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Research Article

The Influence of Satisfaction with E-Learning on the Psychological State of Nursing Students

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Aim. The education system has transitioned from traditional learning to e-learning. Earlier, researchers tested the feasibility of e-learning for nursing students. However, whether satisfaction with e-learning affects students' mental health remains unknown. This study aimed to determine the influence of satisfaction with e-learning on mental health (stress, anxiety, and depression) among undergraduate nursing students. *Methods.* This study design was cross-sectional, correlational, and descriptive. Data were collected between April and December 2022 from local nursing colleges in 13 regions in Saudi Arabia. A convenience sampling method was employed to recruit undergraduate nursing students. One hundred forty-four students responded to the online questionnaire. *Results.* Nursing students demonstrated moderate levels of anxiety ($M = 9.89$ (SD = 4.28)), stress ($M = 10.40$ (SD = 4.05)), and depression ($M = 9.64$ (SD = 4.38)). The average satisfaction with e-learning score was 2.79 (SD = 0.85), indicating that students' satisfaction was low. Strong and positive correlations existed between anxiety and stress ($r = 0.787$, $p < 0.001$) and depression ($r = 0.867$, $p < 0.001$). However, anxiety, stress, and depression were not correlated with satisfaction. Female participants demonstrated more significant anxiety ($M = 11.0$, SD = 3.55), stress ($M = 11.3$, SD = 3.5), and depressive symptoms ($M = 10.9$, SD = 3.6) than their male counterparts. Stress significantly and indirectly affected depression through anxiety ($B = 0.580$, $p < 0.001$, 95% CI 0.449 to 0.719). The proportion of mediation ($P_M = 0.697$) indicated that 69.7% of the total stress effect on depression was because of the indirect impact of anxiety, acting as a partial mediation. *Conclusions.* This study emphasized providing mental health services for nursing students. Conducting qualitative research will help achieve knowledge of nursing students' mental health status.

1. Introduction

E-learning is an alternative educational method that has been in use to provide students with information in the presence of geographical constraints. Technological advancements and the wide use of the Internet facilitated its adoption and implementation in many universities. Nevertheless, its use was limited in the Kingdom of Saudi Arabia before the coronavirus pandemic (COVID-19), where the educational system depended on traditional classes [1].

The emergence of COVID-19 in December 2019 was considered by the World Health Organization (WHO) a public health emergency in January 2020. It was quickly recognized as a pandemic in March 2020 [2]. The disease is caused by the SARS-CoV-2 virus, primarily transmitted through exposure to respiratory droplets or aerosols from an infected person. Thus, preventative measures were instituted to mitigate the rapid spread of COVID-19. Some of these interventions included quarantining infected individuals, implementing mandatory lockdowns, and enforcing physical distancing.

Some of these interventions included quarantining infected individuals, implementing mandatory lockdowns, and enforcing physical distancing. However, these necessary precautions also posed challenges to continuing physical education. In response to these challenges, the United Nations Educational, Scientific, and Cultural Organization recommended the shift from traditional learning to distance learning environments [3]. The national government, in collaboration with the local education authorities, shifted to e-learning. This move aimed to ensure that the educational system remained intact and functional despite the disruptions caused by the pandemic [4].

E-learning is an appropriate strategy to sustain education during COVID-19. However, considerable challenges and queries must be addressed to measure its effectiveness. Many studies have examined online learning and compared it to face-to-face learning in terms of process, content, interaction, assessment, outcome, and satisfaction [5–7]. Pre-COVID-19, the literature provided insights and recommendations on how e-learning can be successful depending on the application context [8]. Therefore, a comprehensive analysis and teaching strategies should be developed to achieve learning goals.

Furthermore, many factors can affect students' preferences and satisfaction, such as their personality, technical skills, Internet access, alternatives to practical classes, and social role and associated responsibilities. Evidence-based teaching modalities are available to compensate for the absence of physical presence. Thus, using blackboards, chat rooms, and discussion boards, an interactive platform was utilized widely to maintain interaction between students and educators. Online learning provides convenient access to educational materials and sessions. However, previous researchers reported that students could not learn practical skills where hands-on training during simulations was not feasible [9]. Therefore, a blended approach, with theoretical and practical components, is widely accepted to deliver information [10].

During the COVID-19 pandemic, mental health declined worldwide due to the unprecedented mandatory quarantine, lockdown, universal masking, and media misinformation, creating uncertainty and fear. Furthermore, the sudden shift in the daily routine and social life caused significant distress, especially concerning exposure and transmitting the virus to parents, close family members, and friends [11]. On the other hand, the education system shifted for the first time in Saudi Arabia from traditional learning to the e-learning system. Adopting and implementing a new system with inadequate preparation might disturb students and create emotional distress that can adversely impact learning outcomes. Understanding students' psychological state, especially during times of crisis, helps educators treat students with compassion to counteract harmful emotions such as anxiety, stress, and depression.

Mental health is crucial to learning and meeting academic requirements. A systematic review addressed the high prevalence of mental health problems among nursing university students, even before COVID-19 [12]. The transitioning phase between high school and college can cause anxiety, stress, and depression because of the sudden change in teaching strategies and the sense of responsibility to meet expectations. Differentiation between the three conditions is provided by the American Psychology Association (APA), where anxiety is defined as an emotion that entails tension and worry associated with physical changes. The symptoms may include sweating, trembling, and an elevated heart rate. People usually experience anxiety as a response to excessive thinking about the future [13].

While anxiety is future-oriented, stress is the reaction to daily pressures that affect how people feel and behave, subsequently affecting physical and psychological health [13]. Depression is a more severe emotional condition where the individual experience profound sadness and despair [13]. It interferes with daily activities as it significantly decreases the ability to concentrate. In addition, it lowers self-esteem and may cause thoughts of death or suicide. Possible physical symptoms associated with it are somatic pain, lack of energy, disrupted sleep, weight loss, or gain. To minimize the adverse impact of such emotions, universities should provide mental health services to support students through consultation, coping strategies, and goal-setting [14].

Many Saudi Arabian studies conducted during COVID-19 indicated that students experienced minimal to moderate levels of anxiety, stress, and depression [15–18]. One recent study indicated that the association between virtual learning and anxiety arose due to dissatisfaction with the teaching modality and fear of examination [19]. The severity levels of these emotions were higher in developing countries due to socioeconomic status and inequitable access to online resources [20–22].

In contrast to developing countries, a study conducted in Poland reported that students felt that e-learning isolated them from their friends, reduced their motivation to learn, and many were not satisfied with their grades [23].

Empirical research is required to understand how e-learning, as perceived by nursing students, can affect their mental health. Therefore, this study aimed to determine the relationship between stress, anxiety, depression, and satisfaction with e-learning among undergraduate nursing students. Specifically, it aimed to (1) assess the level of satisfaction with e-learning, stress, anxiety, and depression; (2) determine the mean differences in anxiety, stress, depression, and satisfaction with e-learning according to the demographics' characteristics; and (3) determine the mediation effect of anxiety on the relationship between stress and depression.

2. Methodology

2.1. Study Design and Settings.
This study used a cross-sectional, correlational, and descriptive design. Data were collected between April 2022 and December 2022 from local nursing colleges located in 13 regions in Saudi Arabia.

2.2. Sampling Design.
The study employed a convenience sampling method to recruit undergraduate nursing students. One hundred forty-four students responded to the online

questionnaire. The inclusion criteria were as follows: (1) undergraduate nursing students in the Bachelor of Science in Nursing (BSN) or bridging program (RN to BSN); (2) those who were exposed to e-learning; and (3) those who were willing to participate in the study. The study participants were given a recruitment statement that addressed the conditions of the study and that the questionnaires would be provided only in English. Faculty members, graduate students, those already diagnosed with a psychiatric disorder or unable to answer the questionnaires in English were excluded from the study.

2.3. Data Collection Procedure.

An official letter was sent to the academic affairs offices in the selected nursing colleges asking for their permission and assistance in distributing the questionnaires. The official letter included a Google form link (QR code) containing questions assessing students' perceptions of their levels of anxiety, stress, depression, and satisfaction with e-learning. The response rate was insufficient. Therefore, the data collection duration was extended, and the survey was distributed through social media platforms (Twitter, WhatsApp, and Facebook). A statement was added asking them to ignore the survey if they had already completed it to ensure that the participants did not respond more than once to the same questionnaire.

The first page of the online survey included the recruitment statement, in which the participants were given a chance to look at the inclusion criteria and the purpose, risks, and benefits of participating in the study. The research team had limited access to the participants' data. Participants were also informed that personal identifiers (i.e., names, emails, or national ID) would not be collected, and the data would be reported in aggregate form.

The sample size necessary for this research was estimated using G-power software 3.1. For a significance level of 0.05, a power of 0.80, an effect size of 0.15, and seven predictors, the estimated sample size was 103 to run the regression analysis. To ensure the adequacy of the sample size with respect to the expected missing data, 20% of the total sample was added. The final study sample size was 144 students.

2.4. Instrumentation.

A structured, self-administered survey with specific demographic questions was distributed to participants. Demographic data on age, gender, year of the study, and grade point average (GPA) were collected from participants. The demographic data, such as year of study and GPA, were self-identified by students. The demographic data and instruments were provided in English. Also, all the scales were used without any translation or modifications.

2.5. Depression, Anxiety, and Stress Scale.

The Depression, Anxiety, and Stress Scale (DASS-21) developed by the authors in [24] was employed to measure the emotional states of depression, anxiety, and stress. This scale comprised 21 items and three subscales using a 4-point Likert scale. Participants were asked to indicate the measure to which each statement stood true over the past week. The higher the scores, the greater the level of harmful emotions [25]. Previous researchers tested the applicability of the DASS-21 in various countries, such as Brazil, Canada, the United Arab Emirates, and the United States [25]. This scale is reliable and valid, as indicated by previous researchers [26–28]. In this study, the scale attained good reliability. Cronbach's alpha was 93.1.

2.6. Students' Satisfaction Scale.

This self-report scale was initially developed to measure students' satisfaction with their learning [29]. It comprises 19 items and three subscales (i.e., teaching, assessment, generic skills, and learning experiences). All the items were measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher satisfaction levels are indicated by higher scores. The Cronbach's alpha (α) values were 0.77 for teaching, 0.80 for assessment, and 0.82 for generic skills and learning experiences.

2.7. Data Analysis Plans.

The Statistical Package for the Social Sciences software (version 28) (IBM Corp, Armonk, New York) was employed to manage and analyze the data. Descriptive statistics (such as percentages, means, and SDs) were utilized to describe the sample characteristics: depression, anxiety, stress, and satisfaction with e-learning. A Pearson product-moment correlation was conducted to determine the association between depression, anxiety, stress, and satisfaction with e-learning. Independent sample t-tests and multiple linear regressions were employed to determine the relationship between participants' demographic characteristics and the main variables. Finally, the mediation effect of anxiety on the relationship between stress and depression was tested using the process macro model 4 and bootstrapping proposed by the author in [30].

2.8. Ethical Considerations.

This study received approval from an institutional review board (deleted for peer review) before collecting data. Participants checked the recruitment statement and agreed to participate in this study. The authors stated that no commercial or financial affiliations interpreted as a possible conflict of interest would be present during the research. To ensure confidentiality, only the research team had access to participants' responses. No personal data were collected from participants. The researchers ensured that all rights of the participants were preserved and that they were not exposed to any harm or risk. The participants were informed that answering survey questions might take 10 to 15 min.

3. Results

One hundred forty-four undergraduate nursing students responded to the online questionnaire. Participant ages ranged from 18 to 41, with an average age of 23.5 (SD 5.0). Male nursing student participants represented 51.4% of the sample ($n = 74$). The GPA of participants ranged from 2.62 to 4.93 out of five, with a mean GPA of 4.13 (SD = 0.34). Table 1 presents the demographic characteristics of the participants.

TABLE 1: Sample characteristics of participants ($N = 144$).

Variable (range)	n (%) or M (SD)
Age (years)	23.5 (5.09)
Gender	
Male	74 (51.4)
Female	69 (47.9)
Year of the study	
Freshman	19 (13.2)
Sophomore year	49 (34)
Junior	25 (17.4)
Senior	25 (17.4)
Intern	24 (16.7)
Grade point average (GPA)	4.13 (0.34)

Table 2 presents the average scores with SDs for anxiety, stress, depression, and satisfaction with e-learning and its subscales (satisfaction with teaching, assessment, and generic skills). These scores indicated that nursing students had moderate levels of anxiety ($M = 9.89$ (SD = 4.28)), stress ($M = 10.40$ (SD = 4.05)), and depression ($M = 9.64$ (SD = 4.38)).

Among the satisfaction subscales, satisfaction with assessment had the highest average score ($M = 3.06$, SD = 1.25), followed by satisfaction with teaching ($M = 2.95$, SD = 1.10), and satisfaction with generic skills and learning experiences ($M = 2.34$, SD = 0.84). The average e-learning satisfaction score was 2.79 (SD = 0.85), indicating that students' satisfaction was relatively low.

Table 3 summarizes the correlations between anxiety, stress, depression, and overall satisfaction with e-learning. Strong and positive correlations existed between anxiety and stress ($r = 0.787$, $p < 0.001$) and depression ($r = 0.867$, $p < 0.001$). Depression was also strongly and positively correlated with stress ($r = 0.771$, $p < 0.001$). Students' satisfaction rate was below the average ($M = 2.79$, SD = 0.85). However, none of the main variables (anxiety, stress, and depression) were correlated with satisfaction.

3.1. The Influence of Demographic Characteristics on DASS and Satisfaction with E-Learning.

Table 4 presents the relationship between the participants' characteristics: anxiety, stress, depression, and satisfaction with e-learning. A statistically significant relationship was found between gender and anxiety (t [141] = 3.45, $p < 0.001$), stress (t [141] = 2.47, $p < 0.001$), and depression (t [141] = 3.36, $p < 0.001$). Female participants experienced more significant anxiety ($M = 11.0$, SD = 3.55), stress ($M = 11.3$, SD = 3.5), and depressive symptoms ($M = 10.9$, SD = 3.6) compared to their male counterparts. The remaining participants' characteristics (age, year of the study, and GPA) were not significantly associated with anxiety, stress, depression, or satisfaction with e-learning.

3.2. Anxiety Mediates the Relationship between Stress and Depression.

Table 5 presents the mediating role of anxiety in the relationship between stress and depression. The results indicated that stress directly affected depression ($B = 0.252$,

TABLE 2: Mean scores for anxiety, stress, depression, and satisfaction with e-learning ($N = 144$).

Variables	Mean (SD)
Anxiety	9.89 (4.28)
Stress	10.40 (4.05)
Depression	9.64 (4.38)
Satisfaction with teaching subscale	2.95 (1.10)
Satisfaction with assessment subscale	3.06 (1.25)
Generic skills and learning experiences subscale	2.34 (0.84)
Total satisfaction with e-learning	2.79 (0.85)

TABLE 3: Correlation matrix for anxiety, stress, depression, and total satisfaction with e-learning ($N = 144$).

Variables	1	2	3	4
1. Anxiety	1			
2. Stress	0.787**	1		
3. Depression	0.867**	0.771**	1	
4. Satisfaction	−0.006	−0.101	0.034	1

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

$p < 0.001$, 95% CI 0.113 to 0.391). Stress had a significant effect on anxiety ($B = 0.830$, $p < 0.001$, 95% CI 0.722 to 0.938) and anxiety on depression ($B = 0.698$, $p < 0.001$, 95% CI 0.567 to 0.830). Thus, stress significantly and indirectly affected depression through anxiety ($B = 0.580$, $p < 0.001$, 95% CI 0.449 to 0.719). The proportion of mediation ($P_M = 0.697$) indicated that 69.7% of the total stress effect on depression was because of the indirect effect of anxiety, indicating a partial mediation.

4. Discussion

The study assessed undergraduate nursing students' satisfaction with e-learning, which occurred in Saudi Arabia as a response to COVID-19 pandemic preventive measures. The results indicated that students experienced low satisfaction with e-learning. In contrast to our findings, most regional and international studies found a moderate to high level of satisfaction with online learning, with increased satisfaction when blended learning was utilized [4, 31]. Blended learning can be achieved by creating an interactive online platform to perform tasks and receive feedback that helps consolidate learning in situations where face-to-face interaction is impossible [32].

Nursing students' average GPA was high, yet their satisfaction with e-learning was low. This result is consistent with previous studies [4, 31]. This finding contradicts the assumption that a high GPA would indicate increased student satisfaction with e-learning. The result is explained by flexible grading and academic dishonesty, as reported during the pandemic [33, 34]. Other researchers reported increased cheating on online exams, as evidenced by data obtained from Google Trends, where keywords for online cheating were used [35]. The education system must develop strategies to combat this challenge and promote academic integrity.

The satisfaction subscales were all low. However, they can be utilized to understand why students were dissatisfied

TABLE 4: Mean differences in anxiety, stress, depression, and satisfaction with e-learning according to the demographics' characteristics.

Variables	Anxiety		Stress		Depression		Satisfaction	
	M (SD)	t or F	M (SD)	t or F	M (SD)	t or F	M (SD)	t or F
Age (years)		0.727		0.587		1.12		2.65
Gender								
Male	8.77 (4.5)	3.45***	9.6 (4.4)	2.47***	8.56 (4.6)	3.36***	2.99 (0.96)	0.719
Female	11 (3.55)		11.3 (3.5)		10.9 (3.6)		3.10 (0.91)	
Year of study		0.92		1.47		0.771		1.22
GPA		0.96		1.93		0.508		0.528

P value is calculated using simple linear regression or an independent sample *t*-test, *** $p < 0.001$.

TABLE 5: Results of mediating the effect of anxiety by bootstrapping ($N = 144$).

Effect	Variables	B	SE	t	p	95% CI		P_M
						LLCI	ULCI	
Direct effect	Stress $\longrightarrow$ depression (c′)	0.252	0.0704	3.58	0.000	0.1133	0.391	
Indirect effect	Stress $\longrightarrow$ anxiety (a)	0.830	0.054	15.2	0.000	0.722	0.938	
Indirect effect	Anxiety $\longrightarrow$ depression (b)	0.698	0.066	10.47	0.000	0.567	0.830	0.697
Indirect effect	Stress $\longrightarrow$ anxiety $\longrightarrow$ depression (ab)	0.580	0.069			0.449	0.719	
Total effect	(c′ + ab)	0.832	0.057	14.43	0.000	0.718	0.946	

Note. 5,000 bootstrapping were re-extracted, $B = B$ coefficient, SE = standard of error, CI = confidence interval, LLCI = lower limit of B in 95% CI, ULCI = upper limit of B in 95% CI, P_M = proportion mediated, the ratio of the indirect effect to the total effect.

with online learning. Satisfaction with assessment was the highest. This finding can presumably be attributed to various factors like consideration on the part of the educators for the psychological and emotional burden of e-learning on students as it was implemented suddenly for the first time, which required faculty members to modify evaluation strategies to ensure that the objectives of the courses are met [36].

However, students' satisfaction with the teaching subscale was the lowest. This finding may indicate that teaching strategies require modification to fit students' skills and learning needs. Other researchers found that students were moderately satisfied with virtual learning for theory classes. However, they were dissatisfied with classes that required technical demonstrations [37]. The lack of alternative teaching methods for practical courses explains this low satisfaction level.

The mean scores for anxiety, stress, and depression were moderate. Female participants experienced more anxiety, stress, and depression than their male counterparts. Our finding is consistent with those of previous studies. Women with these traits were overrepresented in the same age group as our study [38, 39]. This finding could relate to many factors, such as biological differences, cultural norms, and social roles. Moreover, numerous studies reported that women experienced greater anxiety and more depressive symptoms during the pandemic than men did [40–42].

The study examined the impact of anxiety, stress, and depression on student satisfaction. We observed no correlation between these variables and students' satisfaction with e-learning. In addition, a strong positive correlation existed between the three variables, where anxiety directly and indirectly mediated depression. This relationship was demonstrated in a previous model where anxiety mediated depressive symptoms [43]. Therefore, interventions to reduce

anxiety can directly or indirectly mitigate depressive symptoms. While anxiety and stress are not necessarily always harmful, sometimes they can lead to emotional distress and adversely affect mental health and well-being if not managed appropriately [44]. The absence of a statistically significant correlation between DASS and satisfaction with e-learning suggests other confounding factors. One of them could be the global impact of the COVID-19 pandemic on mental health. The World Health Organization declared that COVID-19 increased anxiety and depression by 25% [2].

Furthermore, during the pandemic, numerous studies found increased anxiety and depressive symptoms among nursing students [15, 45, 46]. However, individuals may not seek mental health support because they are apprehensive that they would be stigmatized, affecting their reputation [47]. This finding suggests that students might have been suffering from mental problems but did not seek professional assistance.

4.1. Study Implications. This study highlighted the importance and urgency of providing mental health services for students, as poor mental health can directly affect their learning experiences and outcomes. Furthermore, ignoring mental health may lead to psychiatric disorders. Educational programs are required to encourage students to seek mental health services. Furthermore, in the 2022 Transforming Education Summit, the United Nations provided a briefing recommending that educational institutions build capacity where educators must access learning opportunities and training to promote learners' well-being [48]. Moreover, online services can help students cope and develop healthy resilience.

Conducting qualitative studies is also recommended to understand students' challenges during e-learning. The finding may help educators understand the impediments to

effective teaching and learning and modify their teaching strategies to ensure students' engagement. Furthermore, addressing the lack of alternatives to a simulation lab during the pandemic to teach technical skills to students is imperative. New technologies, such as virtual reality, can be used safely. They offer a contactless environment that ensures course objectives are met while maintaining COVID-19 precautionary measures.

4.2. Limitations. This study has some limitations. To assure the confidentiality of participants' information, the researchers did not ask participants about the nursing college they were attending. The data were reported in aggregate form. Therefore, a comparison of public and private colleges was not feasible. Future researchers should identify the characteristics of the colleges and the types of e-learning platforms nursing students use.

Furthermore, using a convenience sampling method may have influenced the generalizability of the findings. Objective measures may influence the social desirability of participants' responses. Future researchers should conduct qualitative studies to get in-depth details about e-learning satisfaction levels and determine its impact on students' psychological status.

5. Conclusion

This study assessed the nursing students' satisfaction with e-learning and its impact on stress, anxiety, and depression. We discovered that nursing students had moderate levels of anxiety, stress, and depression. Although students were dissatisfied with e-learning, their level of satisfaction was not related to their levels of emotional distress. This study emphasizes the urgency of providing mental health services for nursing students.

Data Availability

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

Ethical Approval

The Institutional Review Board approval was obtained from King Saud University (Ref No: 22-426) prior to data collection from participants.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Adnan Innab performed data curation, designed the methodology, performed formal analysis, wrote the original draft, reviewed and edited the manuscript, provided project administration, and provided funding acquisition. Fatimah Aldawood performed validation, wrote, reviewed, and edited the manuscript, performed supervision, and provided

resources. Naif Omar Abdali performed investigation, provided funding acquisition, and wrote the original draft. Osama Kallas Arishi performed investigation and wrote the original draft. Abdullah Mansi Alomary performed investigation and wrote the original draft.

Acknowledgments

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