Research Article

Digital Fatigue and Its Association With Academic Resilience and Psychological Well-Being Among Undergraduate University Students

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ABSTRACT

Background: Digital Technologies are pervasive in higher education leading to concerns about digital fatigue and its potential impacts on students' psychological and academic adaptation.

Aim: To measure the digital fatigue amongst students in University of Kirkuk and how it correlates with academic resilience and psychological well-being of students of the university.

Methods: The current study is descriptive cross-sectional that was conducted on 250 undergraduate students from the University of Kirkuk in Iraq using stratified random sampling method between January 15 and June 25, 2024. Sociodemographic data were obtained with measures, an adapted Zoom Exhaustion and Fatigue Scale (ZEF), the Academic Resilience Scale (ARS-30), and the Psychological Well-Being Scale (PWB) by Ryff. Descriptive statistics, Pearson's correlation coefficient and simple linear regression were used for data analysis, and a value of $p<0.05$ was considered significant.

Results: More than half of participants (58.0%) said that they use the screen for more than 6 hours a day, the main academic device being the smartphones (59.6%). Digital fatigue had weak, but statistically significant, negative correlation with academic resilience (r=-.153,p=.015) and psychological well-being (r=-.153,p=.016), explaining 2.3% of the variance in each outcome (R^2=.023). On the other hand, academic resilience was strongly correlated with psychological well-being (r=.625, p<.001).

Conclusion and Recommendations: Digital fatigue was significantly related with decreased academic resilience and psychological wellbeing, while increased academic resilience was significantly related with increased psychological wellbeing. To embed “digital healthy use practices” and academic resilience training into students' support programs in universities.

Keywords: Digital fatigue; academic resilience; psychological well-being; university students; digital technology.

1. Introduction

Digital fatigue is a condition of physical and mental tiredness which can result from long or high levels of digital technology use. It can include physical, visual, social, emotional, and motivational fatigue, which is indicative of the multiple facets of prolonged digital engagement (Fauville et al., 2021). Digital stressors are also a potential risk for the individuals using intensive digital technologies, such as information overload, higher expectations of availability, and technology use uncertainty (Fischer et al., 2021). While digital technologies enable access to information, communication and learning, extended exposure can put a high cognitive, visual, emotional and motivational burden on student learning. Therefore, digital fatigue has emerged as a growing issue in higher education.

Students may be more vulnerable to the physiological impact of prolonged digital use with academic-related activities. Gammoh (2021) found digital eye strain was very prevalent among 382 university students in Jordan; 94.5% had digital-device use more than 6 hours a day and 55.5% met the criteria for computer vision syndrome. While digital eye strain is just one aspect of digital fatigue, these results suggest that there may be a physical toll on university students when it comes to long-term digital-device usage. The growing focus on digital stress management among university students also shows the significance of addressing the psychological needs of intensive technology use (Apolinário-Hagen et al., 2021).

After all, the impact of continuous engagement with digital technology can go beyond pain to affect the psychological and learning processes of students. Digital stressors can be associated with negative psychological effects, such as emotional exhaustion and can impact experiences with technology (Fischer et al., 2021). In the same way, the studies that examined digital stress management in the university community highlighted the importance of dealing with the psychological load of technology and fostering coping strategies that are adaptive to the context (Apolinário-Hagen et al., 2021). Hence, an understanding of digital fatigue in the context of university students

should not only take into account the physical symptoms, but also the broader psychological and academic functioning.

Academic resilience is a crucial psychological asset that helps pupils to keep performing academically when they encounter challenges, obstacles and academic expectations. Al-Sarayrah (2022) conducted research at Mut'ah University in Jordan, which revealed moderate academic resilience and perceived self-efficacy among 728 students and concluded that there was a significant positive correlation between academic resilience and perceived self-efficacy. Likewise, another research on 412 students attending university in Egypt revealed that personality traits and social support significantly influenced academic resilience, emphasizing the role of personal and social resources in students' resilience to academic pressures (El-Sayem & Ayoub, 2020). A study conducted among 384 University of Ha'il nursing students in Saudi Arabia also found academic resilience to be relevant to students' quality of life, highlighting the relevance of resilience in students' academic and psychosocial functioning (Grande et al., 2022).

Psychological well-being is another important dimension of university students' overall functioning and reflects positive and adaptive psychological experiences. Among 726 students at the Hashemite University in Jordan, psychological well-being was examined as an important aspect of students' psychological functioning (Alkhazaleh et al., 2020). In Saudi Arabia, a psychological well-being program among University of Jeddah students demonstrated the relevance of psychological well-being to positive psychological outcomes, including meaning in life (Alhaj-Mahmoud & Ahmad, 2021). Despite increasing attention to digital engagement, academic resilience, and psychological well-being, limited evidence was identified in the literature reviewed for the present study regarding their combined examination among Iraqi university students. In particular, evidence concerning the relationship between digital fatigue, academic resilience, and psychological well-being among students at Kirkuk University appears limited. Therefore, the present study aims to assess digital fatigue and examine its relationship with academic resilience and psychological well-being among university students at Kirkuk University.

2. Methodology

2.1 Research Design

A descriptive cross-sectional correlational study design. The study was conducted from January 15 to June 25, 2024.

2.2 Study Setting & Population

The study was conducted at the University of Kirkuk, Kirkuk, Iraq. The study population consisted of undergraduate students enrolled in different academic stages and various fields of study at the university.

2.3 Eligibility Criteria

2.3.1 Inclusion Criteria : Students were eligible to participate if they were undergraduate students enrolled at the University of Kirkuk, aged 18 years or older, regularly used digital devices for academic purposes, and agreed to participate voluntarily in the study.

2.3.2 Exclusion Criteria: Students were excluded if they had a diagnosed severe psychiatric disorder that could interfere with their ability to complete the study instruments or if they submitted incomplete questionnaires.

2.4 Sample and Sampling Technique

A total of 250 undergraduate students participated in the study. A stratified random sampling technique was used to select participants from different colleges and academic stages at the University of Kirkuk

2.5 Data Collection Instruments

Data were collected using a structured self-administered questionnaire consisting of four parts. The questionnaire included sociodemographic and academic characteristics and three standardized measures assessing digital fatigue, academic resilience, and psychological well-being.

Part I: Sociodemographic and Academic Characteristics

This section collected information on participants' age, gender, marital status, academic stage, field of study, place of residence, average daily screen time, and primary device used for study purposes.

Part II: Digital Fatigue Scale

Digital fatigue was measured with a 15-item Zoom Exhaustion and Fatigue Scale (ZEF) adapted by Fauville et al. (2021). The general fatigue of student's use of digital technologies was assessed using the adapted scale, not videoconferencing specifically. The instrument consists of five dimensions (three items per dimension): general

fatigue, visual fatigue, social fatigue, motivational fatigue and emotional fatigue. These are rated using a 5 point Likert Scale (1 = Not at all to 5 = Extremely). The total score is between 15 and 75, with higher scores representing higher levels of digital fatigue.

Part III: Academic Resilience Scale

The Academic Resilience Scale (ARS-30) (Cassidy, 2016) was used to measure academic resilience. The scale has 30 items that measure students' responses to academic success, failure, and problems/situations across three factors: perseverance, reflecting/helping-seeking, and negative affect/emotional response. Responses are on a 5-point scale. The negatively-worded items were reverse scored to ensure that higher scores always represented higher academic resilience. The means and standard deviations of items were computed for descriptive analysis and the total scale score was used in the correlation and regression analyses.

Part IV: Psychological Well-Being Scale

The 18 item version of the Ryff Psychological Well-Being Scale was used to assess psychological well-being. The scale measures six subscales: self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life and personal growth each with three items. The negatively worded items were reverse scored prior to the total score. Scores that are higher mean higher psychological well-being.

2.6 Ethical Considerations

The ethical principles were observed throughout the study. The purpose and objectives of the study were explained to the participants and their voluntary participation was emphasized and their right to withdraw at any time without penalty was explained. All participants gave informed verbal consent for data collection. The confidentiality and anonymity of the data provided was maintained during the collection, the management and analysis of the data. All the gathered data was used solely for research purposes.

2.7 Statistical Analysis

The Statistical Package for the Social Sciences (SPSS), version 26, was used to analyze the data. The study variables were summarized with descriptive statistics such as frequencies, percentages, means and standard deviations. In order to obtain the total score for the Academic Resilience Scale (ARS-30) and the Ryff Psychological Well-Being Scale, items with negative wording were reverse scored. The total scores obtained were subsequently used for analysis of Pearson correlation and simple linear regression. The relationships between digital fatigue, academic resilience and psychological well-being were analyzed using Pearson's correlation coefficient. Simple linear regression analysis was used to determine if digital fatigue was a significant predictor of academic resilience and psychological well-being. A p-value of < 0.05 was considered statistically significant.

3. Results

Table 1. Sociodemographic and Academic Characteristics of the Study Participants (n = 250)

Variables		Frequency	Percentage
Age	18–20 years	96	38.4
	21–23 years	123	49.2
	≥24 years	31	12.4
Gender	Male	105	42
	Female	145	58
Marital Status	Single	146	58.4

	Married	98	39.2
	Divorced	6	2.4
Academic Stage	First	57	22.8
	Second	58	23.2
	Third	55	22
	Fourth	60	24
	Fifth & Sixth	20	8
Field of Study	Medical	73	29.2
	Scientific	78	31.2
	Humanities	99	39.6
Place of Residence	Urban	179	71.6
	Rural	71	28.4
Average Daily Screen Time	<3 hours	47	18.8
	3–5 hours	58	23.2
	6–8 hours	76	30.4
	>8 hours	69	27.6
Primary Device Used for Study	Smartphone	149	59.6
	Laptop	67	26.8
	Tablet	34	13.6

Table 1 indicates that 49.2% of the participants were between the ages of 21-23 and 58.0% of the participants were females. Among the participants, the largest group were in the fourth academic stage (24.0%) and the majority were single (58.4%). The largest group of students studying humanities (39.6%) and most of the respondents lived in urban areas (71.6%). As for screen time per day, 30.4% reported 6–8 hours and 27.6% reported more than 8 hours. The most used devices for study were the smartphone (59.6%) and laptop (26.8%) devices, followed by the tablet (13.6%).

Table 2. Mean and Standard Deviation of Students' Responses to the 15-Item Digital Fatigue Scale (n = 250)

Items		Mean	Std. Deviation
General Fatigue	I feel tired	3.01	.674
	feel exhausted	3.49	.777
	I experience cognitive fatigue.	3.39	.849
Visual Fatigue	My sight becomes obscured.	3.42	.988
	My eyes experience discomfort.	3.28	.852
	I endure discomfort in the vicinity of my eyes.	3.31	.774
Social Fatigue	I refrain from engaging in social circumstances.	3.64	.899
	I simply desire solitude.	3.20	.808
	I require solitude.	3.20	.644

Motivational Fatigue	I fear engaging in activities.	3.39	.805
	I lack the motivation to engage in any activities.	3.40	.851
	I'm frequently too exhausted to accomplish anything else.	3.18	.763
Emotional Fatigue	I'm emotionally spent.	3.52	.856
	I'm agitated.	3.37	.878
	I'm feeling moody.	3.46	.918

Table 2 shows variation across the five dimensions of digital fatigue. The highest item mean was observed for avoiding social situations (M = 3.64, SD = 0.899), followed by feeling emotionally drained (M = 3.52, SD = 0.856) and feeling exhausted (M = 3.49, SD = 0.777). Within the individual dimensions, blurred vision showed the highest mean for visual fatigue (M = 3.42, SD = 0.988), not feeling like doing anything for motivational fatigue (M = 3.40, SD = 0.851), and avoiding social situations for social fatigue (M = 3.64, SD = 0.899).

Table 3. Mean and Standard Deviation of Students' Responses to the Academic Resilience Scale (ARS-30) (n = 250)

No.	Item	Mean	Std. Deviation
1.	I wouldn't take the tutors' criticism.	2.91	.739
2.	I would use the criticism to make my work better.	3.56	.943
3.	I would simply give up.	2.74	.723
4.	I would take use of the circumstance to inspire myself.	2.81	.788
5.	I would alter my professional goals.	2.92	1.000
6.	I would probably become irritated.	3.12	.829
7.	I would start to believe that I had little chance of succeeding in college.	2.76	.747
8.	I would consider the circumstance to be difficult.	2.79	.917
9.	I would try my hardest to cease having pessimistic ideas.	2.68	.768
10.	In my opinion, the problem is only temporary.	2.38	.690
11.	I would put in more effort.	3.17	1.117
12.	I would most likely become depressed.	2.12	.876
13.	I would attempt to come up with fresh ideas.	3.34	1.022
14.	I would be really let down.	2.09	.778
15.	I would hold the tutor accountable.	2.98	.923
16.	I would continue to attempt	2.75	1.128
17.	I wouldn't alter my long-term objectives.	3.27	.907
18.	I would inspire myself by drawing on my prior accomplishments.	3.16	1.085
19.	I would start to believe that I had little chance of landing the job I wanted.	2.06	.850
20.	I would begin keeping track of and assessing my efforts and accomplishments.	2.07	.673
21.	I would begin keeping track of and assessing my efforts and accomplishments.	2.68	.708
22.	I would encourage myself.	2.76	.874
23.	I would prevent myself from being anxious.	3.15	1.040
24.	I would experiment with different study methods.	2.88	.827
25.	I would establish my own objectives for success.	3.02	1.134
26.	I would ask my loved ones and friends for support.	3.27	.907
27.	To improve my work, I would strive to consider my strengths and shortcomings more.	2.55	.670
28.	I would feel as though everything had failed and was wrecked.	3.26	.891
29.	I would begin imposing incentives and penalties on myself based on how well I performed.	3.39	.849
30.	I'm eager to demonstrate that I can raise my grades.	3.42	.988

Table 3 presents the mean scores and standard deviations of students' responses to the 30 items of the Academic Resilience Scale (ARS-30). The highest item mean was observed for using feedback to improve work (M = 3.56, SD = 0.943), followed by looking forward to improving grades (M = 3.42, SD = 0.988) and self-imposing rewards and punishments based on performance (M = 3.39, SD = 0.849). Other relatively high item means were observed for trying to think of new solutions (M = 3.34, SD = 1.022) and maintaining long-term goals and ambitions (M = 3.27, SD = 0.907).

Table 4. Mean and Standard Deviation of Students' Responses to the 18-Item Ryff Psychological Well-Being Scale (n = 250)

Item	Mean	Std. Deviation
Self-Acceptance		
Most aspects of my personality appeal to me.	3.31	.774
When I consider my life's narrative, I am happy with how things have worked out.	3.64	.899
I am disappointed in several aspects of my life's accomplishments.	3.09	.817
Positive Relations with Others		
People would characterize me as generous and eager to share my time with others.	3.39	.825
It has been challenging and annoying for me to keep up intimate relationships.	3.20	.887
I have not had many relationships with people that are friendly and trustworthy.	3.26	.922
Autonomy		
Even if my opinions don't align with the majority, I am confident in them.	3.27	.770
People with strong opinions have a tendency to influence me.	3.52	.856
I evaluate myself based on my own values rather than those of others.	3.43	.853
Environmental Mastery		
Generally speaking, I believe that I am in control of my circumstances.	3.49	.911
I'm frequently depressed by the pressures of daily life.	2.53	.856
I'm frequently depressed by the pressures of daily life.	3.07	1.137
Purpose in Life		
I'm not one of those folks that wander aimlessly through life.	2.80	1.037
I don't really consider the future; I just take each day as it comes.	2.48	.915
I feel like I have a purpose and direction in life.	2.64	1.024
Personal Growth		
Life has been an ongoing process of growth, learning, and transformation for me.	2.77	.990
I believe it's crucial to have fresh experiences that make you reevaluate your beliefs about the world and yourself.	2.61	.980
I long ago gave up on making significant changes or improvements in my life.	2.69	1.074

Table 4 presents the mean scores and standard deviations of students' responses to the 18 items of the Ryff Psychological Well-Being Scale. The highest item mean was observed for being pleased with how life had turned out (M = 3.64, SD = 0.899), followed by feeling in control of the situation in which they lived (M = 3.49, SD = 0.911) and judging oneself according to personally important values (M = 3.43, SD = 0.853). Other relatively high item means were observed for being a giving person willing to share time with others (M = 3.39, SD = 0.825) and having confidence in one's opinions even when contrary to the general consensus (M = 3.27, SD = 0.770).

Table 5. Pearson Correlation Coefficients among Digital Fatigue, Academic Resilience, and Psychological Well-Being (n = 250)

Correlations				
		Digital Fatigue	Academic Resilience	Psychological Well-Being
Digital Fatigue	Pearson Correlation	1	−.153*	−.153*
	Sig. (2-tailed)		.015	.016
Academic Resilience	Pearson Correlation	−.153*	1	.625**
	Sig. (2-tailed)	.015		.000
Psychological Well-Being	Pearson Correlation	−.153*	.625**	1
	Sig. (2-tailed)	.016	.000	

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Table 5 shows significant correlations among digital fatigue, academic resilience, and psychological well-being. Digital fatigue was significantly and negatively correlated with academic resilience ($r = -.153$, $p = .015$) and psychological well-being ($r = -.153$, $p = .016$), indicating weak negative associations. In contrast, academic resilience was significantly and positively correlated with psychological well-being ($r = .625$, $p < .001$), indicating a strong positive association.

Table 6. Simple Linear Regression Analysis of Digital Fatigue Predicting Academic Resilience (n= 250)

Variable	B	SE	β	t	P
Constant	103.101	12.530	—	8.228	< .001
Digital Fatigue	-0.608	0.249	-0.153	-2.442	.015*

Model Statistics: R: .153, R^2: .023, Adjusted R^2: .019 , p-value: .015 .

Table 6 shows that digital fatigue significantly and negatively predicted academic resilience ($\beta = -.153$, $p = .015$). The model explained 2.3% of the variance in academic resilience ($R^2 = .023$), indicating that higher digital fatigue was associated with lower academic resilience.

Table 7: Simple Linear Regression Analysis of Digital Fatigue Predicting Psychological Well-Being (n= 250)

Variable	B	SE	B	t	p
Constant	66.732	5.202	—	12.829	< .001
Digital Fatigue	-0.252	0.103	-0.153	-2.436	.016*

Model Statistics: R: .153, R^2: .023, Adjusted R^2: .019, p-value: .016.

Table 7 shows that digital fatigue significantly and negatively predicted psychological well-being ($\beta = -.153$, $p = .016$). The model explained 2.3% of the variance in psychological well-being ($R^2 = .023$), indicating that higher digital fatigue was associated with lower psychological well-being.

4. Discussion

The results of the present study show that undergraduates of Kirkuk University suffer from various forms of digital fatigue, including physical, visual, social, motivational, and emotional. This strain is largely contextualized by the high amount of daily screen exposure reported by participants (30.4% for 6-8 hours and 27.6% for >8 hours). In addition, the smartphones became the main academic instrument for almost 60% of students. The patterns support those found in the wider literature that discusses the physical and mental burden of high levels of technology usage amongst higher education students. For example, Gammoh (2021) noted that digital eye strain is exceptionally

common among university students in Jordan with 55.5% of them using their devices for more than 6 hours per day. Small screen devices like mobile phones are increasingly used to complete long academic tasks, increasing cognitive load and sensory overload, and confirming the high items means scores for visual fatigue and emotional strain found in this sample.

Digital fatigue showed a statistically significant, weak negative relationship with academic resilience (r=-.153,p=.015) and significantly predicted lower scores on the academic resilience scale (β=-.153,p=.015) accounting for 2.3% of variance. Constantly being exhausted due to digital devices slightly reduces students' adaptive ability to respond to academic stress and failure. The results are consistent with the regional evidence investigating resilience of students in challenging learning environments. Al-Sarayrah (2022) concluded that there is a significant correlation between the academic resilience and perceived self-efficacy in the state of Jordan, and Ali (2022) reached a positive relationship between the academic resilience and cognitive curiosity of Tikrit University students in Iraq. The digital fatigue effect is relatively small, suggesting that academic resilience is a complex construct, with a primary influence from internal psychological factors and external support systems, and not primarily based on digital exposure. El-Sayem and Ayoub (2020) found that core personality traits and perceived social support still continued to be the main factors that shape academic resiliency of university students.

The digital fatigue variable was statistically significant with regards to academic resilience and psychological well-being (β=-.153, p<.05) but explained only 2.3% of the variance (R^2=.023). It is a measure of digital exhaustion that it can be shown to have a negative impact on students' outcomes, but that this impact is relatively small. Exposure to digital content is not the key factor influencing academic resilience and psychological well-being; it's internal cognitive processes, self-efficacy and external social support networks. But the clear positive association between resilience and well-being (r=.625, p<.001) suggests that any intervention that has a positive impact on coping will have a far greater psychological impact than a reduction in screen time. Al-Salman et al. (2022) in a similar study reported that the heavy use of e-learning tools for during academic time led to increased psychological stress, sleep disturbances and low levels of well-being among students who studied in universities in Jordan. However, the modest amount of variance accounted for by digital fatigue indicates that there are larger psychological protective factors and lifestyle factors that need to be taken into account. The role of psychological interventions in enhancing psychological well-being, as studied by Alhaj-Mahmoud and Ahmad (2021) with Saudi university students, highlights the need for targeted psychological interventions that can help to create more purpose and life satisfaction without the burden of technology.

The highest and most significant result, in the current study, was the high positive correlation between academic resilience and psychological well-being (r=.625 and p<.001). Students who demonstrated higher levels of perseverance, adaptive help-seeking and constructive response to academic adversity also reported significantly more self-acceptance, environmental mastery and life purpose. This important correlation also supports the findings of empirical research in various regional and international educational studies. Grande et al. (2022) reported structural connections between academic resilience and quality of life in nursing students in Saudi Arabia, and Afifah et al. (2022) highlighted the buffering effect of academic self-efficacy for maintaining academic resilience. Moreover, Hassan et al. (2023) showed that personal resilience and positive coping significantly mitigated the sense of fatigue experienced by Iraqi university students during lockdowns. Taken together, these findings provide crucial insights for higher education administrators and student support services. Although controlling screen time and creating healthy digital habits is important to reduce physical and visual fatigue, improving academic resilience is a much more powerful way to support students' mental health. Given that digital technology is an essential aid in today's university education, universities should move their attention from giving students cognitive-behavioral coping strategies to providing them with stress-management workshops and resilience-building frameworks.

5. Conclusion

The present study findings indicated that digital fatigue has a negative effect on academic resilience and psychological well-being of students at Kirkuk University, but that this effect is not strong. Academic resilience, on the other hand, has a positive link with psychological well-being. Thus, the challenge of control of screen time is important but the challenge of developing resilience is much more important to protect mental health and academic achievement.

6. Recommendations

1. Awareness programs on digital fatigue and healthy digital-use practices should be offered in universities, such as taking regular screen breaks and managing screen-time.
2. Stress management and resilience building programs must be included in student support services in order to enhance students' adaptive coping mechanisms.
3. Long-term impacts should be assessed by researchers performing longitudinal studies with larger samples at multiple Iraqi universities.

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