleep patterns (Adams et al., 2022; Alwhabi et al., 2023). This implies that university students exposed to stressful academic environments may struggle with poor sleep patterns, and indirectly lead to them being test anxious. Additionally, university students with test anxiety are usually enmeshed in negative appraisals of their capabilities. They lack the skill to promptly integrate resources and use adequate ways to successfully cope with various academic pressures (Alotaibi et al., 2020). According to social cognitive theory, students' level of anxiety or depression could be affected by the manner by which they rate their personal effectiveness (Zheng et al., 2023; Alhamed, 2023). Exposure to stress can affect sleep patterns and lead to poor sleep quality among undergraduates who are lacking the capacity to handle academic pressure effectively (Mofatteh, 2020; Hamilton et al., 2021), past studies have identified the role of heightened startle reactions that follows the exposure to high level of stress that interfere with sleep quality as one of the factors that link academic stress to poor sleep and psychological distress like test anxiety (Time et al., 2024; Tran et al., 2023; Xiong et al., 2019).

These results are essentially in line with previous studies conducted in diverse populations that considered health related quality of life, which found that sleep quality mediated the relationships between negative emotional states and quality of life among Italian medical students (Carpi & Vestri, 2022). Alvaro et al. (2013) had earlier identified the bidirectional relationship between poor sleep, anxiety and depression in a systematic review. Sleep quality also mediated the relationship between optimism and mental health of college students a northeast public university in the United States (Lai et al., 2024). Another study by Hamilton et al., (2021) also established a reciprocal bidirectional relationship between poor sleep and test anxiety. It is therefore plausible that poor sleep quality mediates the association between academic stress and test anxiety, given the previously discussed bidirectional and recursive

relationship between psychological disturbances and inadequate sleep.

When considering gender differences in test anxiety, the current study identified a high level of test anxiety among the female undergraduates. This finding suggests that gender might play a role in the experience of test anxiety, with females being more susceptible to higher test anxiety levels. In addition, these finding is consistent with published studies that included female gender as a factor in the level of test anxiety (Aydin, 2017; Harris et al., 2019). Additionally, the findings of this study are consistent with other research that discovered that disparities between female students and their male peers might be the consequence of distinct physiological and psychological reactions to stress reactivity, which could lead to various coping strategies and the increased prevalence of stress-related problems among female students (Barbayannis et al., 2022). For instance, some literature attributed the disparities in the experience of test anxiety to the meaning each gender attaches to testing situations (Barbayannis et. al., 2022; Gao et al., 2020). In the testing and evaluative scenario, males were more likely to have behavioural or athletic concerns than females, who were more likely to have mental and emotional concerns (Zheng et al., 2023; Wuthrich et al., 2020). While females were more likely to view evaluative and competitive circumstances as a threatening situation, react fearfully, and struggle with confidence in completing the task, males were more likely to view testing situations as a challenge and choose strategies based on their ability to complete the task (Zheng et al., 2023).

Conclusion and Recommendations

The present research shows that academic stress and sleep quality are factors that significantly impact test anxiety among university undergraduates across the selected universities in Osun State. Also, the findings of this study observed that sleep quality partially mediated the relationship between academic stress and test anxiety. This indicated that sleep quality played significant role in the relationship between academic stress and test anxiety. Given the limited numbers of studies examining the mediating role of sleep quality in the relationship between academic stress and test anxiety, further studies are needed to investigate additional factors that might link academic stress and test anxiety, such as socio-economic status, psychological wellbeing, resilience, self-esteem and personality traits. Despite using standardised tests to examine the variables of this study, there are some limitations

inherent in this study. First, the study sample was exclusively drawn from three faculties at a single public university in Nigeria, resulting in a small sample size and thereby limiting the generalizability of the findings to broader populations or countries. Second, this study utilises a quantitative cross-sectional study, which makes the determination of a causal relationship between study variables difficult. In the future, researchers can conduct longitudinal tracking further to explain the impact of academic stress on test anxiety. Future studies should employ large sample size that cut across different universities for generalizability of the results and consider a longitudinal study to ensure that the patterns of influence of the study variable are measured over the years.

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