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Remote Online Test Anxiety during the Coronavirus Disease 2019 Crisis: A Cross-Sectional Study among Medical Students

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Abstract

Background: The coronavirus disease 2019 (COVID-19) forced higher education to adopt e-learning and remote online tests as a kind of assessment that leads to new paradigms.
Objectives: This study aimed to investigate the medical students' test anxiety toward remote online tests during the COVID-19 pandemic.
Methods: The current cross-sectional study has been conducted in the 2020-2021 academic year. A self-reported online questionnaire was used to investigate the medical students' test anxiety at Mashhad University of Medical Sciences, Mashhad, Iran. The survey consisted of demographic characteristics, including gender, age, and curriculum phase, as well as the validated version of the Sarasons's test anxiety scale in Persian.
Results: The findings indicated that the prevalence rates of mild, moderate, and severe test anxiety were 27.9%, 36.9%, and 35.2%, respectively, toward remote online tests. Although the comparison of test anxiety levels showed a statistically significant difference due to gender and age ($P<0.05$), the difference in test anxiety among the students of basic sciences and preclinical was not significant ($P>0.05$). Furthermore, the female students' test anxiety was more than that of male students, and participants over 20 years old had higher test anxiety scores ($P<0.05$).
Conclusion: Moderate to severe test anxiety was more common in medical students, which can have devastating effects on the students' academic performance. There is a critical need to recommend anxiety management techniques and bring reforms in e-assessment systems to reduce test anxiety in medical students.

Keywords: COVID-19, E-Learning, Medical education, Medical student, Test anxiety, Test anxiety scale

1. Background

Anxiety is defined as a mental phenomenon that all people experience during life. Although anxiety is the cause of our inappropriate performance and many mistakes, an average level of anxiety seems to be necessary for hardworking and being responsible (1, 2). Medical education is more stressful than other disciplines, and anxiety is one of the most common challenges among medical students (3,4). Paying attention to the problem of anxiety in medical students requires more attention due to the significant consequences it can have (5). Among the types of anxiety, test anxiety is a psychological reaction that consists of worry, stress, emotionality, lack of confidence, fear of failure, or confusion that a person may experience before, during, or after the exam, or in similar situations (6). It is characterized by somatic, cognitive, and behavioral symptoms of anxiety. To some extent, like other types of anxiety, test anxiety can make students work harder and study better. Still, the high level of this kind of feeling causes psychological distress, low performance, underachievement, and demotivation in the students (7). Personal factors, such as insufficient studying and defects in test skills, are not the only causes of test anxiety, and the organization's performance can also attribute to this (8). Previous studies investigated that medical students, compared to other students, had a higher level of test anxiety because they tended to have a higher level of knowledge and professional skills (9).

Today, virtual education and electronic assessment have become more common in universities, and many fields take the place of traditional face-to-face learning and evaluation (10). In addition to the advantages of online testing, such as cost and time effectiveness, it is necessary to discuss the disadvantages, including test security, availability of required equipment, and learning effectiveness of this method (11). Universities worldwide have been partially or entirely closed to limit the spread of the novel coronavirus disease in 2019 (COVID-19). Remote online tests have become common and popular for many years. Still, the new coronavirus disease's emergence notified its importance and has forced us to use it more than before (12). Although many educational institutions have approved electronic exams, these processes are usually based on on-campus online tests, and the students receive technical support to improve their exam environment. Unfortunately, these supports are not currently entirely possible with remote online testing. Mashhad University of Medical Sciences

(MUMS), Razavi Khorasan Province, Iran, has adopted virtual education by initiating the COVID-19 crisis in late January 2020 (13). In addition, a remote online test has been introduced as an evaluation approach to assess student performance in the current situation. To date, many studies have been conducted to determine the level of anxiety among students under examination, especially medical students, and most of these studies from around the world have shown high levels of this phenomenon in medical students (14). Some studies overestimate test anxiety; therefore, serious interventions were considered necessary (15, 16). However, because of the COVID-19 pandemic, the learning and evaluation of medical students shifted to be online, and higher education will never be the same after the coronavirus crisis. It should be noted that the COVID-19 pandemic, on its own, makes people anxious, and medical students are not an exception. It seems that this kind of assessment procedure (i.e., remote online tests) needs further evaluations to find its advantages and disadvantages.

2. Objectives

The primary objective of this study was to investigate and explain the medical students' test anxiety of MUMS toward remote online tests due to their curriculum phase (basic sciences and preclinical) during the COVID-19 pandemic based on the Sarasons's test anxiety scale.

3. Methods

3.1. Study design

This cross-sectional study was conducted at MUMS on medical students who were trained virtually in the 2020-2021 academic year when medical schools were closed due to the COVID-19 pandemic in Iran. All medical students studying basic sciences and preclinical courses in the general medicine curriculum during the desired semester and sampling period were eligible to participate in this research and were informed about the purpose of the study. According to Morgan's table, the sample size was estimated to be 280 eligible participants, and a convenience sampling method was used. On the other hand, incomplete questionnaires were excluded from the final analysis. All procedures were in line with the Ethics Committee of the MUMS (approval date was 2021-01-02 with IR.MUMS.REC.1399.551 reference code), and all respondents provided informed consent. The forms were gathered with an anonymous identification code.

3.2. Survey development

A self-reported questionnaire was used to enroll participants, and it was designed as a web-based form using the Porsline® platform. All participants studying basic sciences and preclinical courses received an anonymous online survey by email and WhatsApp® messenger to fill out upon their consent. Before the final exams of the desired semester, the questionnaire was available to collect data within a period of one week, from January 4th to January 10th, 2021. Daily reminders were sent to the participants to increase the response rate during the data collection. The response was prevented from being recorded more than once with a device. The survey consisted of a validated version of the questionnaire in Persian that was designed to investigate the students' test anxiety (16). It contained a series of questions on the demographic characteristics of the students, such as gender, age, the experience of in-campus online tests, curriculum phase (basic sciences and preclinical), and Sarasons's test anxiety scale questions (17) to investigate the students' mental states and physiological experiences. The reliability and validity of the scale were confirmed in Iran by Yazdani; moreover, Cronbach α, internal consistency, and criterion validity were reported to be 0.88, 95%, and 0.72, respectively (16). This questionnaire is widely used to explain test anxiety because of its psychometric properties and having standard cut points. The scale consists of 37 self-report questions that evaluated the participants' test anxiety toward remote online tests. The questions were pointed as 0=No and 1=Yes. Generally, students were in one of the following groups: mild test anxiety (score 12 and lower), moderate test anxiety (score 13 to 20), and severe test anxiety (score 21 and higher) (16, 17).

3.3. Statistical analysis

Statistical analyses were performed in SPSS software (version 23). Categorical variables were demonstrated using frequency and percentage, and the quantitative variables were presented as mean±SD. The normality assumption was met (checked via the Kolmogorov-Smirnov normality test); therefore, an independent-sample *t*-test was run. The comparison of medical students' test anxiety levels according to their curriculum phase (basic sciences and preclinical), gender (female and male), and age (=<20 and >20) distribution was examined by the Chi-square test. All tests were two-tailed at a 5% significance level.

4. Results

In this cross-sectional study, 290 medical students were enrolled in basic sciences and preclinical courses. Out of 290 students, 98% of them had already participated in the in-campus online exams, and almost all students did not have the experience of remote online tests before. In total, 66.9% of the participants were female, and the age of 43.8% of the

Table 1. Demographic characteristics of the medical students (N=290)

Variables		N (%)
Gender	Female	194 (66.9)
	Male	96 (33.1)
Age	=<20	163 (56.2)
	>20	127 (43.8)
Curriculum phase	Basic sciences	177 (61)
	Preclinical	113 (39)
Experience of in-campus online tests	Yes	284 (98)
	No	6 (2)

respondents was more than 20 years. It is worth mentioning that 61% of the students were studying in the basic sciences course (Table 1).

The findings indicated that in terms of test anxiety, 27.9%, 36.9%, and 35.2% of the medical students experienced mild, moderate, and severe anxiety toward remote online tests, respectively. As demonstrated in Table 2, moderate to severe test anxiety was more common among medical students. Although the comparison of test anxiety levels using the Chi-square test showed a statistically significant difference due to gender and age (P<0.05), the difference in test anxiety among the students of basic sciences and preclinical was not significant (P>0.05).

In addition, the mean±SD of the students' test anxiety was analyzed according to Sarasons's test anxiety scale regarding the medical students' curriculum phase, gender, and age. As represented in Table 3, the results of the independent-sample *t*-test showed that students' curriculum phase was not significantly related to mean test anxiety score (P>0.05). As it was obtained from the previous analysis (Table 2), figurefemale students' test anxiety was more than that of male students, and participants over the age of 20 years old had higher test anxiety scores (P<0.05).

Table 2. Test anxiety according to medical students' curriculum phase, gender, and age

Groups		Test Anxiety Level			X^2	df	P-value
		Mild N (%)	Moderate N (%)	Severe N (%)			
Curriculum phase	Basic sciences (N=177)	51 (28.8)	67 (37.9)	59 (33.3)	.676	2	.36
	Preclinical (N=113)	30 (26.5)	40 (35.4)	43 (38.1)			
Gender	Male (N=96)	44 (45.8)	33(34.4)	19 (19.8)	26.366	2	<.0001
	Female (N=194)	37 (19.1)	74 (38.1)	83 (42.8)			
Age	=<20 (N=163)	51 (31.3)	67 (41.1)	45 (27.6)	9.344	2	<.01
	>20 (N=127)	30 (23.6)	40 (31.5)	57 (44.9)			

Table 3. Mean±SD of test anxiety score according to curriculum phase, gender, and age of the individuals

Groups		Mean±SD	*t*-value	df	P-value
Curriculum phase	Basic sciences	17.15±7.55	-1.107	288	.26
	Preclinical	18.15±7.26			
Gender	Male	14.44±7.15	-5.204	288	<.0001
	Female	19.07±7.11			
Age	=<20	15.98±6.63	-4.072	244	<.0001
	>20	19.55±7.95			

5. Discussion

Medical education, like in many other fields, was influenced by the COVID-19 pandemic. Therefore, undergraduate and graduate medical education has inevitably changed the approach to virtual education to adapt to the conditions of this crisis. Adherence to physical distance and health protocols has led to the implementation and application of remote electronic technologies in medical education and evaluation. However, the first step requires a complete understanding of their features, and the next step is medical knowledge of the available platforms, as well as their possibilities and limitations (14). Therefore, the present study investigated and explained the medical students' test anxiety of MUMS, one of the top five Iranian medical schools, toward remote online tests during the COVID-19 pandemic. The results showed that mild, moderate, and severe test anxiety prevalence rates were 27.9%, 36.9%, and 35.2%, respectively, toward remote online tests. These findings declared that a small number of medical students had mild anxiety, and the majority had moderate to severe levels of test anxiety. However, the comparison of test anxiety represented female students experienced more moderate to severe anxiety levels than males, and students over 20 years old had higher test anxiety scores than the other group. Yet, there was no significant difference between medical students in terms of their curriculum phase.

There is evidence that medical students become

anxious before and during the exam (18). Therefore, more attention should be paid to the level of test anxiety that causes the problem. Our results are consistent with the findings of other research that declared medical students' high prevalence of test anxiety. Queke et al. indicated the prevalence of anxiety among medical students as 33.8%, with the highest rates of anxiety among medical students in the Middle East and Asia (5). Jadoon et al. announced the anxiety level of medical students at 28% (19). In the same line, Latas et al. stated that most medical students suffered from test anxiety and presented a moderate level of test anxiety (20). Darabi et al. explained that 66% of students suffer from moderate to severe anxiety (21), and Tsegay et al. showed that test anxiety accounts for a significant proportion (52.30%) of medical students in Ethiopia (22).

In this study, gender was also an influential factor in the test anxiety levels, leading to significant differences. The findings of many studies indicate that the gender factor leads to a significant difference in the level of test anxiety. The female students experience more anxiety before the test than males (3, 20, 23-25), and female students have statistically significantly more intense symptoms of test anxiety than male students (20). A possible reason for the difference in test anxiety between males and females may be due to increased emotional vulnerability in women (26). Considering the factors that increase exam anxiety in medical students, it has been reported that females experience memory loss in the exam and must work harder to remember than men (24). Nevertheless, some studies showed no significant difference between the mean score of anxiety and gender (5, 27).

On the other hand, findings indicated that the difference in test anxiety among the basic sciences and preclinical students was not statistically significant, which was consistent with some other studies that did not report a meaningful relationship between test anxiety and academic year (5, 27, 28). Nevertheless, a previous study of medical students in the basic sciences course reported that 50% of students suffer from severe test anxiety (29).

There is a tendency that assessment and measurement can lead to anxiety. The main concerns of students that lead to stress are academic performance, success, and graduate school planning (3). It seems that there may be a relationship between test anxiety and dysfunction. A total of 25%-40% of problematic test anxiety rates of undergraduate medical students can have a devastating impact on their performance (22). However, it is clear that the transition to virtual education has posed significant challenges for universities and educational institutions, and at the same time, the implementation of formal assessment and assessment processes. Remote online testing has encountered major challenges (30). Digital technology in every field has enhanced the efficiency of operations, and higher education is no exception (31). Today, educational processes are transforming away from conventional methods. Accordingly, in the current context, this issue is exacerbated by the COVID-19 crisis (32, 33).

This study has some limitations, including the cross-sectional nature of the study design, which confined our ability to derive causal associations. In addition, convenience sampling was used; therefore, a limited list of demographic characteristics, personal factors, and psychological variables was available. Further studies are required to consider the possible confounder factors. While research regarding online exams is ongoing, discussions at the pedagogical level are yet to be completed, and the studies must continue to find and share experiences.

6. Conclusion

As mentioned, a small number of undergraduate medical students had mild anxiety, and the majority had moderate to severe levels of test anxiety. It can lead to harmful effects on academic performance and student achievement. There seems to be an urgent need to apply anxiety management techniques and improve electronic assessment systems to reduce test anxiety in medical students. A considerable number of medical students have intense symptoms of test anxiety, and these students require help and support. Medical school stakeholders can reduce student anxiety by providing a stable environment for an accurate and high-quality assessment framework and supporting students.

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