Original Article

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A Cross-Sectional Study on the Role of Computer Anxiety in Students' Online Learning

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Abstract

Introduction: Although e-learning has been incorporated in higher education system, students may undergo negative emotions like anxiety using this new mode of learning which ultimately interfere with their learning performance. Hence, the current study aimed to examine the role of computer anxiety in students' online learning.

Methods: This is a cross-sectional correlational study, in which a convenient sample of 330 students of Shiraz University of Medical Sciences participated. To collect the data, we used two pre-validated questionnaires. Face, content, and construct validity were used to check the validity of the questionnaires. Cronbach's alpha and composite reliability were also used to check the reliability. Data were analyzed using SPSS 16 and AMOS 6.

Results: Confirmatory factor analysis results yielded the underlying factorial structure of the scales. In addition, correlation coefficient results indicated that there was a significantly negative relationship between students' computer anxiety and their online learning ($r=-0.59$, $P<0.001$).

Conclusion: The results of the present study revealed that a considerable number of students experienced some level of computer anxiety, highlighting that highly anxious students face negative consequences such as inadequate online learning.

Keywords: Anxiety, Learning, Online learning

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Introduction

Distance learning has a long history in the education sector, and e-learning, as a form of distance learning (1), has been incorporated into the teaching-learning process due to technological advances (2, 3). In the U.S., for instance, 35.3% of college students participated in at least one online course in the academic year 2018-2019 (3). The outbreak of COVID-19 has expedited the adoption pace of e-learning in higher education globally, making it the only viable mode of learning to avoid the spread of the infectious disease (2-7). E-learning, defined as "use of electronic technology and media to deliver, support, and enhance teaching and learning" (5), has many advantages like flexibility (7-9), convenience (10), accessibility in terms of time and place (7, 8, 11), cost-effectiveness (7, 12), and even academic progress (13, 14). As a new learning environment, however, e-learning requires news ways of designing, delivering, and assessing learning which does pose serious problems (6). Students have to adjust to this novel environment (4) and in this process may experience negative

emotions like anxiety and stress (1, 3, 5-7) due to many different factors such as poor internet connectivity (15), technology failure (5, 16), lack of direct or face to face interaction (17), lack of technological skills (1, 5, 15, 18), or confusion and uncertainty about what to do and how to do it (1, 4, 7, 18, 19). In developing countries like Iran, online students are expected to experience more anxiety owing to lousy infrastructure. Similarly, anecdotal evidence suggests that online learning in Iran suffers from continuous internet dysconnectivity and occasional power outages which makes online students feel anxious.

In fact, empirical evidence points to the prevalence of anxiety among students in the context of e-learning (20, 21). Comparing the anxiety of 120 graduate students in a traditional class and an online class, DeVaney (2010) reported that online students were more apprehensive compared to the other group of students (22). In this vein, Romos-Morcillo et al. (2020) qualitatively explored the experience of 32 nursing students in the context of e-learning and showed that older students feel higher levels of anxiety (23). Also, in their quantitative study on 520 undergraduate college students, Fawaz and Samaha (2020) showed that e-leatning resulted in anxtey and depression among students (24).

Aanxiety is a subject of concern since it is a fundamental factor in online learning setting. Empirical studies also confirm that anxiety is negatively correlated with online students' satisfaction (10, 18, 24, 25), adoption of e-learning (5, 15, 26, 27), and learning performance in online learning settings (1).

With the growing integration of e-learning in higher education system, anxiety becomes of primary importance to ensure e-learning success; thus, anxiety-learning link in online-learning environment needs more investigation (28). Therefore, the present study aimed to examine the relationship between computer anxiety and online learning among medical students.

Methods

Study design and Participants

A quantitative cross-sectional correlational research design was the method of choice to conduct the present study. The target population consisted of all medical students at Shiraz University of Medical Sciences; of them, a convenient sample of 330 was selected using Krejcie and Morgan's (1970) table. Studying at Shiraz University of Medical Sciences and willingness to participate were among the inclusion criteria. In addition, the exclusion criteria included incomplete questionnaires and unwillingness to participate in the study.

Measures

In order to collect the data, the following two pre-validated questionnaires were deployed:

Computer anxiety questionnaire

Computer anxiety was measured using a seven-item self-reported tool developed by Fuller et al. (2006). Participants marked their responses to every item using a five-point Likert scale ranging from "strongly disagree=1" to "strongly agree=5" (29). In order to determine the validity of the computer anxiety questionnaire, construct (confirmatory factor analysis), we used face, and content validity. The results showed that the questionnaire had acceptable validity. Also, its reliability was measured using Cronbach's alpha (0.71) and composite reliability (0.77).

Online learning questionnaire

The online learning questionnaire was constructed by Watkin et al. (2004) and is comprised of 25 questions in 6 components. A 5-point Likert scale, ranging from "completely disagree=1" to "completely agree=5", was used to rate the responses. In the present study, the face and content validities of the questionnaire were approved by a panel of experts; construct validity was approved by confirmatory factor analysis. The results showed that the questionnaire had good validity. Also, its reliability was measured using Cronbach's alpha (0.81) and composite reliability (0.85).

Ethical Considerations

First, the Ethics Committee of Shiraz University of Medical Sciences approved the study process (IR.SUMS.REC.1401.081). Then, written informed consent was obtained from the participants and they were asked to complete the questionnaires anonymously and were assured of the confidentiality of the data.

Data analysis

For the analysis of the data, both descriptive and inferential statistics were employed using SPSS version 16 (IBM Corp, Chicago) and AMOS 6.

Results

Results showed that 27.9% (92 people) were male and 72.1% (238 people) female. The samples were divided into five groups of basic sciences, physiopathology, student, externship and internship based on the educational level. The results showed that the percentage of samples in basic science, physiopathology, student, externship, and internship were 71.2, 10.4, 8,

Table 1: Descriptive statistics of research variables

Variable	Min	Max	Mean± SD
Computer anxiety	7	31	15.35±5.09
Online learning	38	123	91.73±16.62

Table 2: The metrics of goodness of fit of computer anxiety and online learning scales

Metrics	Value	
	Computer anxiety scale	Online learning scale
(X^2/df)	2.18	2.24
(RMSEA)	0.07	0.06
(GFI)	0.96	0.95
(AGFI)	0.92	0.93

Table 3: Factor loadings of computer anxiety items

Item	Factor loadings	R^2
1	0.72	0.52
2	0.42	0.18
3	0.31	0.09
4	0.38	0.14
5	0.89	0.79
6	0.77	0.60
7	0.63	0.39

6.5, and 3.9, respectively. In terms of age, the participants' mean age was 21.6 (Table 1).

As to determination of the construct validity of the computer anxiety and online learning scales, confirmatory factor analysis was the method of choice. The metrics of the goodness of fit of the scales are presented in Table 2. As can be seen, the data fitted well with the factorial structure of scales, indicating that the theoretical conceptualizations of computer anxiety and online learning align with the reality of these two constructs.

The factor loadings of the scales and their explained variance are presented in Tables 3, 4 and Figure 1, 2; according to the results, the items are representative of the corresponding constructs.

As shown in Tables 3 and 4, factor loading pertaining to each item was provided, which indicates the extent to which between latent variables and their corresponding indicators are correlated; the more the value, the better. Also, R^2 values are presented which shows the estimated variance of the items in the measurement model.

The Pearson's correlation coefficient results showed that a significantly negative correlation existed between the students' computer anxiety and their online learning ($r=-0.59$, $P\leq0.001$), meaning that the more the students feel anxious in an online learning setting, the more their online learning is expected to reduce (Table 5).

Discussion

Given the prevalence of computer anxiety and its role in attracting the students' attention and consequently interfering with online learning (18), we examined the influence of students' computer anxiety on their online learning. According to the results, medical students experienced high levels of computer anxiety; this is in agreement with the empirical results reported by DeVaney (22) and Fawaz and Samaha (24). In addition, the majority of the participants were over 40 y ears of age, which may provide a good explanation about the high level of Internet anxiety; in a qualitative

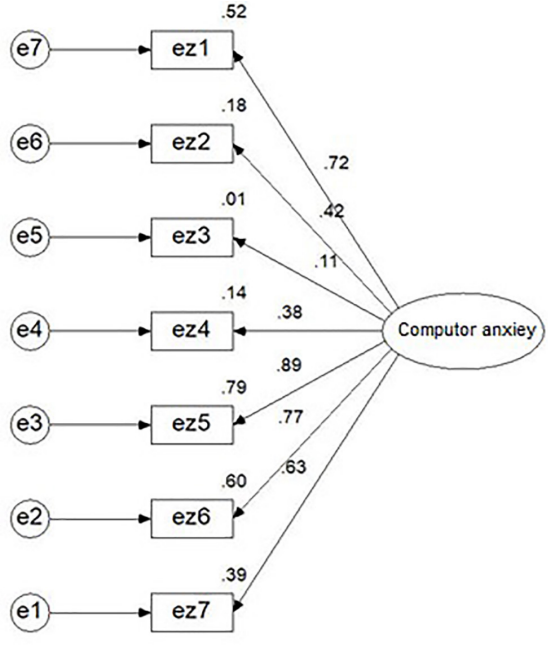

Figure 1: Confirmatory factorial analyses for computer anxiety

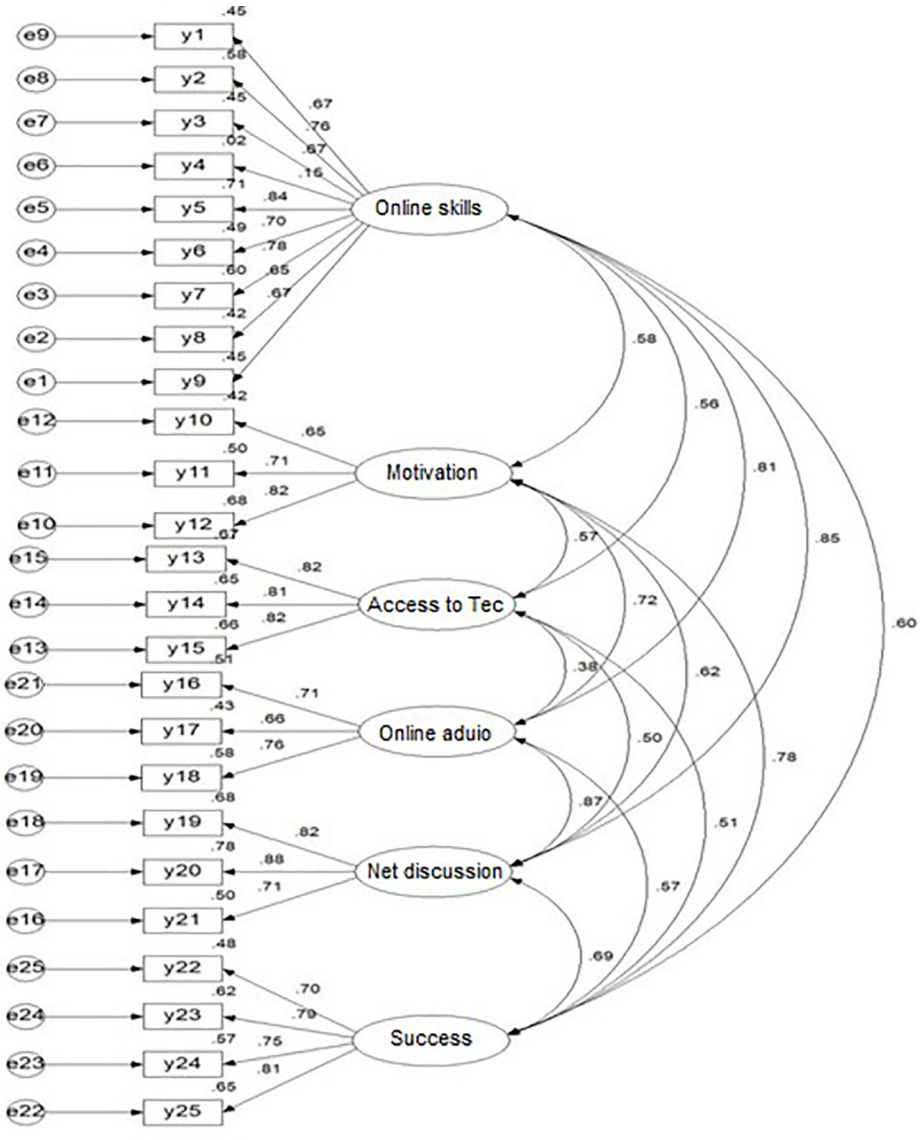

Figure 2: Confirmatory factorial analyses for online learning

study, similarly, Romos-Morcillo et al. (2020) found that older students were more anxious in an e-learning environment (23).

As demonstrated by the results, there was a significantly negative association between computer anxiety and online learning. Online learning is highly demanding in terms of personal characteristics (e.g. self-efficacy, technological skills, motivation) and infrastructure (e.g. Internet connectivity and speed), and any shortage may cause online anxiety which may, in turn, result in academic underperformance. Distracting students, computer anxiety makes it hard for them to concentrate on learning. In fact, anxiety plays an important part in online learning; impacting student's self-efficacy (5) and motivation (30-32), computer anxiety results in a decline in student's engagement in online learning. Therefore, any increase in anxiety gives rise to decreased learning. Indeed, the higher the anxiety level, the more attention it attracts, which leads to more risk in errors and mistakes on the part of students. According to socio-cognitive theory, also, anxiety is detrimental to the students' physiological, physical, and behavioral state. According to Paul and Glassman (2017), anxious students undergo maladjusted thinking process, experience physical discomfort, and decide not to attend online classes (33).

Conclusion

As shown here, computer anxiety is high among medical students and negatively affects their online learning experience. This study indicated the significance of psychological dimension of e-learning. Therefore, any attempt to boost the quality and success of e-leaning must adopt a holistic view by taking both technological and psychological factors into account.

Table 4: Factor loadings of online learning items

Component	Item	Factor loading	R^2
Continuous communication skills	1	0.67	0.45
	2	0.76	0.58
	3	0.67	0.45
	4	0.15	0.02
	5	0.84	0.71
	6	0.70	0.49
	7	0.78	0.60
	8	0.65	0.42
	9	0.67	0.45
Motivation	10	0.65	0.42
	11	0.71	0.50
	12	0.82	0.68
Access to technology	13	0.82	0.67
	14	0.81	0.65
	15	0.82	0.66
Ability to learn through media	16	0.71	0.51
	17	0.66	0.43
	18	0.76	0.58
Computer group chats	19	0.82	0.68
	20	0.88	0.78
	21	0.71	0.50
Important issues for success in electronic learning	22	0.70	0.48
	23	0.79	0.62
	24	0.75	0.57
	25	0.81	0.65

Table 5: Correlation between the students' computer anxiety and online learning

Variable	Online learning
Computer anxiety	-0.59
P	0.001

Altogether, findings from this study inform organizational decision-makers regarding the set-up of a positive online learning experience by alleviating students' anxiety so that they'll be able to complete online courses. Helping students to complete an online learning course shall lead to their increased sense of preparedness and diminished anxiety, subsequently contributing to their persistence and success in online settings. Indeed, exploring the influence of online students' affective factors, both negative and positive, on their performance and persistence warrants further investigations. As for performance, more research is needed to explore the influence of anxiety and frustration experienced by online students on their learning outcomes.

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Authors' Contribution

AAH, NB, MA, MHK and HF made a substantial contribution to the concept and design of the study and prepared the first draft of the manuscript. AAH, MHK, MA, SR, and NB supervised the study and participated in the analysis and interpretation of data and proofreading of the manuscript. AAH, HF, MHK, SR, and NB contributed to the writing of the manuscript and substantially revised the manuscript. Finally, all authors have read and approved the final manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

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