Original Research

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Internet Addiction and Academic Fatigue, Engagement, and Performance Among Undergraduates in Southwestern Universities in Nigeria

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Abstract

Objective: Internet addiction among university undergraduates may deeply impact their academic lives. This study investigated the association between academic fatigue, academic engagement, academic performance, gender, and internet addiction and how the variables jointly and relatively predict internet addiction among undergraduates in southwestern universities in Nigeria.

Method: The correlational research type of the non-experimental research design was adopted for this study. A multi-stage sampling procedure was used to select 1,157 students. The main variables were the Internet Addiction Test ($r = 0.82$) and the Academic Fatigue Questionnaire ($r = 0.85$; both adapted), as well as the Academic Engagement Scale ($r = 0.93$; researcher developed) and cumulative grade point average. We analyzed the data using frequency, percentages, correlation, and multiple regression.

Results: Undergraduate males are significantly more addicted to the internet than females. Academic fatigue, academic engagement, male gender, and internet addiction had a positive significant relationship, while academic performance did not. The multiple association among academic fatigue, engagement, male gender, and internet addiction was 0.6, while the variance accounted for by the predictors on internet addiction was 35.2%. Further, academic fatigue ($\beta = 0.346$, $t = 14.042$, $p < .01$), academic engagement ($\beta = 0.394$, $t = 15.741$, $p < .01$), and male gender ($\beta = 0.191$, $t = 7.609$, $p < .01$) are the potent predictors of internet addiction among undergraduates.

Conclusion: Academic fatigue, academic engagement, and gender (specifically male) are leading causes of increased internet addiction among undergraduates. This study contributes to the extant literature by providing evidence that academic performance or success does not necessarily predict internet addiction among university students. Nevertheless, undergraduates should be helped to moderate internet usage.

Keywords: *academic engagement, academic fatigue, academic performance, internet addiction.*

Introduction

The National Bureau of Statistics (2023) posits that well over 109 million Nigerians use the internet, and that number is only expected to rise. Youths comprise approximately 60% of the Nigerian population, and a significant portion of internet users are known to be undergraduate students. Young people in Nigeria, especially

students, are most likely to subscribe to internet data bundles that allow free internet access at certain hours of the day, especially at night. This option is affordable and allows longer hours online (Afolabi et al., 2022). However, most undergraduates often open their browsers intending to do academic research but instead waste time on social media, gaming, and other non-academic activities (Chowdhury, 2024; Taş, 2017). Internet usage has greatly impacted undergraduates' daily lives, more so than any other technology (Bachleda & Darhiri, 2018).

Internet addiction may have become one of the major challenges confronting educational institutions and stakeholders (Lebni et al., 2020). Social media, a component of the internet that is supposed to aid educational engagement and enhance academic performance in general, may have turned into a vehicle for academic decadence: excessive time spent surfing the internet among students has become worrisome (Chowdhury, 2024; Lozano-Blasco et al., 2022). Ordinarily, the internet and social media platforms are expected to improve social interactions, dissemination of information and opinion, academic engagement, and performance (Apuke & Ezeah, 2018; Ojokheta et al., 2018; Omokhabi, 2023; Fadiya & Akinola, 2024). Internet addiction, on the other hand, is associated with aggression, narcissism, and neuroticism (Sriati et al., 2022), poor academic performance (Lozano-Blasco et al., 2022), and academic fatigue (Bachleda & Darhiri, 2018). Internet addiction makes it more difficult for students to pay attention during class, engage in active learning in and outside the classroom, and participate in required school activities (Sert et al., 2019). Researchers have demonstrated the continued negative impact of internet addiction on academic performance (Chemnad et al., 2023). Therefore, the current study aims to investigate the predictors of internet addiction, including academic fatigue, engagement, and performance, as well as gender, among undergraduates in southwestern universities in Nigeria.

Rationale

Anecdotal records show a significant decline in student learning in many tertiary institutions in Nigeria, and undergraduates who complete their programs often fall short of the expectations of employers and the labor market, being considered "unqualified and unskilled" (Okoedion et al., 2019, p. 1). Despite the importance of student success, issues regarding academic fatigue, engagement, and performance and how these influence students' addiction to the internet have been underreported and are sparse in the extant literature (Bachleda & Darhiri, 2018). Some prior studies exist concerning the effect of internet addiction on mental and physical fatigue (Bachleda & Darhiri, 2018; Sert et al., 2019), self-esteem (Bahrainian et al., 2014), physical health problems (Lebni et al., 2020; Sert et al., 2019), impaired communication and phone obsession (Fernández-Andújar et al., 2022), academic stress (Sriati et al., 2022), mental health and academic performance (Aderinto, 2022), and academic engagement (Zhuang et al., 2023). Research on internet use and addiction among students is gaining ground in the literature, but more must be done (Alimoradi et al., 2019; Carbonell & Panova, 2017; Kabadayi, 2020). Within the African continent, no known study has explored these four phenomena (academic fatigue, academic engagement, academic performance, and gender) as they relate to internet addiction, which the current study investigates. Moreover, studies in the existing literature concentrated on examining the effect of internet addiction on these variables—and not the other way around. Against this backdrop, the current study fills a gap by investigating the extent to which internet addiction is predicted by undergraduates' academic fatigue, academic engagement, academic performance, and gender.

Research Questions

1. What is the strength and direction of the relationship among undergraduates' academic fatigue, academic engagement, academic performance, gender, and internet addiction?
2. To what extent would academic fatigue, academic engagement, academic performance, and gender jointly predict internet addiction?

3. What is the relative contribution of academic fatigue, academic engagement, academic performance, and gender to internet addiction?

Literature Review

Theoretical Underpinning

Underpinning this study are self-determination theory (SDT; Deci & Ryan, 2000) and cognitive behavioural theory (CBT). Deci and Ryan (2000) posited that all individuals have basic needs for autonomy (sense of self, making the right choices and decisions), competency (feelings of "I can"), and relatedness (feelings of attachment, such as love and care); these have been linked to internet addiction (Aderinto, 2022; Jaishy et al., 2023). Accessing the internet, particularly through mobile devices, can quickly meet an individual's basic needs (Song et al., 2004). When basic needs are not met, students may experience psychological distress, which increases their susceptibility to developing an internet addiction, by which they engross themselves in online activities (both academic and non-academic) to satisfy these needs (Chowdhury, 2024). Students seek satisfaction and are empowered to control or forge their true or false identity and physical characteristics via social media platforms (Fadiya, 2020; Jaishy et al., 2023). Unmet needs may be the cause of psychological distress, which either arises from internet use or predates the development of this behavior (Song et al., 2004). Students who struggle to maintain offline social relationships turn to online interactions for solace (C. Zhang et al., 2023), which can lead to internet addiction (DeSouza et al., 2022). These students may rely heavily on the internet to meet their desire for relatedness.

Internet Addiction

The internet continues to be one of the fastest-growing and most transformative technologies in human history, with global users increasing at geometric rates (Lebni et al., 2020). Despite advantageous features of the internet, such as entertainment, retail sales, and social sharing applications that make it easier and faster to obtain information (Rabeaa et al., 2023), its misuse can hamper student learning and academic performance (Maqableh et al., 2021). Internet use has continued to rise among university students, posing a greater risk of internet addiction (Lebni et al., 2020). Defining internet addiction is problematic (Bachleda & Darhiri, 2018). It has been referred to by many scholars as excessive internet use, cyberspace addiction, problematic internet use, pathological internet use, compulsive internet use, and a sense of psychological distress when internet access is unavailable (Aderinto, 2022; Cash et al., 2012). Bachleda and Darhiri (2018) have found that internet addiction has also been associated with a need to dedicate an increasing amount of time to internet-related activities. Internet addiction is sometimes defined as excessive use of the internet (especially social media) that interferes with an individual's everyday social and professional activities (Apuke & Ezeah, 2018). According to Dou and Shek (2021), internet addiction could also be understood as the act of spending excessive amounts of time on the internet while engaging in less physical activity and getting less sleep, which may lead later to mental and physical exhaustion.

Rabeaa et al. (2023) defined internet addiction as an impulse-control disorder of internet use that negatively affects an individual's living. For Salarvand et al. (2022), internet addiction is a compulsive spectrum disorder that includes five specific addictions: cyber-sexual addiction, cyber-relationship addiction, net compulsions, information overload, and computer addiction. It has become a major global problem that affects both the young and old (Ahmed, 2020), attracting increased research interest (Alimoradi et al., 2019; Carbonell & Panova, 2017; Kabadayi, 2020). Sriati et al. (2022) listed the harmful impacts of internet addiction to include dishonesty, aggression, narcissism, and neuroticism.

Gender

In recent years, gender-based studies have garnered the attention of researchers, particularly when it comes to psychologically-oriented problems (Akomolafe, 2022; Fadiya & Akinola, 2024; Osiesi et al., 2022; Sanni et al., 2023). Several studies have shown that males are more addicted to the Internet (Lin et al., 2021; Mari et al., 2023). Women have higher levels of academic fatigue than men but higher academic performance and engagement (Cabras et al., 2023; Fiorilli et al., 2022). In contrast, Zhao et al.'s (2023) findings indicate that men have higher academic engagement than females (Zhao et al., 2023), while Jiang et al. (2024) found that gender significantly impacts addiction to the internet.

Academic Fatigue

Academic fatigue is a condition of physical, mental, and emotional tiredness experienced by students as an aftermath of continuous academic obligations and stress; it is often referred to as academic burnout (Salgado & Au-Yong-Oliveira, 2021). It often occurs when students are under extreme pressure and have high expectations, large workloads, tough courses, and continuous deadlines in a competitive atmosphere (Madigan & Curran, 2021). It may also be caused by factors such as lack of sleep, poor time management, lack of enthusiasm, and being overburdened by academic commitments (Tomaszek & Muchacka-Cymerman, 2020). Academic fatigue seriously affects the individual and the academic community, resulting in decreased class and school participation, decreased interest in learning, decreased motivation and study habits, and increased likelihood of burnout (Madigan & Curran, 2021; Osiesi et al., 2023). In this study, academic fatigue refers to the academic burnout experienced by undergraduates while carrying out their academic activities on campus.

Scholars agree that undergraduates can suffer from physical and/or mental fatigue (Nikpour et al., 2020). Mental fatigue impedes cognitive functioning and abilities and can lead to a lack of academic concentration (Mehta, 2022), while physical fatigue entails the tiredness, pain, or feeling of weakness students suffer due to sleep deprivation (Mehta, 2022). Academic fatigue is one of the leading causes of academic underperformance (Bachleda & Darhiri, 2018). Complaints of academic fatigue among university students have risen recently, with some attributing the trend to student lifestyles, including internet addiction (Bachleda & Darhiri, 2018).

Academic Engagement

Academic engagement is a positive mental state that is related to learning and is manifested in students' preparation and hands-on activities during the learning process (Alrashidi et al., 2016; Amerstorfer & von Münster-Kistner, 2021; Fuertes et al., 2023). We define it as the amount of time students dedicate to academic pursuits, along with the standard of their educational endeavors, characterised by academic liveliness, devotion, and focus. Zhuang et al. (2023) asserted that internet addiction is a major detrimental factor impeding academic engagement. They also noted that addressing fatigue symptoms among students can foster their academic engagement. Academic engagement is a proxy for the quality of students' learning and a measure of their academic performance (Fuertes et al., 2023).

Academic engagement occurs when students actively participate in learning activities and are emotionally and intellectually committed to instructional tasks and interactions with other students; it indicates how attentive and involved students are in their learning and incorporates thoughts, feelings, and actions (Y. Zhang et al., 2018). Academic progress, the achievement of learning outcomes, and general well-being among students all depend on their levels of academic engagement (Salmela-Aro & Read, 2017). Academic engagement is determined by personal, teacher-related, environmental, and social factors (Alrashidi et al., 2016; Skinner et al., 2016). Skinner and Pitzer (2012) reported that academic engagement has behavioral, cognitive, and emotional components. Behavioral engagement is the degree to which students show interest in their studies (Salmela-Aro & Read, 2017). When students are cognitively engaged, they are trying to learn, be critical in

their thinking, and apply what they have learned (Y. Zhang et al., 2018). Positive feelings about learning, such as curiosity, interest, and excitement, are examples of emotional engagement (Skinner et al., 2016).

Academic Performance

Academic performance is the outcome of learning experiences (Shahzadi & Ahmad, 2011) and is the totality of a student's grades, test scores, and general academic growth in the classroom (Bonsaksen et al., 2018; Ekwochi et al., 2019). Academic performance improves when students concentrate on achieving attainable and quantifiable objectives within a specified time frame (Sanni et al., 2023; Vaida & Brînzei, 2021). Various issues, such as individual, contextual, and academic factors (Asikainen et al., 2020), study habits, attitude towards learning, academic fatigue, academic engagement, and internet use can all account for variability in academic performance (Bonsaksen et al., 2018; Ekwochi et al., 2019).

Internet Addiction and Academic Fatigue, Engagement, and Performance

Numerous studies have affirmed the positive relationship between internet addiction and academic fatigue (Ahmed, 2020; Bachleda & Darhiri, 2018; Bener et al., 2021; Mukhlif & Younis, 2022; Sert et al., 2019; Sriati et al., 2022; Tomaszek & Muchacka-Cymerman, 2020). Men have been shown to report higher levels of academic fatigue and internet addiction than women, and this was more common among freshmen. Nonetheless, Sert et al. (2019) found that women students report more addiction to the internet than men, while other researchers have reported a non-significant impact of gender on internet addiction (Ipem & Okwara-Kalu, 2021; Tomaszek & Muchacka-Cymerman, 2020).

Research results indicate that internet addiction negatively impacts academic engagement (Maqableh et al., 2021; Taş, 2017; Zhuang et al., 2023), as well as other academic and social outcomes (Al-Menayes, 2015). Y. Zhang et al. (2018) found that academic engagement mitigated the negative effects of internet addiction on academic achievement. On the other hand, a qualitative investigation by Apuke and Ezeah (2018) showed that students' academic performance and social relationships were enhanced by internet addiction. Numerous other studies confirmed that internet addiction negatively affected academic performance (Hayat et al., 2020; Rabeaa et al., 2023; Sert et al., 2019; Usman et al., 2014). Nevertheless, research by Hamza et al. (2021) indicated that internet addiction has no effect on undergraduate students' academic performance. Meanwhile, the studies of Jiang et al. (2024) and Avcı and Kula (2021) indicate a negative effect of engagement on internet addiction. Clearly, research is needed on the factors that predict student internet addiction. We fill this gap by providing empirical evidence on the extent to which undergraduates' academic fatigue, engagement, and performance predict their internet addiction while accounting for gender differences.

Methodology

Research Design

The study adopted the correlational research type of the non-experimental research design.

Population, Sampling Technique, and Sample

The population included all undergraduate students at southwest Nigerian government-owned universities. A multi-stage sampling procedure was used. In the purposively chosen location, three public universities were chosen using purposeful sampling, as they were the only public universities. Undergraduate students were chosen randomly from each academic faculty in the chosen universities, and those who responded to the online survey (N = 1,157) comprised the sample.

Instruments

Internet Addiction
We adapted the Internet Addiction Test (IAT), which Pee (2009) modified from the original version (Young, 1998). It is a 16-item questionnaire used to determine if a person is slightly, moderately, or seriously addicted to the internet. The instrument used a 4-point Likert scale from strongly agree (SA) = 4 to strongly disagree (SD) = 1. Example items include, "I spend much to maintain my phone to avoid being cut off from the internet," and, "I spend long hours daily on the internet." (The full instrument is located in the Appendix.) The overall score range is 20 to 100. A score of 49 or lower was regarded as normal, 50 to 79 as troublesome, and 80 or more as seriously problematic. Students were considered to be internet addicted for the purposes of this study if they met these two inclusion criteria: an IAT score of >50 and maximum daily internet usage of 3 to 4 hours (Acharva et al., 2023; Kumar & Mondal, 2018). Ordinal's alpha was 0.85 in this sample.

Academic Fatigue Questionnaire
We adapted the Academic Fatigue Questionnaire (AFQ) originally developed by Chalder et al. (1993) to determine individuals' physical and mental exhaustion symptoms. It is a 7-item questionnaire, modified from the 11-item version of the original (resulting from the pilot study on a sample from this study's context). The instrument used a 4-point Likert scale from strongly agree (SA) = 4 to strongly disagree (SD) = 1. The original version of the instrument has been confirmed to have high internal consistency and content validity (Cella & Chalder, 2010; De Vries et al., 2003; Loge et al., 1998). Example items include, "I need to rest more," "I usually feel sleepy/drowsy during the day," and "I have problems doing tasks." (The full instrument is located in the Appendix.) The overall score range is from 0 to 11. A score of 3 or lower indicated low fatigue symptoms, and a score of 4 or more indicated high fatigue symptoms (Chalder et al., 2010). Ordinal's alpha was 0.85 in this sample.

Academic Engagement Scale
We developed the Academic Engagement Scale (AES), which has 28 items in all and is used to determine the students' level of academic engagement. It was sub-divided into engagement in academic activities (17 items) and social activities (11 items) and used a 4-point Likert scale from very often = 4 to never = 1. Example items include "Talked about career plans with your academic adviser," "Come to class with completed assignments," "Participated in elections in the faculty," and "Contested for student executive positions in the department." (The full instrument is located in the Appendix.) The overall score range is from 20 to 100. A score of 49 or lower was regarded as representing a low level of academic engagement, 50 to 79 as average academic engagement, and 80 or more as high academic engagement. For this study, the researchers considered students to be academically engaged if they met the inclusion criteria: an AES score of >50. Ordinal's alpha was 0.93 in this sample.

Academic Performance
Academic performance in this study was measured using cumulative grade point average (CGPA). In the study's context, the usual CGPA are 1.00–1.49 (pass degree), 1.50–2.49 (3rd class), 2.50–3.49 (2nd class: lower division), 3.50–4.49 (2nd class: upper division), and above 4.50 (1st class). The CGPAs were categorized into letter grades A (70–100), B (60–69), C (50–59), D (45–59) and E (40–44). The overall performance was then measured by applying the mid-scores of each grade, where A = 75, B = 65, C = 55, D = 47, and E = 42.

A pilot study was conducted with 43 students using the same methodology as the main study to ensure the questions were simple to understand. Data from the pilot research were excluded from the analysis of the actual study.

Method of Data Collection

Faculty officers (FOs) from the included universities approved the research study. The researchers designed a Google form, which was posted on student Telegram, an online education platform within the faculties and departments where vital academic information is shared. The survey was automatically administered, once students agreed to participate and signed an online consent form with their university matriculation numbers. Reminders were frequently sent to the Telegram group to facilitate the data collection. The Google form remained open for 8 weeks (May to July 2023) to allow for more responses.

Data Analysis

Analysis was conducted using frequencies and percentages for the demographic variables, correlation for association among the variables, and multiple linear regression for joint and relative contributions in SPSS, Version 26. Major statistical assumptions were tested to ensure the dataset was consistent with each statistical analysis. Potential multicollinearity was assessed to ensure no pair of the variables yielded correlations greater than 0.9 (Mason & Perreault, 1991). The normality assumption was tested using skewness and kurtosis values of -2 to +2 and -7 to +7, respectively (Byrne, 2010), while the homogeneity assumption was tested using Levene's test for equality of variance (Levene, 1960). Gender, which is nominal in nature, was converted into dummy variables (where male and female were recoded as 0 and 1, respectively) and transformed into a continuous scale using a *z*-score to fit multiple regression analysis.

Results

Descriptive Statistics

Table 1 presents the demographic distribution of the respondents in the universities. About 38.8% of the respondents reported are male, while 61.2% are female. Of the respondents, 5.6% were between 15 and 19 years of age, 75.8% were between 20 and 24 years, 14.7% were between 25 and 29 years, and 3.9% were above 30 years. Additionally, 16.4% of the respondents had a CGPA of 1.50–2.49, while 43.6% had a CGPA of 2.50–3.49, 38.2% had a CGPA of 3.50–4.49, and 1.7% had a CGPA above 4.50. Regarding time spent online, 13.4% of the respondents spent less than 2 hours per day, 47.5% between 2 to 5 hours, and 39.1% spent above 5 hours. The vast majority (90%) were from Federal University Oye Ekiti (FUOYE).

Table 1. *Demographic Variables*

Variable	Frequency	Percentage (%)	Mean	Standard deviation
Gender				
Male	449	38.8	1.61	0.488
Female	708	61.2		
Total	1157	100		
Age				
15–19 years	65	5.6		
20–24 years	877	75.8	2.17	0.575
25–29 years	170	14.7		
Above 30 years	45	3.9		
Total	1157	100		

Variable	Frequency	Percentage (%)	Mean	Standard deviation
CGPA				
1.50−2.49	190	16.4		
2.50−3.49	505	43.6		
3.50−4.49	442	38.2	3.25	0.743
4.50 and above	20	1.7		
Total	1157	100		
Online time per day				
<2 hrs	155	13.4		
2−5 hrs	550	47.5		
Above 5 hrs	452	39.1	2.26	0.678
Total	1157	100		
University				
BOUESTI	91	7.9		
EKSU	25	2.1		
FUOYE	1041	90.0	2.82	0.552
Total	1157	100		

Research Question One

What is the strength and direction of the relationship among undergraduates' academic fatigue, academic engagement, academic performance, gender, and internet addiction?

Table 2 presents the intercorrelation matrix among internet addiction, academic fatigue, academic engagement, academic performance, and gender of undergraduates in Ekiti State universities. It was observed from Table 2 that there is no multicollinearity among the study variables, as no pair of the variables had a coefficient as high as 0.9. The intercorrelation matrix showing the correlation coefficients among the variables reveals that internet addiction had a significant positive relationship with academic fatigue ($r = 0.35$, $p = 0.000$), academic engagement ($r = 0.47$, $p = 0.000$), and male gender ($r = 0.27$, $p = 0.000$). This implies that undergraduates' internet addiction is associated with academic fatigue, academic engagement, and male gender. Similarly, the results in Table 2 show that academic engagement had a significant positive relationship with academic performance ($r = 0.10$, $p = 0.000$) and male gender ($r = 0.27$; $p = 0.000$). This implies that undergraduates' academic engagement is associated with academic performance and male gender. However, results reveal that internet addiction had an insignificant negative relationship with academic performance ($r = -0.05$, $p = 0.109$). This implies that undergraduates' internet addiction decreases academic performance. Furthermore, results in Table 2 reveal that academic fatigue had a significant negative relationship with academic performance ($r = -0.23$, $p = 0.000$). This implies that undergraduates' academic fatigue hampers their academic performance.

Table 2. *Intercorrelation Matrix of Internet Addiction, Academic Fatigue, Academic Engagement, Academic Performance, and Gender*

Variables	Internet addiction	Academic fatigue	Academic engagement	Academic performance	Z score: Male	Z score: Female
Internet addiction	1	0.349**	0.465**	-0.047	0.270**	-0.270**
Academic fatigue		1	0.053	-0.230**	-0.073*	0.073*
Academic engagement			1	0.103**	0.270**	-0.270**
Academic performance				1	-0.124**	-0.124**
Z score: Male					1	
Z score: Female						1
Mean	38.95	57.85	16.75	62.30		
Standard deviation	5.498	6.894	3.403	13.272		

*Note: * = significant at 0.05; ** = significant at 0.01 level.*

Research Question Two

To what extent would academic fatigue, academic engagement, academic performance, and gender jointly predict internet addiction?

Table 3 presents the regression and ANOVA results that show the combined impact of undergraduates' academic fatigue, academic engagement, academic performance, and gender on internet addiction in universities in Ekiti State. The results in the table show that the multiple correlation coefficient (R) of the combined predictor variables with internet addiction is 0.6. This implies a positive and high association between academic fatigue, academic engagement, academic performance, gender, and internet addiction. The adjusted R^2 reveals that the variability accounted for in internet addiction by the combined effect of the predictor variables is 0.352. This implies that the predictor variables contributed 35.2% to the variance observed in internet addiction. Furthermore, the regression ANOVA was statistically significant ($F_{(1156)} = 158.150$, $p = 0.000$). This implies that a substantial proportion of the variance in internet addiction can be attributed to the joint contribution of academic fatigue, engagement, performance, and gender among undergraduates in universities in Ekiti State.

Table 3. *Composite Contribution of Academic Fatigue, Academic Engagement, Academic Performance and Gender on Internet Addiction*

R	0.595				
R square	0.354				
Adjusted R square	0.352				
Std. error of the estimate	4.425				
Analysis of variance					
Sources of variance	Sum of squares	*Df*	Mean square	*F*	Sig.
Regression	12386.782	4	3096.695		
Residual	22557.002	1152	19.581	158.150	.000
Total	34943.784	1156			

Note: Significant at 0.01 level.

Research Question Three

What is the relative contribution of academic fatigue, academic engagement, and academic performance to internet addiction?

Table 4 presents the relative contributions of the predictor variables (academic fatigue, academic engagement, academic performance, and gender) to the criterion variable (internet addiction) among undergraduates in Ekiti State universities. The predictor variables contributed significantly to internet addiction, except for academic performance. That is, academic fatigue ($\beta = 0.346$, $t = 14.042$, $p = 0.000$), academic engagement ($\beta = 0.394$, $t = 15.741$, $p = 0.000$), academic performance ($\beta = 0.016$, $t = 0.622$, $p = 0.534$), and male gender ($\beta = 0.191$, $t = 7.609$, $p = 0.000$). This result implies that the value of the standardized regression beta weight associated with academic engagement, academic fatigue, and male gender, respectively, shows that these three variables are potent predictors of internet addiction among undergraduates in Ekiti State universities.

Table 4. *Relative Contributions of Academic Fatigue, Academic Engagement, Academic Performance, and Gender to Internet Addiction*

Variables	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	*SE*	Beta		
(Constant)	18.716	1.499		12.486	0.000
Academic fatigue	0.559	0.040	0.346	14.042	0.000
Academic engagement	0.163	0.010	0.394	15.741	0.000
Academic performance	0.012	0.020	0.016	0.622	0.534
Gender	1.051	0.138	0.191	7.609	0.000

Note: Significant at 0.01 level.

Discussion

The internet is commonly understood to have its pros and cons, and our data have yielded viable evidence to further this idea. The findings of this study reveal that undergraduates' academic fatigue significantly influences their internet addiction. This implies that undergraduates in the sampled universities who experience academic fatigue are likely to spend more time on the internet as a way out of the fatigue. This is consistent with the findings of Ahmed (2020), Bachleda and Darhiri (2018), Bener et al. (2021), Mukhlif and Younis (2022), Sert et al. (2019), Sriati et al. (2022), and Tomaszek and Muchacka-Cymerman (2020), whose studies revealed a positive relationship between students' academic fatigue and internet addiction levels.

Also, regarding gender, the findings reveal that male undergraduates are significantly more addicted to the internet than females. This is plausible: we think undergraduate males are more likely to be internet-inclined and -addicted because, in the study context, male undergraduates are more involved in "Yahoo, Yahoo" (an internet fraud syndrome). Many of them can fund their education from the proceeds of this practice. The more time these male undergraduates spend online perpetrating this fraud, the more victims they are likely to scam and the more money they make. The finding corroborates several research findings that demonstrate that males are more addicted to the internet (Jiang et al., 2024; Lin et al., 2021; Mari et al., 2023). Moreover, the finding contrasts studies that indicate that females were more internet-addicted than males or that gender has a non-significant impact on internet addiction (Ipem & Okwara-Kalu, 2021; Sert et al., 2019; Tomaszek & Muchacka-Cymerman, 2020).

The study findings indicated that academic fatigue and academic engagement had a significant relationship with internet addiction among undergraduates. This implies that undergraduates in the universities in the study who spend more time on the internet could be doing so to escape from tiredness or boredom or in pursuit of their academic endeavors, such as further reading, research, and completion of academic tasks. Furthermore, given that most academic activities in the sampled universities are now executed via the blended learning mode, undergraduates may be prone to more online academic engagements. This finding supports previous authors' findings that internet addiction affects students' academic engagement (Taş, 2017; Y. Zhang et al., 2018; Zhuang et al., 2023).

The findings also show that there is a considerable association among academic fatigue, academic engagement, academic performance, male gender, and internet addiction, and the variability accounted for in internet addiction by the combined effect of the predictor variables is 35.2%. However, while academic fatigue, academic engagement, and male gender are potent predictors of undergraduates' internet addiction, academic performance does not significantly predict undergraduates' internet addiction. Regarding this, we argue that undergraduates who are academically fatigued and more academically engaged spend more time on the internet, performing internet activities that may or may not be academic in nature, which could likely result in their poor or high academic performance. This agrees with the findings of Hamza et al. (2021), which indicate that undergraduates' academic performance is unaffected by internet addiction. However, the finding negates those of other previous studies, such as Al-Menayes (2015), Apuke and Ezeah (2018), Bachleda and Darhiri (2018), Hayat et al. (2020), Ipem and Okwara-Kalu (2021), Maqableh et al. (2021), Sert et al. (2019), Jiang et al. (2024), Avcı and Kula (2021), and Usman et al. (2014), which reaffirm that internet addiction has a negative effect on students' academic achievement. Our study's findings also do not support the findings of Rabeaa et al. (2023), who found a strong correlation between students' overall academic success and internet addiction.

Conclusion

This study investigated the predictors of internet addiction among undergraduates in Ekiti State universities. According to the study's findings, undergraduates spent more time on the internet to ease their fatigue, and males were more addicted to the internet. Concerning the relationship among the variables of this study, a positively significant relationship exists among academic fatigue, academic engagement, male gender, and internet addiction. In contrast, a negative relationship exists between academic performance and internet addiction. Specifically, academic fatigue, academic engagement, and male gender predicted internet addiction among undergraduates in Ekiti State universities.

Recommendations

This study contributes to the existing literature by providing further evidence that undergraduates' addiction to the internet predicts their academic fatigue and engagement but not their academic performance. Based on the findings and discussion, we recommend that moderation with respect to internet use among undergraduates be considered in terms of university policy. Student orientation programs and support services should be provided to undergraduates by university management and governments. Counseling and mediation programs should be set up to help those undergraduates who are already suffering from internet addiction. It is our view that measures and mechanisms should be put in place to ameliorate undergraduates' addiction to the internet and academic fatigue, as well as to foster their academic engagement. Future research should examine other variables not considered in this study (such as school/institution, socioeconomic factors, home and societal backgrounds, environment, religion, peer pressure, and psychological and psychosocial factors) vis-à-vis their impact on internet addiction or internet addiction tendencies among university students.

Limitations

The findings of this study could be considered limited because of its cross-sectional nature (a single time point study) and the representative bias associated with the sample used, since only one region of the country was sampled. Thus, future research could adopt a more representative sample from other regions in the country to further validate the present study findings. Also, self-reporting on the part of undergraduates about their internet addiction and academic fatigue, engagement, and performance may have influenced the results. Future research could explore a similar study via qualitative or mixed research.

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Contributions from authors: All authors contributed significantly to the paper and agreed with the conclusions.

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Appendix

Undergraduates Internet Addiction Questionnaire (UIAQ)

Dear Respondents,

This questionnaire is designed to elicit responses on internet addiction among undergraduates in Nigerian public universities. You are expected to respond to all the items on the questionnaire by picking the appropriate option. Your response will be treated with utmost confidentiality and used for research purposes only.

Thank you.

Biographical Data

Gender: Male   [ ]   Female [ ]

Age: 15-19   [ ]   20-24   [ ]   25-29 [ ]   Above 30 [ ]

What is your current CGPA?   1.00-1.49 [ ]   1.50-2.49 [ ]   2.50-3.49 [ ]   3.50-4.49 [ ]   above 4.50 [ ]

How long do you spend on the internet in a day?   < 2 hrs [ ]   2-5 hrs [ ]   Above 5 hrs ( )

Section A: Internet Addiction

S/N	Items	Strongly agree	Agree	Disagree	Strongly disagree
1	I spend long hours daily on the internet.				
2	The internet always makes me lonely.				
3	All my school work is done using internet.				
4	I find it easier to get academic information from the internet.				
5	I watch You-Tube daily.				
6	I hardly ask for food while on the internet.				
7	I have many friends on the social network.				
8	I stay on the internet until daybreak.				
9	I have no friends in the social media.				
10	I used a lot of data daily to browse.				
11	I prefer to be absent from class most of the time, because I can get better information from the internet.				
12	I have three handsets used to browse.				
13	I stay back in the town because of poor/no network in my locality.				
14	I spend much to maintain my phone to avoid being cut off from the internet.				
15	I watch and chat on Facebook all day.				
16	I use internet service every day of the week.				

Undergraduates Academic Fatigue Questionnaire (UAFQ)

Dear Respondents,

This questionnaire is designed to elicit responses on academic fatigue among undergraduates in Nigerian public universities. You are expected to respond to all the items on the questionnaire by picking the appropriate option. Your response will be treated with utmost confidentiality and used for research purposes only.

Thank you.

Section B: Academic Fatigue

S/N	Items	Strongly Agree	Agree	Disagree	Strongly Disagree
1	I need to rest more.				
2	I usually feel sleepy/drowsy during the day.				
3	I have problems doing tasks.				
4	I have difficulty concentrating in class or on a given task.				
5	I have slips of the tongue when speaking.				
6	I have difficulty recalling things of the past.				

Student Academic Engagement Questionnaire (SAEQ)

Dear Respondents,

This questionnaire is designed to elicit responses on academic engagement among undergraduates in Nigerian public universities. You are expected to respond to all the items on the questionnaire by picking the appropriate option. Your response will be treated with utmost confidentiality and used for research purposes only.

Thank you.

Section C: Academic Engagement

S/N	Items	Very often	Often	Rarely	Never
A. Academic Activities					
	How often have you …				
1	Talked about career plans with your academic adviser?				
2	Come to class with completed assignments?				
3	Worked with classmates to prepare assignments?				
4	Tutored other classmates voluntarily?				
5	Made presentations on projects in class?				
6	Contributed to class discussions?				
7	Asked questions during classes?				
8	Worked on projects that required integration of ideas from various sources?				
9	Used ideas from different courses to complete assignments?				
10	Used e-learning facilities to communicate with lecturers?				
11	Participated in service learning on community projects within the school?				
12	Been concerned about the grading system of the school?				
13	Engaged classmates on topical discussions?				
14	Discussed your performance with academic advisers after the semester?				
15	Applied concepts to practical situations?				
16	Worked in the laboratory?				
17	Attended seminars/workshops?				

	B. Social Activities				
	How often have you ...				
18	Participated in elections in the faculty?				
19	Contested for student executive positions in the department?				
20	Participated in excursions?				
21	Participated in quizzes/debates?				
22	Participated in student union activities?				
23	Participated in sporting activities?				
24	Attended exhibitions?				
25	Attended student/faculty week programs?				
26	Attended spiritual events in the school?				
27	Attended variety/dinner party events?				
28	Related with administrative staff?				