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RESEARCH PAPER

Harnessing Digital Tools with Real-Time Feedback for Modern Coping Strategies and Impact of Resilience on Techno-Stress in Higher Education

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ABSTRACT

This study aims at how to use digital technologies that provide real-time feedback for contemporary coping mechanisms, as well as how resilience affects techno-stress. The influence of information technology has introduced significant challenges for the students of modern higher education, especially in the form of techno-stress. There is a significant need for students to develop resilience and effective coping strategies to reduce its impact. The goals of the research were to examine the mediated role of students in undergraduate programs. The Connor-Davidson Resilience Scale (CD-RISC), a Techno-stress Scale, along with coping style scale were used in this study; all three demonstrated excellent internal consistency through Cronbach's alpha values regarding.81,.82, and.84. According to the study's findings resilience and coping methods are positively correlated, but techno-stress and resilience are negatively correlated. As a recommendation, it was proposed that universities are encouraged to put certain policies into place to reduce academic pressure and foster a community that supports students' social and intellectual needs.

KEYWORDS Coping Strategies, Digital Tools, Higher Education, Resilience, Techno-Stress

Introduction

Students face several obstacles that test their cognitive, emotional, and mental resilience in the quickly changing world of college and university. It's more important than ever to have good coping strategies because of the tough schoolwork, job uncertainty, and social demands that come with it. Conventional methods of building resilience are still useful, but they frequently don't provide the immediate and customized attention that today's rapidly evolving world requires. This is the point at which technology becomes a game-changer.

Students' adaptability may be revolutionarily increased with real-time feedback systems and by using technological innovations. These tools, which include wearable technology, learning platforms driven by AI, and applications for mental health, are available and tailored to each user's needs. By enabling students to track their development, identify stresses, and modify their tactics on the go, they transform resilience-building into a proactive, continuous process. Furthermore, the immediate feedback that these tools offer gives pupils the ability to make wise decisions and develop a stronger feeling of control over their mental health.

Numerous researches have shown different connections among mental health results, resilience, and coping mechanisms. Coping mechanisms may have an impact on the connection among resilience and mental health, according to earlier study. The impact of technology on students' coping mechanisms in higher education is examined in this essay. The findings emphasize the important role of coping strategies in educational environments, especially when it comes to tackling issues like resilience, fear, and psychological stress. These results also offer valuable information for developing educational support initiatives. By embracing these tools, institutions and individuals alike can cultivate a culture of proactive, adaptive resilience, assure that students are not only surviving but are also excelling in their educational journeys.

Literature Review

In higher education, resilience is indispensable area of research. It reflects the need for students to address the academic and personal challenges in an effective way. The related review of literature highlights various research findings that include definition of resilience, its nature, resilience developing strategies and intimation for student's success. This review also includes the information on relationship between resilience and digital tools, and barriers that students face while adapting the digital resources to enhance resilience and coping strategies.

Resilience and its Role in Higher Education

According to Luther (2006), states that resilience is "positive adaptation despite adversity" Luther's point of view about resilience is that it is assemblage of two dimensions: adverse fortune and positive adaptation. According to this concept, resilience cannot be quantified directly but it is concluded indirectly from evidence of the given dimensions. This idea is also accepted by other researchers (Yates et al., 2003, and Sroufe et al., 2005) as well. Rutter says, "Resilience is a relative resistance psychosocial risk experiences" (Rutter, 2000). Rutter's perspective emphasizes a range of results, not just favorable ones. It doesn't inherently assume that safety stems from pleasant experiences or that the solution lies in how an individual responds to negative experiences at the moment (how different individuals cope with it) (Rutter, 2000).

On the other hand, (hunter, 1999) says that resilience is of two distinct kinds: "less optimum resilience and optimum resilience" Less optimum resilience may involve coping strategies such as resorting to violence, involvement in high risk behaviors, or withdrawing socially and emotionally. The adults having such resilience are often abnormal (Hunter, 1999). Higher education studies bring challenges like economic problems, time management difficulties, mental stress and social challenges. Resilience is the factor that makes students able to come out of such crises. Research provides the evidences that resilience enables students to use effective coping strategies i.e. meditation, problem solving, positive thinking and seeking support (Hartley, 2011).

Modern Stressors in Higher Education

Modern students face different challenges, including academic, financial, and technological and psychological pressures. These stressors emphasize the importance of developing resilience and strong coping strategies to manage these stressors effectively. The competition in higher education has risen in past few years. In such a competitive environment, students are facing increasing workloads, strict deadlines and fears about performance. Ask for multitasking, especially in online study system, can grow mental stress and lessen the ratio of academic success (NIMH). Another challenge that students

face at higher education is financial crisis. Costly study materials, rising living expenses and high tuition fees are the main causes of considerable pressure for students. According to the survey of undergraduates and recently graduated individuals by Inceptia, finds that four major issues are related to finance, such as personal debts repayment, educational expenses, taking loans for college, and finding part time jobs (Trombitas, 2012).

Mental health challenges like anxiety and depression contribute to the failure of the students at higher education. It has been observed that great expectations and competitive environment might harm students' mental health and general well-being (Bashir et al. 2019). Moreover, students face uncertainty about their future and find themselves under pressure for making decision for their future life; this situation can cause stress and anxiety (Guzman et al., 2023)

Resilience and Techno-Stress

Students often face the challenges of technology demands such as intrusion, overload, and complexity, which can exhaust their mental and physical resources. This depletion may affect their ability to handle emotional and cognitive challenges, leading to negative emotional experiences. Research highlights that resilience plays a crucial role in shaping how individuals perceive various ICTs. Resilience not only fosters the positive benefits of communication technology but also helps reduce the adverse effects associated with techno-stress.

Coping Strategies and Techno-Stress

People experience technology-related stress differently depending on their conditions that is why its effects vary from person to person. Recent studies show that some people see certain technology stresses as threats, like when technology feels too complicated or unsafe. Others see stresses like having too much technology or dealing with unpredictability as challenges. Research also shows that students feel pressure to use the widely available information and communication technology (ICT). When students view technology positively or as a challenge, they are more likely to solve problems directly. However, if they feel threatened or harmed by it, they tend to rely on emotional coping strategies. Students who are comfortable using computers, have experience with online or blended learning, and feel less anxious are better at handling the demands of educational technology.

Real- Time Feedback in digital tools as a Resilience Building Tool

Real-time feedback is an actionable response provided by digital tools to the user, contributes a lot in enhancing resilience. Such feedbacks encourage self reflection and adaptive learning behaviors. An instant feedback fosters positive mindset that enables students to view a challenge or failure as opportunity for growth (Martin &Marsh, 2009).Physiological response tracking tools, are a source of real-time feedback to lead students in coping their emotions in academic life (Eisenberg et el., 2009). Digital tools (stress-monitoring wearable device, AI evaluation system, and emotion recognition technologies) with such feedback features make students enable to indicate the areas of improvement and achievements. Tools that track physiological responses, such as stress and anxiety, provide real-time feedback to guide students in managing their emotions during academic tasks (Eisenberg et al., 2009).

Factors influencing the use of Digital Tools in Higher Education

Digital tools have proved to be an integral part of higher education to ensure resilience and academic success among students, yet there are factors that are badly effecting the incorporation of these tools in higher educational institutions. The availability of the internet, mobile devices, and computers affects the students' ability to use digital tools. Students belonging to far-flung rural areas have to face technological constraints. Educational institutes can provide access to such resources and can help resolve such issues (OECD, 2021). Real-time feedback tools require latest and well equipped infrastructure, which is not available in many regions.

Another factor that affects more is the lack of technical skills in students. Lack of such skills makes students unable using digital tools for coping. While the students who have fluency in such skills, can use advanced solutions or apps for coping (Van Deursen& Van Dijk, 2019).

There are varieties of challenges in higher education, a student has to face. Despite all these difficulties, the intervention of real-time feedback in digital tools remains a promising approach for fostering resilience in students. A specific mechanism should be focused in future research, a mechanism with real time feedback that can have great impact on resilience. According to some research, understanding healthy coping mechanisms, such flexibility, can mitigate the negative impacts of technology stress on employee burnout and even have a beneficial effect. Additionally, mindfulness and technical self-efficacy have been found to be useful strategies for lowering technology stress.

Material and Methods

Research Design

In this research the researcher used quantitative methods for the purpose of descriptive analysis. A voluntary, anonymous, self-administered online questionnaire was used to gather data for a cross-sectional research study. Students verbally consented to participate in the study after being told about its goal. 250 students from the University of Education, D.G. Khan Campus, were chosen at random to be included in the sample.

Data Collection Procedure

Individual questionnaires containing coping mechanisms, resilience scales, and psychological measures of techno-stress were sent in order to collect data. The responses were scored based on the criteria outlined in the study instruments. Statistical software was then used to analyze the collected data.

Research Instrument

The Connor-Davidson Resilience Scale (CD-RISC) was adapted for this research, comprising three dimensions: strength, optimism, and tenacity. Each dimension is rated on a five-point scale to measure a person's adaptability, with resilience degrees categorized as low, moderate, or high according to predetermined cut-off values. The scale had a strong internal consistency, with a Cronbach's α coefficient of 0.84. The Simplified Coping Style Questionnaire (SCSQ), developed by Folkman and Lazarus (1988), evaluates coping behaviors using a five-point Likert scale (1 being strongly disagree; 5 being strongly agree).

A Techno-stress Questionnaire was specifically developed for this research, incorporating items measured on a five-point Likert scale from 1 ("strongly disagree") to 5 ("strongly agree"), along with an option for "not applicable" or "I don't know." All scales demonstrated high reliability, with reliability coefficients exceeding 0.8.

Data Analysis

Table 1
Regression Analysis of the Relationships between Variables in the Mediation Model

Variables	Model 1		Model 2		Model 3	
	β	T	β	t	β	t
Resilience	-0.25	-5.32***	0.27	6.39***	-0.12	-2.42***
Coping Strategies					-2.28	-4.54***
R^2		0.09		0.37		0.18
F		35.64**		63.28**		26.83**

Note: (1)* p < .05. ** p< .01. *** p< .001. (2) After being normalized, each variable in the model is entered into the regression equation. Techno-stress is predicted by Model 1 Resilience: Coping Strategies are predicted by Model 2 Resilience: Techno-stress is influenced by both Model 3 Coping Strategies and Resilience.

According to the mediation model results (Table 1), Coping Strategies are strongly predicted positively by Resilience (β = 0.27, t = 6.39, p < 0.001). Both Coping Strategies (β = -2.28, t = -4.54, p < 0.001) and Resilience (β = -0.12, t = -2.42, p < 0.001) substantially and adversely predict the degree of attribution need when both are included in the regression equation.

Table 2
Descriptive Statistics of Impact of Resilience and Coping Strategies on Techno-Stress of Higher Education Students

The Impact of Resilience and Coping Strategies on Techno-Stress		M	SD	Levels
Resilience	Strength	3.26	0.44	Moderate
	Optimism	3.31	0.52	High
	Tenacity	3.17	0.35	Moderate
Coping Strategies	Seeking help and Problem Solving	2.84	0.34	High
	Self-Regulation	2.99	0.44	High
	Fantasy & Evasion	2.38	0.52	Low
Techno-Stress	Techno-Stress	2.90	0.41	Moderate

A moderate level of strength (M=3.26, S.D=0.44), a high level of optimism (M=3.31, S.D=0.52), and a moderate level of tenacity (M=3.17, S.D=0.35) were the resilience variables among students in higher education, according to Table 1. Self-regulation (M=2.99, S.D =0.44) and problem-solving and requesting assistance (M=2.84, S.D=0.34) were seen as good coping methods, whereas fantasy and avoidance (M=2.38, S.D=0.52) were viewed as low. Techno-stress was found to be moderate (M=2.90, S.D=0.41).

Using Pearson's product-moment correlation coefficient, as indicated in Table 3, the study examines the connection between higher education students' coping mechanisms, resilience, and techno-stress.

Table 3
Correlation Coefficient of the Resilience and Coping Strategies on Techno-Stress of Higher Education Students

	Variables	Techno-Stress	Strength	Optimism	Tenacity	Seeking Help and Problem Solving	Self-Regulation	Fantasy and Evasion
Techno-Stress	Techno-Stress	1.00						
	Strength	-0.16*	1.00					
Resilience	Optimism	-0.22*	0.6*	1.00				
	Tenacity	-0.37*	0.30*	0.21*	1.00			
	Seeking Help and Problem Solving	-0.12*	0.58*	0.46*	0.20*	1.00		
Coping Strategies	Self-Regulation	0.18*	0.04	-0.05	-0.03	0.12*	1.00	
	Fantasy and Evasion	-0.38*	0.32*	0.30*	0.40*	0.32*	-0.03	1.00

Note. * p< .05. ** p< .01. *** p< .001.

Higher education students' resilience and techno-stress are related, as shown in Table 3, which shows a negative relationship coefficients ranging from -0.16 to -0.37. Tenacity has the largest negative association (-0.37) with techno-stress among the resilience characteristics, whereas strength has the least negative correlation (-0.16). These findings imply a lower likelihood of techno-stress among pupils who exhibit more resilience.

Analyses of the link between coping mechanisms and technological stress also reveal negative correlation coefficients, ranging from -0.12 to -0.38. Fantasy and avoidance showed the largest negative association (-0.38), whereas problem-solving and asking for help showed the least negative correlation (-0.12). However, self-regulation and techno-stress had a positive connection (0.18), suggesting that using self-monitoring as an inactive coping strategy may make techno-stress more likely.

Conclusion

Programs that assist students acquire social-emotional skills, such emotional control and counseling, and meet their emotional needs are becoming more and more popular (Morales Rodríguez, 2017). Additionally, mindfulness-based stress treatment is becoming more popular in educational settings (Valero et al., 2020; Getachew, 2020). In order to provide students the tools they need for both personal and academic success, counseling is essential (Danger et al., 2018; Turner & Berry, 2000). According to this study, resilience and coping strategies are positively correlated, whereas resilience and technological stress are negatively correlated. Resilient pupils use healthy coping mechanisms to successfully handle technological stress. These findings are in line with other research's findings that found a relationship between methods of coping, resilience, and stress (Ursu&Măirean, 2022; Denovan&Macaskill, 2017).

The psychological responses of pupils to technological stress were examined in this study. The results showed that pupils who were more resilient had a lower level of stress from technology, with correlation values between -0.16 and -0.37 ($p < 0.05$).

According to Diller (2016), resilience may both mitigate the negative effects of technology use; such overload, and increase its positive effects. Furthermore, a negative association between coping methods and techno-stress was observed, with coefficients fluctuating between -0.12 to -0.38 ($p < 0.01$), highlighting the significance of efficient coping mechanisms in stress management. According to Sun et al. (2020), one of the best strategies to manage stress during trying times is to look for social support.

Recommendations

i. Encouraging students to adopt flexible coping strategies can significantly enhance their self-efficacy.

ii. Higher education institutions should implement effective initiatives to strengthen students' psychological resilience and minimize learning burnout.

iii. Universities are encouraged to put certain policies into place to reduce academic pressure and foster a community that supports students' social and intellectual needs.

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