## ARTICLE

Check for updates

# Academic stress and cyberloafing among university students: the mediating role of fatigue and self-control

Gabriel E. Nweke[1], Yosra Jarrar[2] & Ibrahim Horoub [3✉]

This study aims to fill a gap in existing literature by investigating the relationship between academic stress and cyberloafing behavior among university students. By examining 415 final-year undergraduate students from various faculties at Girne American University, the research utilizes a correlational design to analyze the impact of academic stress on cyberloafing, considering the mediating effect of fatigue and the moderating influence of self-control. The findings reveal a significant positive association between academic stress and cyberloafing, with fatigue partially mediating this relationship and self-control moderating the influence. This research offers a novel perspective on understanding and addressing cyberloafing in educational settings, thereby contributing to the existing body of knowledge on this topic. The study's methodology and findings provide valuable insights into the complex interplay of academic stress, fatigue, self-control, and cyberloafing, offering implications for educational institutions in addressing and mitigating cyberloafing behaviors among students.

[1] Faculty of Humanities, Girne American University, Girne, Cyprus. [2] Mohammed Bin Rashid School for Communication, American University in Dubai, Dubai, UAE. [3] Faculty of Arts, Bethlehem University, Bethlehem, Palestine. ✉email: avihroub1951994@gmail.com

## Introduction

The abundant amount of internet services and the proliferation of mobile technologies have greatly impacted various aspects of our lives. People utilize the advancements in mobile internet technologies in all environments for activities such as entertainment, posting updates, research, shopping, visual communication, texting, gaming, online gambling, and internet surfing. While these activities can be beneficial in certain aspects of life activities and learning, uncontrolled and excessive use of internet mobile technologies can be detrimental and counterproductive (Metin-Orta and Demirutku, 2020; Venkatesh et al., 2012; Yılmaz et al., 2015). In academic settings, there is no doubt that the use of mobile and internet technologies has greatly improved the instructor–student relationship, easy access to various databases, and overall quality of education. However, the widespread use of technology in the classroom has been shown to have negative unintended consequences, including compulsive use of media, resulting in cyberloafing or cyberslacking (Alyahya and Alqahtani, 2022).

Cyberloafing is a modern-day concept that represents aspects of the dark or distracting side of technology and its uses. The term cyberloafing was operationalized by Lim (2002), who defined it as a voluntary personal act of browsing and surfing the internet for entertainment and social interaction during work hours. Cyberloafing is referred to as the use of mobile devices and internet services to engage in activities that are outside the scope of the required task during work/class time (Ravizza et al., 2014). In an educational environment, cyberloafing is the use of internet services during lecture time for extraneous issues and engaging in activities not relevant to the class requirements (Twum et al., 2021). Cyberloafing activities in the classroom primarily involve exchanging emails and text messages, online gaming, watching movies, and social media use (Hardiani et al., 2018; Khansa et al., 2017; Olmsted and Terry, 2014).

Cyberloafing is currently prevalent in universities due to the availability of mobile devices and easy access to Internet services. A large proportion of students in TRNC use their smartphones during class, with the majority admitting using the smartphone for non-learning activities (Ozdamli and Ercag, 2021). Previous studies have reported that cyberloafing is associated with reduced classroom attention (Taneja et al., 2015), low academic engagement (Ravizza et al., 2014), instructor-student conflict (Hembrooke & Gay, 2003) and poor academic performance (Dursun et al., 2018; Flanigan and Babchuk, 2015; Ravizza et al., 2014). Additionally, cyberloafing contributes greatly to the development of smartphone addiction among students (Doush and Alhami, 2018; Gokcearslan et al., 2016; Nwakaego and Angela, 2018).

Taking into consideration these negative impacts of cyberloafing, particularly on the quality of education and student mental health, it is imperative that researchers try to understand various situational and dispositional factors that influence cyberloafing behaviors in the classroom. Past studies on students' cyberloafing behaviors in educational settings have mostly focused on factors such as age, gender, computer skills, and access to the internet in the classroom as predictors of cyberloafing but, within the current stage of these factors, the role of student academic activities workloads or academic stress has not been examined in relation to cyberloafing.

Academic stress is the emotional, physical, and psychological strain a student experiences that can be attributed to the academic demands and requirements (Rahmawati, 2012). Heavy course loads, assignments, exams, time management, competitions among students, teacher competency, and lack of resources constitute stress and can trigger cyberloafing in students (Hibrian et al., 2022). Cyberloafing behaviors, and surfing the internet, is used by students to ameliorate the impact of academic stress in the classroom. Furthermore, aspects including fatigue and self-control, mostly contained separately on each of the main variables, have the power to connect either. As such, this paper plans on examining the effect of academic stress on cyberloafing behavior, while also understanding the mediating role of fatigue between both, in addition to the moderating role of self-control within the academic or non-academic setting.

## Theoretical framework

Through the application of a study towards which academic stress influences or causes the act of cyberloafing, an analysis towards the type of behavior, the causes behind the action, and how both interconnects should be deduced through the theoretical framework. An applicable theory, that of which might direct itself more towards cyberloafing, is the Theory of Planned Behavior. Coined in the 1980s by Icek Ajzen, the psychological theory describes the behaviors of individuals to be primarily influenced by belief, that of which comprises the three core components: attitude, subjective norms, and perceived behavioral control, in order to produce the outcome of the "planned behavior" (Askew et al., 2014). The theory was further expanded due to a need for understanding towards the motivations and intentions behind any and all behaviors (Conner and Armitage, 1998). Within the scope of cyberloafing, a connection was placed towards the effect of self-efficacy, or its placement as a self-determinant factor, to it application through cyberloafing behavior at locations such as the workplace, with the subjective norms and control focusing on the need or desire of cyberloafing as a whole (Askew et al., 2014). In such a case, a further relationship can be hypothesized towards the planned behavior, cyberloafing, occurring from the cause of academic stress, moderated by self-control, in the theory's case behavioral control, and mediated by fatigue. If applied within that sense, the theory of planned behavior can then prove that in most cases, within the norms of technology access and expansion, cyberloafing has become a subjective norm that is enhanced within academic stress, where students intentionally focus on cyberloafing as a means to assist their ongoing stress. Yet, criticism towards the theory follows its inadequate portrayal of rationalism or logical behavior, that of which Ajzen has argued for the assumptions, stating that it could be irrational, untrue, or unreasonable (Barber, 2011). In addition, lack of application towards experimental studies places the need to further understand the interconnectedness of the theory towards concepts including education and technology, within this case academic stress and cyberloafing, which will be further analyzed within this paper.

## Literature review

In examining the connection between academic stress and cyberloafing, within the mediating role of fatigue and the moderating role of self-control, several studies were identified to understand the background behind the variables studies and examine the research within the methods and findings further on, while also breaking down the hypotheses of the study.

**Relations between academic stress and cyberloafing.** In presenting a background to the study, a 2021 paper by Chen et al., examining university students within the Hubei province, found a connection between academic stress, that of which was defined as the psychological strain students experience due to sensory overload, with that of cyberloafing as a method of maladaptive coping mechanisms. In placing a connection between both, the study places a central factor to the experiment, however, crossed out its potential mediating and moderating factors of fatigue and

self-control, while focusing towards one specific province. Moreover, a 2019 study found that academic stress directly has an effect towards cyberloafing, most prominently through smartphone addiction as the concentrated platform. Curating its study within the post-graduate students of Universitas Negeri Jakarta at an older age range, the study concluded that higher levels of academic stress increased phone addiction, creating a connection and identifying a prominent source (Hamrat et al., 2019). Moreover, Zhou et al., 2021 study, focusing on examining academic stressors and cyberloafing within college students amidst the moderating role of self-control, also concluded a positive influence, excluding the possibility of fatigue as a mediator, but extending cyberloafing's role as a form of cure for their stress. As such, through the literature reviewed, the following hypothesis can be compromised for the relationship between academic stress and cyberloafing within the study:

**H₁**. *Academic stress would have a positive influence on cyberloafing.*

**Academic stress, fatigue, and cyberloafing**. While studies showed a constant relationship between academic stress and cyberloafing, a further evaluation towards the role of fatigue was also observed. This is supported by Yogisutanti et al. (2020), who observed that individuals experiencing heightened work-related stress were more prone to becoming fatigued and may seek extraneous activities for relief. The premise of relief through this study, could be further disguised as that of cyberloafing. In addition, Hibrian et al.'s (2022) study found that the amount of stress individuals go through on one day significantly impacts their fatigue levels the following day. Furthermore, when students are fatigued, they struggle to concentrate on their tasks, making them more prone to distractions like cyberloafing during academic activities. Akbulut et al. (2017) paper similarly noted that fatigue hampers individuals' ability to focus on their primary objectives, making them more susceptible to online distractions, such as cyberloafing, regardless of their gender or social status. A study on Iranians found that individual levels of work-related fatigue had a notable impact on cyberloafing activities and greater fatigue levels were associated with a higher likelihood of engaging in cyberloafing (Aghaz and Sheikh, 2016). Similarly, Ghani et al. (2018) found that high level stress, and fatigue are associated with low productivity, reduced attention and cyberloafing behaviors among Government Servants in Malaysia. It has also been proposed that stress and fatigue are linked to cyberloafing, but it remains unclear if fatigue acts as a potential mechanism connecting stress to cyberloafing in particular. As such, the following hypothesis is proposed based on that of which was examined above:

**H₂**. *Fatigue would mediate the relationship between academic stress and cyberloafing.*

**Academic stress, self-control, and cyberloafing**. One factor that has been shown to play a significant role in mitigating the link between stress and cyberloafing is self-control (Li et al., 2023; Zhou et al., 2021). Self-control is defined as the capacity to override or alter one's internal reactions and to halt undesirable behavioral inclinations, such as impulsive actions (Zhang et al., 2015). Self-control refers to individuals' capacity to consciously manage their actions, resisting impulses, habits, or automatic responses. Extensive research has consistently shown that self-control is predictive of positive adjustment, optimal performance, and academic success, as proved by Duckworth et al. (2019) study and Li et al.'s (2023) paper. According to a 2011 examination of self-control within individuals, strong self-control was correlated with responsibility, discipline and drive (Zettler, 2011). Given that

cyberloafing frequently has detrimental effects on academic performance and goal attainment and can be considered a form of deviant behavior in the educational setting, it is plausible to assume that individuals with higher inherent self-control would engage in less cyberloafing during their daily academic tasks. That is supported by the 2021 paper, which in connecting self-control, cyberloafing and the big five personality traits, found that students with strong self-control, who are predisposed to setting ambitious goals and striving for achievement, are likely to be less susceptible to the influence of daily academic stressors. This is because they find it easier to establish effective and consistent study routines, and they are less likely to engage in cyberloafing during class time. On the other hand, the study concluded that individuals with low self-control facing the same level of academic stressors may be more prone to engage in cyberloafing because they struggle to resist the temptation of online distractions during academic tasks (Liani et al., 2021). In addition, Zhou et al.'s paper, through the strength model of self-control, found that higher levels of self-control generally imply greater cognitive resources and a reduced likelihood of being depleted by academic stressors (Zhou et al., 2021). Therefore, high self-control may act as a natural safeguard against the impact of academic stressors on cyberloafing. Based on the literature reviewed, we proposed that self-control may act as a moderator in the relationship between academic stress and cyberloafing among university students.

**H₃**. *Self-control would moderate the relationship between academic stress and cyberloafing.*

Through observing and correlating the literature reviewed in the past, this study can therefore identify and isolate the necessary factors to be examined within the study, while also showcasing its effects within the scope of the target participants as well as the findings presented later on.

**The present study**. This study aimed to explore (a) whether the level of academic stress is associated with cyberloafing behavior among university students, (b) whether fatigue would mediate the relationship between academic stress and cyberloafing, (c) and whether the direct path between academic stress and cyberloafing would be moderated by individuals' level of self-control.

As an integrated model (see Fig. 1), the present study was guided by the following hypotheses:

**H₁**. Academic stress would have a positive influence on cyberloafing.

**H₂**. Fatigue would mediate the relationship between academic stress and cyberloafing.

**H₃**. Self-control would moderate the relationship between academic stress and cyberloafing.

## Methodology

**Participants and procedure**. Data collection took place manually, located in the classrooms during the spring semester (April through June) of 2023 at the Girne American University, Cyprus. The study included 424 final-year undergraduate students from five faculties and departments, including Architecture, Communication, Education, Engineering, and Humanities, all of which constituted within the university. The inclusion criteria were being adapted in the final year of study, requested graduation projects or dissertation, to ensure relative similar academic stressors. These participants were selected through convenience sampling.

After removing nine students who did not respond to substantial part of the questions, the remaining sample, 415, had an average age of 23.42 years (with a standard deviation of 1.34), and 56.25% of them identified as female. Utilizing simulation tool by the MARlab Power Analysis for Indirect
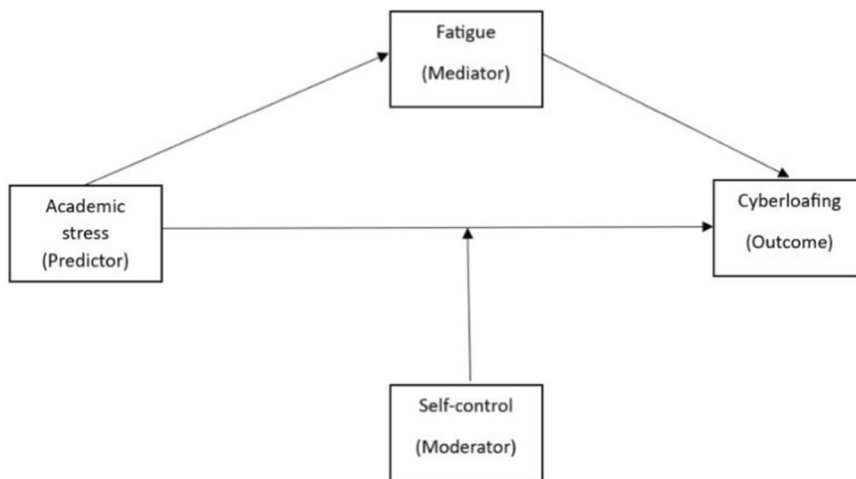
**Fig. 1 Conceptual model depicting the relationship between academic stress and cyberloafing with fatigue as a mediator and self-control as a moderator.**

Effects as outlined by Schoemann et al. (2017), and applying a significance level of $\alpha = 0.05$, medium effect size of 0.30 with a power of 0.80, the achieved sample size of $N = 415$ is deemed sufficient for testing the research hypotheses.

The sample composition consisted of 62 Communication (14.94%), 59 Humanities (14.22%), 82 Engineering (19.76%), 97 Architectures (23.37%), and 115 Education (27.71%).

This study received approval from the Research Ethics Committee of Girne American University. Before collecting the data, participants were given written informed consent forms that explained the aim of the study and its significance. They were informed that their responses would be kept confidential with no identifying information recorded, and their answers would be solely used for research purposes. Participants were also told they could withdraw from the study at any time without any consequences. Subsequently, participants were invited to give brief demographic information and complete a series of questionnaires. It took the participants ~20 min to complete all the questionnaires.

**Measures**

*Fatigue Assessment Scale (FAS).* Fatigue was measured by the Fatigue Assessment Scale (FAS) developed by Michielsen et al., (2003) to assess the level of mental and physical fatigue. Fatigue Assessment Scale (FAS) contains 10 self-report items with a response ranging from 1- never to 5- always. Five questions assess physical fatigue, while five questions (specifically questions 3 and 6–9) pertain to mental fatigue. Respondents were required to provide an answer to each question, even if they were not currently experiencing any symptoms. Total score for the Fatigue Assessment Scale (FAS) was computed by summing the scores for all questions. The total FAS score ranges from 10 to 50, with a score below 22 indicating an absence of fatigue and a score of 22 or higher indicating the presence of fatigue. The scale developers reported acceptable internal consistency and validity (Michielsen et al., 2003). The FAS has a Cronbach alpha of 0.90 for this study.

*Perception Scale Academic Stress (PAS).* Academic stress was measured with the Perception Scale Academic Stress (PAS), developed by Bedewy and Gabriel (2015). It is an 18-item scale created to ascertain how individuals perceive academic stress and identify its primary sources, namely academic expectations, workload, examinations, and students' self-perceptions in academics (Bedewy and Gabriel, 2015). The PAS is re-structured so that a higher score signifies higher levels of stress, with scores

ranging from 18 to 90. The developers reported a high reliability and validity for this scale. The Cronbach Alpha in this study is 0.78

*Cyberloafing Activities Scale (CAS).* Cyberloafing was assessed using the Cyberloafing Activities Scale (CAS), a 30-item scale developed by Akbulut et al. (2016), to evaluate classroom cyberloafing activities. This scale encompassed five distinct factors: "sharing" (9 items, e.g., "I share content on social networks"), "shopping" (7 items, e.g., "I visit online shops for used products"), "real-time updating" (5 items, e.g., "I read tweets"), "accessing online content" (5 items, e.g., "I watch videos online"), and "gaming/gambling" (4 items, e.g., "I play online games"). Respondents indicated the frequency of their engagement in these behaviors during classroom activities using a 5-point scale. Cronbach's alpha was 0.85 in this study.

*The Self-Control Scale (SCS).* The Self-Control Scale (SCS) measured the individual differences in self-control during class activities, and under stressful conditions. The scale evaluates an individual's capacity to manage their impulses, modify their emotions and thoughts, and prevent unwanted behavioral tendencies from being acted upon. The scale was adapted from Tangney et al. (2004) and includes 36 items, e.g., "I am good at resisting temptation". Respondents rated their alignment with a series of statements on a 5-point scale, and the cumulative scores yield a total self-control score, where higher values signify stronger self-control. The Cronbach's alpha of this scale for this study was 0.78.

*Data analysis.* Data analysis was conducted using SPSS 23.0 and JAMOVI 2.3.2.1.0 statistical package. Specifically, SPSS 23.0 was employed to generate descriptive statistics, assess questionnaire reliability, check the assumptions and perform correlational analyses while GLM mediation models in JAMOVI were utilized for mediation and moderation analyses. Prior to testing the models in the JAMOVI library, we checked the data for linearity, normality, outliers and multicollinearity, and no violation was recorded. The Through visual inspection of the scatter plots or linearity residual plots (Pallant & Manual, 2013), linearity was ascertained. Kolmogorov-Smirnov test for normality indicated that all constructs had a p-value greater than 0.05, and the skewness-kurtosis values fell within the range of ±1.5, suggesting normal distribution of the data (Tabachnick et al., 2013). In addition, a comprehensive collinearity diagnostics, assessing variance inflation factor (VIF) values following the criteria of

Hair et al. (2017) with a threshold of 5, revealed that all constructs exhibited VIF values ranging from 1.801 to 3.102. This implies the absence of multicollinearity in the study.

## Results

**Descriptive statistics and correlations matrix**. Table 1 displays the descriptive statistics and Pearson correlation coefficients for the variables under examination. The average scores for cyberloafing, self-control, and academic stress were above the mean (3.634, 3.198, and 3.111, respectively), while fatigue exhibited a below-average mean score (2.317). Cyberloafing is positively correlated with academic stress and fatigue, whereas psychological cyberloafing is negatively correlated with self-control. Additionally, there is a negative correlation between academic stress and self-control. Surprisingly, the correlation between fatigue and fatigue is negative.

Our findings suggested that individuals who experienced higher academic stress are more prone to indulge in cyberloafing behaviors. Similarly, those with high levels of fatigue also exhibited increased cyberloafing behaviors. Additionally, individuals low in self-control tend to engage more in cyberloafing activities (Table 2).

**Mediating role of fatigue**. Correlation analysis revealed significant and positive associations among academic stress, fatigue, and cyberloafing, which set the stage for examining the mediating role of fatigue. To test Hypothesis 1, a construction of the general linear model was held, using the medmod jamovi package,

treating academic stress as a predictor, cyberloafing as the outcome variable, and fatigue as a mediator. The direct and indirect paths between academic stress and cyberloafing are detailed in Table 3. As shown in Table 3 (direct path), our results showed that academic stress positively contributed to cyberloafing ($\beta = 0.109$, $p < 0.05$). This supports Hypothesis 1, suggesting that higher academic stress was associated with higher cyberloafing activities among students. To examine Hypothesis 2, a mediation analysis was conducted to examine the mediating effect of fatigue on academic stress and cyberloafing. The total effect of the model was found to be significant, ($\beta = 0.133$, $z = 2.72$, CI [0.037, 0.229], $p < 0.05$). Notably, there was a statistically significant direct effect ($\beta = 0.104$, $z = 2.20$, CI [0.011, 0.197], $p < 0.05$.), and the Bootstrap 95% confidence intervals for the indirect effect of fatigue did not include zero ($\beta = 0.029$, $z = 2.08$, $p = 0.038$). The finding suggests that fatigue partially mediates the relationship between academic stress and cyberloafing. Therefore, Hypothesis 2, stating that fatigue would mediate the relationship between academic stress and cyberloafing, is supported.

**Moderating the impact of self-control**. To test hypothesis 3 a moderation test was conducted, with academic stress as the predictor, cyberloafing as the outcome, and self-control as a moderator. As shown in Table 4, the interaction effect of academic stress and self-control negatively and significantly explained cyberloafing ($\beta = -0.011$, $z = -2.93$, CI [−0.028, 0.11], $p = 0.037$).

These findings strongly supported Hypothesis 3, which proposed that self-control moderates the link between academic stress and cyberloafing. To further elucidate this interaction effect, we conducted separate analyses, conducting the simple slope estimates, and by plotting academic stress against cyberloafing for individuals with low (M - SD) and high (M + SD) levels of self-control.

In examining simple slopes, it was observed that the relationship between academic stress and cyberloafing was notably weaker but still statistically significant among individuals with high self-control ($B = -0.19$, Bse = 0.067, $z = -2.87$, $p < 0.005$), compared to those with low self-control ($B = -0.31$, Bse = 0.076, $z = -4.65$, $p < 0.001$). Individuals possessing lower self-control and facing elevated academic stress tended to exhibit a higher

---

**Table 1 Mean, standard deviation Pearson Correlations between the variables ($n = 415$).**

|    | mean  | SD    | AS        | SC       | FG     | CL |
|----|-------|-------|-----------|----------|--------|----|
| AS | 3.111 | 1.061 | —         |          |        |    |
| SC | 3.198 | 1.390 | −0.216*   | —        |        |    |
| FG | 2.317 | 0.510 | 0.213**   | −0.141** | —      |    |
| CL | 3.634 | 0.955 | 0.277***  | −0.321** | 0.311* | —  |

*AS academic stress, SC self-control, FG fatigue, CL cyberloafing.*
*\*p < 0.05, \*\* p < 0.01, \*\*\*p < 0.001.*

---

**Table 2 Mediation estimates.**

| Type      | Effect                                  | Estimate | SE     | 95% C.I. (a) | | $\beta$ | $z$  | $p$    |
|           |                                         |          |        | Lower   | Upper  |         |      |        |
|-----------|-----------------------------------------|----------|--------|---------|--------|---------|------|--------|
| Indirect  | Academic stress ⇒ Fatigue ⇒ Cyberloafing | 0.0291   | 0.0140 | 0.00162 | 0.0565 | 0.0290  | 2.08 | 0.038  |
| Component | Academic stress ⇒ Fatigue               | 0.1308   | 0.0586 | 0.01592 | 0.2457 | 0.1089  | 2.23 | 0.026  |
|           | Fatigue ⇒ Cyberloafing                  | 0.2223   | 0.0394 | 0.14518 | 0.2995 | 0.2664  | 5.65 | <0.001 |
| Direct    | Academic stress ⇒ Cyberloafing          | 0.1038   | 0.0473 | 0.01117 | 0.1965 | 0.1036  | 2.20 | 0.028  |
| Total     | Academic stress ⇒ Cyberloafing          | 0.1329   | 0.0488 | 0.03722 | 0.2286 | 0.1326  | 2.72 | 0.006  |

*Confidence intervals are computed with the method: parametric bootstrap.*
*Betas are completely standardized effect sizes.*

---

**Table 3 Moderation Estimates.**

|                                | Estimate | SE      | 95% Confidence Interval | | Z     | p      |
|                                |          |         | Lower   | Upper   |       |        |
|--------------------------------|----------|---------|---------|---------|-------|--------|
| Academic stress                | 0.1239   | 0.05493 | 0.0163  | 0.2316  | 2.26  | 0.024  |
| Self-Control                   | −0.0194  | 0.00412 | −0.0274 | −0.0113 | −4.70 | <0.001 |
| Academic stress ✳ Self Control | −0.0110  | 0.00601 | −0.0228 | −0.0114 | −2.93 | 0.037  |

**Table 4 Simple slope estimates.**

|  | Estimate | SE | 95% Confidence Interval | | Z | p |
|---|---|---|---|---|---|---|
|  |  |  | Lower | Upper |  |  |
| Average | −0.249 | 0.0533 | −0.354 | −0.1447 | −4.08 | <0.001 |
| Low (−1SD) | −0.308 | 0.0760 | −0.457 | −0.1590 | −4.65 | <0.001 |
| High (+1SD) | −0.190 | 0.0663 | −0.320 | −0.0605 | −2.87 | 0.004 |

Shows the effect of the predictor (Academic stress) on the dependent variable (Cyberloafing) at different levels of the moderator (Self-control).
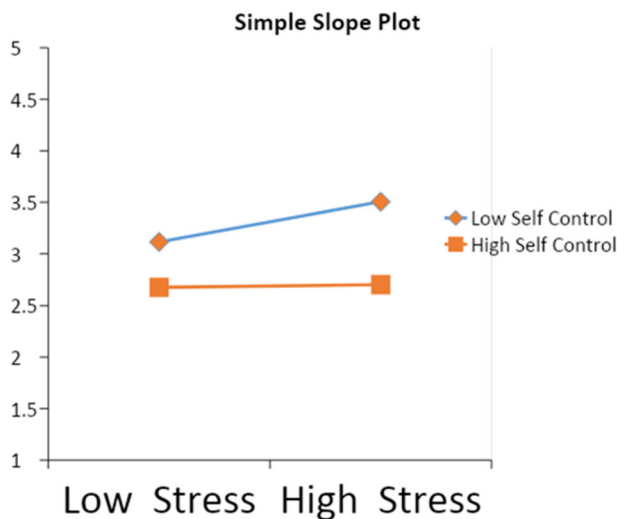


**Fig. 2 Self-control moderating the relationship between academic stress and cyberloafing.**

tendency for cyberloafing compared to their counterparts with greater self-control.

Figure 2 indicated that participants who reported lower than average levels of self-control experienced a more pronounced impact of academic stress on cyberloafing compared to those with average or higher than average levels of self-control.

In summary, the study found that fatigue mediated the relationship between academic stress and cyberloafing. Moreover, participants' self-control level played a moderating role in the academic stress-cyberloafing relationship.

## Discussion

Building on previous research, this cross-sectional study investigated the connection between academic stress and cyberloafing among final year students at Girne American University, TRNC. It also examined how fatigue mediates this relationship and how self-control moderate it. The findings indicated that academic stress, fatigue, and self-control play vital roles in cyberloafing behavior in the classroom.

Within the scope of the theoretical framework, which of which was noted as the theory of planned behavior, the findings, which proved a positive relationship between academic stress and cyberloafing, further managed to prove its correlation towards the theory further. When faced with low self-control, students are more likely to feel academically stressed, leading to that of cyberloafing. Through the use of cyberloafing as a withdrawal action, that of which was studied prior by Askew et al. (2014), it is

therefore considered an intentional behavior occurring as a result of the combination of attitude, both within academic stress and self-control, along with the mediating role of fatigue at hand. As such, considering the behavioral perceptions of students, the act of cyberloafing, influenced by academic stress, can therefore be considered a "planned behavior" in support of the theory. Moreover, looking towards the social norms of technological use, the subjectivity of the norm to gravitate towards cyberloafing can also be considered when discussing this study. Implications analyzed from the theory can contradict cyberloafing as a planned behavior, rather as a natural result, however when looking into several other outcomes of academic stress, that of which can be predicted to be consultation, isolation, etc. The use of cyberloafing in specific modifies it to be that of an intentional behavior, rather than a natural outcome. Furthermore, the role of self-efficacy through academic stress and self-control as a whole play a crucial part in deducing the role of the theory within cyberloafing, but nonetheless can be carried towards different cases, demographics, etc.

**Relationship between academic stress and cyberloafing.** The first hypothesis result revealed a direct link between academic stress and cyberloafing. Academic stress positively impacted cyberloafing behaviors among the students. Our findings showed that students tend to engage in cyberloafing behaviors during lectures, such as accessing social media and watching online videos, particularly when they are stressed about their academic performance or when faced with a high workload. Academic stress is an integral part of students' lives, encompassing various facets as categorized by Deng et al. (2022), including pressure from instructors, test result pressure, exam-related stress, group work pressure, peer pressure, time management, and internal stress. Some individuals cope with this stress by disengaging from stress-inducing activities (Zhou et al., 2021). In our study's context, students experiencing stress tend to turn to the internet and games for entertainment purposes (Liang et al., 2022), with cyberloafing serving as a means for students to relieve academic pressure.

Our study's findings are consistent with Chen et al. (2021), which explored related variables and identified a strong connection between perceived stress and cyberloafing and maladaptive coping mechanisms among university students within Hubei province, China. In addition, relating back to the study of Hamrat et al. (2019), which identifies the significance of academic stress's direct impact on cyberloafing activities and smartphone addiction among post-graduate students at Universitas Negeri Jakarta, smartphone addiction can be also placed as a probable factor to the results discovered within this study. Based on our findings, it is evident that academic stress efficiently and positively influences cyberloafing behavior, corroborating the conclusions of Zhou et al. (2021), who argued that academic stress plays a pivotal role in driving cyberloafing behavior and that cyberloafing serves as a means for students to alleviate boredom, sensory overload, and stress. Consequently, the first hypothesis of this study is supported.

**Mediating role of fatigue in the relationship between academic stress and cyberloafing.** The results of the second hypothesis show that academic stress has a positive and significant impact on fatigue, suggesting that high levels of academic stress deplete energy levels and lead to fatigue, which is consistent with the findings of past research. In specific, basing off Yogisutanti's et al. (2020) study, the method of "relief" can be explored as cyberloafing, in which sense fatigue would also play a role within the equation. In addition, Hibrain's et al. (2022) study could also be

analyzed in correlation within the study as fatigue was considered an essential variable discovered within the results, and although placing a partial role, was still confirmed within the participants, as such curating similar results. Moreover, in support of Akbulut et al. (2017) paper, the study can conclude that fatigue, in shifting focus of students from their academic objectives, can direct them towards cyberloafing, placing it as a mediator, which was highlighted within this paper as well. In comparing countries, the study found similar results to that of Aghaz and Sheikh in Iran and Ghani, to which in this case, Girne University's students were also exposed to cyberloafing after excessive fatigue caused by academic stress, supporting their stances on the topic as a whole. As such, although placing a partial role within its correlation, fatigue as a mediator does show strong potential and observation within more concentrated analysis, but nonetheless shows a positive relationship towards both main variables.

**Moderating the role of self-control in the relationship between academic stress and cyberloafing**. We investigated the interaction between academic stress and self-control in predicting cyberloafing behaviors among students. Our initial findings revealed a significant positive relationship between academic stress and cyberloafing, and a significant negative relationship between academic stress-cyberloafing and self-control, suggesting that low self-control is associated with high academic stress and high cyberloafing activities. This is in line with Zhou et al. (2021) study that found Individuals with low levels of trait self-control were more susceptible to the impact of daily academic stressors when it came to engaging in cyberloafing. The moderation analysis showed that adding self-control to the relationship between academic stress and cyberloafing changed the dynamics. In this study, self-control moderated the positive relationship between academic stress and cyberloafing by altering the strength, but not the direction of the relationship. For both high and low levels of self-control, the positive relationship between academic stress and cyberloafing was maintained but the strength of the relationship was much higher for low self-control. As such, through cyberloafing, the lower levels of self-control are separated from the drive, discipline, and responsibility found within higher levels of self-control, as discussed in Zettler's study, further enhanced by the high levels of academic stress, which serves as a blockade to such factors. In addition, through the results, the study can also connect towards the 2021 paper by Liani et al. in which students with stronger self-control would be less likely to engage in cyberloafing or distracting activities. All in all, connecting towards previous studies, this paper shows a more prominent and direct role of self-control as a moderator between cyberloafing and academic stress, further proving its significance amongst students.

## Conclusion

This study identified academic stress, fatigue, and self-control as significant factors influencing university students', in TRNC, cyberloafing behaviors. The research on academic stress and cyberloafing behavior among university students yielded significant findings. Firstly, it established that higher levels of academic stress are positively associated with an increased frequency of cyberloafing activities in the classroom. Secondly, the study revealed that fatigue plays a mediating role in the relationship between academic stress and cyberloafing, indicating its influence on students' online behaviors. Lastly, the research demonstrated that the link between academic stress and cyberloafing is moderated by self-control, with individuals exhibiting low self-control being more prone to engaging in cyberloafing, particularly when experiencing high levels of academic stress. As such, the

importance of identifying the cause of a common action such as cyberloafing, in addition to the mediating and moderating factors of such activities can enhance the solutions projected to prevent cyberloafing, and assist in boosting self-control, decreasing fatigue and academic stress, to further support productive support, especially within the educational field, later on expanding to that of the work field and other communities with similar causes.

**Limitations and recommendations**. Limitations of this study include the isolation of participants from one university in TRNC, Girne American University, which may restrict the generalizability of our findings. As such, the study recommends further research including participants from different age ranges, educational facilities, and locations. In addition, this study explored the mediating roles of fatigue and the moderating role of self-control through a cross-sectional correlational design, preventing the results from establishing causal relationships between variables. The use of time series analysis and longitudinal studies could overcome this limitation, and is further recommended moving forward. Finally, all the data in our study were collected through self-reporting questionnaires, academic stress, self-control, and fatigue were assessed using scales that measured the participant's perception of the variables which may lack objectivity, and cyberloafing was assessed by relying on the participants' self-reported frequency. Future research recommends employing more objective measures, such as monitoring devices, to assess student cyberloafing frequency and duration.

## Data availability

The data used to support the findings of this study are available from the corresponding author upon request.

## References

Aghaz A, Sheikh AY (2016) Cyberloafing and job burnout: an investigation in the knowledge-intensive sector. Comput Hum Behav 62:51–60

Akbulut Y, Dönmez O, Dursun ÖÖ (2017) Cyberloafing and social desirability bias among students and employees. Comput Hum Behav 72:87–95

Akbulut Y, Dursun ÖÖ, Dönmez O, Şahin YL (2016) In search of a measure to investigate cyberloafing in educational settings. Comput Hum Behav 55:616–625

Alyahya S, Alqahtani A (2022) Cyberloafing in educational settings: a systematic literature review. Int J Interact Mob Technol 16(16):113–141. https://doi.org/10.3991/ijim.v16i16.32285

Askew K, Buckner JE, Taing MU, Ilie A, Bauer JA, Coovert MD (2014) Explaining cyberloafing: the role of the theory of planned behavior. Comput Hum Behav 36:510–519

Barber JS (2011) The Theory of Planned Behaviour: considering drives, proximity and dynamics. Vienna Yearb Popul Res/Vienna Inst Demogr, Austrian Acad Sci 9:31

Bedewy D, Gabriel A (2015) Examining perceptions of academic stress and its sources among university students: the Perception of Academic Stress Scale. Health Psychol Open 2(2):2055102915596714

Chen Y, Chen H, Andrasik F, Gu C (2021) Perceived stress and cyberloafing among college students: the mediating roles fatigue and negative coping styles. Sustainability 13(8):4468. https://doi.org/10.3390/su13084468

Conner M, Armitage CJ (1998) Extending the theory of planned behavior: a review and avenues for further research. J Appl Soc Psychol 28(15):1429–1464

Deng Y, Cherian J, Khan NUN, Kumari K, Sial MS, Comite U, Gavurova B, Popp J (2022) Family and academic stress and their impact on students' depression level and academic performance. Front Psychiatry 13:869337. https://doi.org/10.3389/fpsyt.2022.869337

Doush IA, Alhami I (2018) Evaluating the accessibility of computer laboratories, libraries, and websites in Jordanian Universities and Colleges. Int J Inf Syst Soc Change 9(2):44–60

Dursun OO, Donmez O, Akbulut Y (2018) Predictors of cyberloafing among preservice information technology teachers. Contemp Educ Technol 9(1):22–41. https://doi.org/10.30935/cedtech/6209

Duckworth AL, Taxer JL, Eskreis-Winkler L, Galla BM, Gross JJ (2019) Self-control and academic achievement. Annu Rev Psychol 70:373–399. https://doi.org/10.1146/annurev-psych-010418-103230

Flanigan AE, Babchuk WA (2015) Social media as academic quicksand: a phenomenological study of student experiences in and out of the classroom. Learn Individ Differ 44:40–45. https://doi.org/10.1016/j.lindif.2015.11.003

Hair J, Hollingsworth CL, Randolph AB, Chong, AYL (2017) An updated and expanded assessment of PLS-SEM in information systems research. Industrial management & data systems 117(3):442–458

Hamrat N, Hidayat DR, Sumantri MS (2019) Dampak stres akademik dan cyberloafing terhadap kecanduan smartphone [The impact of academic stress and cyberloafing on smartphone addiction]. J EDUCATIO: J Pendidik Indones 5(1):13–19. https://doi.org/10.29210/120192324

Hardiani WA, Rahardja E, Yuniawan A (2018) Effect of role conflict and role overload to burnout and its impact on cyberloafing. J Bisnis Strateg 26(2):89–99

Hembrooke H, Gay G (2003) The laptop and the lecture: the effects of multitasking in learning environments. J Comput High Educ 15:46–64. https://doi.org/10.1007/BF02940852

Hibrian H, Baihaqi M, Ihsan H (2022) Relationship between academic stress and cyberloafing behavior among Psychology Department Students at Universitas Pendidikan Indonesia. PSIKOPEDAGOGIA J Bimbing Dan Konseling 10(2):89–93. https://doi.org/10.12928/psikopedagogia.v10i2.17602

Ghani FA, Muslim NA, Rasli MA, Bhaskaran KN, Rashid RE, Kadir SL (2018) Problematic usage of digital technologies at workplace: a study on job stress and cyberloafing behaviour among government servants in Malaysia. Glob Bus Manag Res Int J 10:754

Gokcearslan Ş, Mumcu FK, Haşlaman T, Cevik YD (2016) Modelling smartphone addiction: the role of smartphone usage, self-regulation, general self-efficacy and cyberloafing in university students. Comput Hum Behav 63:639–649. https://doi.org/10.1016/j.chb.2016.05.091

Khansa L, Barkhi R, Ray S, Davis Z (2017) Cyberloafing in the workplace: mitigation tactics and their impact on individuals' behavior. Inf Technol Manag, 1–19

Li Q, Ren X, Zhou Z, Wang J (2023) Reciprocal relationships between self-control and self-authenticity: a two-wave study. Front Psychol 14:1207230. https://doi.org/10.3389/fpsyg.2023.1207230

Liang X, Guo G, Gong Q, Li S, Li Z (2022) Cyberloafing to escape from the "Devil": investigating the impact of abusive supervision from the third-party perspective. Front Psychol 12:722063. https://doi.org/10.3389/fpsyg.2021.722063

Liani L, Baidun AD, Rahmah M (2021) The influence of big five personality trait and self-control on cyberloafing. In Proceedings of the 9th international conference on Cyber and IT Service Management (CITSM), Bengkulu, Indonesia, 2021, pp 1–5, https://doi.org/10.1109/CITSM52892.2021.9588899

Lim VK (2002) The IT way of loafing on the job: cyberloafing, neutralizing and organizational justice. J Organ Behav 23(5):675–694. https://doi.org/10.1002/job.161

Metin-Orta I, Demirutku K (2020) Cyberloafing behaviors among university students and its relation to Hedonistic-Stimulation value orientation, cyberloafing attitudes, and time spent on the Internet. Curr Psychol, 1–12. https://doi.org/10.1007/s12144-020-00932-9

Michielsen HJ, De Vries J, Van Heck GL (2003) Psychometric qualities of a brief self-rated fatigue measure the fatigue assessment scale. J Psychosom Res 54:345–352

Nwakaego FO, Angela OI (2018) Influence of cyberloafing on library and information studies students at the University of Ibadan, Nigeria. J Educ Res Rev 6(3):54–60. https://doi.org/10.30918/AERJ.63.18.039

Olmsted NM, Terry CP (2014) Who's texting in class? A look at behavioral and psychological predictors. Psi Chi J Psychol Res 19(4):183–192. https://doi.org/10.24839/2164-8204.JN19.4.18

Ozdamli F, Ercag E (2021) Cyberloafing among university students. TEM J 10(1):421–426. https://www.proquest.com/scholarly-journals/cyberloafing-among-university-students/docview/2702220573/se-2

Pallant J, Manual SS (2013) A step by step guide to data analysis using IBM SPSS. Australia: Allen & Unwin. 10(1):1753–6405

Rahmawati DD (2012) Pengaruh self-efficacy terhadap stres akademik pada siswa kelas I rintisan sekolah bertaraf internasional (RSBI) di SMP Negeri 1 Medan [The effect of self-efficacy on academic stress in class I International Standard School Pilots (RSBI) at Public Junior High School 1 Medan]. [Undergraduate Thesis, North Sumatera University]. North Sumatera Utara Digital Archive. https://l24.im/MRb0i

Ravizza SM, Hambrick DZ, Fenn KM (2014) Non-academic internet use in the classroom is negatively related to classroom learning regardless of intellectual ability. Comput Educ 78:109–114. https://doi.org/10.1016/j.compedu.2014.05

Schoemann AM, Boulton AJ, Short SD (2017) Determining power and sample size for simple and complex mediation models. Social Psychological and personality Science, 8(4):379–386

Tabachnick BG, Fidell LS, Ullman JB (2013) Using multivariate statistics vol. 6. Boston, MA: pearson, pp 497–516

Taneja A, Fiore V, Fischer B (2015) Cyber-slacking in the classroom: potential for digital distraction in the new age. Comput Educ 82:141–151. https://doi.org/10.1016/j.compedu.2014.11.009

Tangney JP, Baumeister RF, Boone AL (2004) Self-Control Scale (SCS) [Database record]. APA PsycTests. https://doi.org/10.1037/t19593-000

Twum R, Yarkwah C, Nkrumah IK (2021) Utilisation of the internet for cyberloafing activities among university students. J Digit Educ Technol 1(1):ep2101. https://doi.org/10.21601/jdet/10912

Venkatesh V, Thong JY, Xu X (2012) Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Quart, 36(1):157–178. Retrieved on 27 November 2022 from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2002388

Yılmaz FGK, Yılmaz R, Ozturk HT, Sezer B, Karademir T (2015) Cyberloafing as a barrier to the successful integration of information and communication technologies into teaching and learning environments. Comput Hum Behav 45:290–298

Yogisutanti G, Hotmaida L, Gustiani Y, Panjaitan SW, Suhat S (2020) Teaching under stress and fatigue: can affect the performance? Health Sci J 12:112–123

Zettler I (2011) Self-control and academic performance: two field studies on university citizenship behavior and counterproductive academic behavior. Learn Individ Differ 21(1):119–123. https://doi.org/10.1016/j.lindif.2010.11.002

Zhang H, Zhao H, Liu J, Xu Y, Lu H (2015) The dampening effect of employees' future orientation on cyberloafing behaviors: the mediating role of self-control. Front Psychol 6:1482. https://doi.org/10.3389/fpsyg.2015.01482

Zhou B, Li Y, Tang Y, Cao W (2021) An experience-sampling study on academic stressors and cyberloafing in college students: the moderating role of trait self-control. Front Psychol 12:514252. https://doi.org/10.3389/fpsyg.2021.514252

## Competing interests

The authors declare no competing interests.

## Ethical approval

This study received approval from the Research Ethics Committee of Girne American University.

## Informed consent

Participants were given written informed consent forms that explained the aim of the study and its significance.

## Additional information

**Correspondence** and requests for materials should be addressed to Ibrahim Horoub.

**Reprints and permission information** is available at http://www.nature.com/reprints

**Publisher's note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.