



# Evaluation of Medical Students' Satisfaction with the Virtual Assessment of Cardiac Physiology Course

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## Abstract

**Background:** Universities have switched to virtual assessments due to the spread of COVID-19 around the world. Therefore, this study aimed to evaluate the satisfaction level of medical students at the Abadan University of Medical Sciences (AUMS) with the virtual assessment methods of the cardiac physiology course.

**Methods:** This study was conducted on 42 medical students of AUMS who were in the second semester of 2020 - 2021 (COVID-19 pandemic) and participated in the cardiac physiology course. Researchers developed an online questionnaire with 17 questions about students' satisfaction with assessment methods. Data were collected and organized in SPSS Software Version 21 for descriptive statistical analysis.

**Results:** The mean age of the participants was  $21.4 \pm 2.08$  years, of whom 76.2% (32) agreed that a higher percentage of the score should relate to the virtual formative assessment and 78.6% (33) experienced more stress in virtual summative assessment compared to the formative method. About 93.6% (39) agreed that all virtual summative assessment questions should be multiple-choice, and 88.4% (37) believed that allocating 1 to 2 minutes for each multiple-choice summative assessment question lowers their stress levels.

**Conclusions:** According to the results, the virtual formative assessment had an accepted place in the cardiac physiology course and helped students reduce stress and learn more. The students preferred summative assessment questions to be multiple-choice due to the difficulty of the cardiac physiology course. More research should be conducted on this subject with a larger sample size in future studies.

**Keywords:** Assessment, Physiology, COVID-19, Medical, Student

## 1. Background

Online learning or distance learning, is an online learning activity in which students communicate with instructors and other students at an appropriate time, which does not depend on their physical location (1). Payame Noor University in Iran established distance education methods in 1988 to address some of the shortcomings of traditional education, including time and place restrictions (2).

There is a global issue called coronavirus disease 2019 (COVID-19) that needs to be addressed (3). A first patient with COVID-19 was observed in Qom, Iran, on February 7, 2017 (4). Since then, the government has decided to close schools and universities to keep people at home and control the disease spread (5). With the advent of the COVID-19, the global medical education was disrupted. Globally, distance education is an important solution, and electronic distance learning is the primary method for evaluating dis-

tance education (6-8).

Computer-based assessments or online examinations involve taking exams via the intranet or web (9). Often, medical students must undergo examinations to measure their progress toward achieving the learning outcomes of the curriculum (10).

Assessment can be used as a tool to help students learn a way to report their progress and make teaching decisions. Effective assessment requires direct evidence of student learning (11). Several studies have highlighted the advantages and disadvantages of online exams (9, 12-16).

According to previous types of research, E-exam has plenty of advantages for students (12, 13). A transparent and effective exam preparation system, flexibility (to time and place), frequent online quizzes, the ability to solve practice tests, less errors made by students when filling out answer bubbles, instant results, the ability to receive feed-

back on the exam result, and a higher degree of objectivity are among these advantages (9, 12-14). Evaluating medical students is one of the essential aspects of curriculum development in the virtual learning. The COVID-19 pandemic has created new challenges for teachers, and virtual evaluation and grading policies are one of these challenges (17). Ensuring medical students' safety and timely evaluation is essential during this pandemic crisis. Medical sciences universities need to invest in individualized learning for competency-based education and technologies for assessing students' clinical skills (18). As a result of COVID-19, universities have had to make rapid changes to offer online classes and decide whether to conduct high-risk online assessments. Additionally, students' concerns about academic progress and exams during online education increased (19). Online assessment improves teaching and learning process both in managing distance education, increasing class size and staff workload, and teaching (to provide continuous feedback to students and staff on progress towards learning objectives), which creates challenges for the academic integrity and equality of students (20). Low-income and lower-middle-income countries have problems with e-learning due to infrastructure challenges, resource shortages, and communication and social barriers. A recent review of the transition to e-learning in pharmacy schools in Africa found several barriers related to poor access in rural areas, high internet data costs, poor infrastructure in many places, and digital divides, both at the country and between individuals (21).

Most universities have expressed concerns about the quality of online resources produced during the pandemic due to time constraints. For example, faculty members lack motivation and have difficulty focusing on students. Therefore, some students prefer face-to-face teaching, and many teachers are not adequately prepared (22). Physiology is one of the most difficult courses for a medical student to learn because of requiring a thinking ability (23, 24).

## 2. Objectives

The importance of assessment in the educational system is heightened by the current global conditions, especially during the COVID-19 pandemic. On the other hand, the difficulty and importance of physiology courses for basic medical students can motivate students to learn better. Hence, this study tried to assess the satisfaction level of medical students at Abadan University of Medical Sciences (AUMS) with the virtual assessment methods of the cardiac physiology course.

## 3. Methods

This cross-sectional descriptive study was conducted to evaluate the satisfaction of AUMS medical students with the virtual assessment methods of the cardiac physiology course. The sample size included 42 students of basic medical sciences at AUMS, who were selected by the convenience sampling. The inclusion criteria were the students of basic medical sciences of AUMS who had chosen the cardiac physiology course virtually in the second semester of 2020 - 2021 (COVID-19 pandemic) and had no problem in choosing this course in the education department. The exclusion criteria included students whose desired courses were removed either by the student or by the university. A researcher-made questionnaire was used to collect the information presented in three parts. The first part was about the project objective. The second part included questions about students' demographic information. The third part contained 19 questions in the form of closed-ended questions with a five-point Likert scale (strongly agree, agree, have no opinion, disagree, strongly disagree) about students' satisfaction with the methods used to evaluate students during the semester (virtual formative assessment) and at the end of the semester (virtual summative assessment). The validity of the third part of the questionnaire questions was established by 20 experienced professors, and its reliability was confirmed by the Retest method. The reliability coefficient of this questionnaire was 0.7 by Cronbach's alpha method.

The virtual formative assessment of the heart physiology course was combining load assignments in the Navid educational system (Virtual University of Medical Sciences of Iran (<https://abadanumsnavid.vums.ac.ir>), classroom quizzes, and finding the articles to date and loading in Navid educational system.

The virtual summative assessment was designed by Digi survey software (<http://www.digisurvey.net>), which is a valid software in Iran for making different virtual exams and questionnaires. This study was approved (Ethical approval ID: IR.ABADANUMS.REC.1399.087) by the Ethics Committee of AUMS (Direct link: <http://ethics.research.ac.ir>).

The data were imported to SPSS Software Version 21 and analyzed using descriptive statistics such as mean and standard deviation, frequency, and frequency percentage, and the Chi-Square statistic was used for analytical analysis.

## 4. Results

Among 53 qualified medical students of the AUMS, 42 participated, of which 25 (59.5%) were female. Student age

ranged from 18 to 32 years, with a mean and standard deviation of 21.4 and 2.0 years, respectively.

There was not much difference in the way that exams (online or face-to-face) were conducted on student satisfaction, but 76.2% (32) agreed that a higher percentage of the score should relate to the virtual formative assessment rather than the summative assessment, and 78.6% (33) experienced more stress in virtual summative assessment than the formative method. About 73.8% (31) of medical students believed that a higher percentage of the virtual formative assessment of cardiac physiology should be related to class assignments. Approximately, 93.6% (39) of students agreed that all summative assessment questions should be multiple-choice and only 2.4% (1) agreed with an essay-type question. In addition, 70.4% (30) were concerned about not being able to access the internet during the online summative assessment. The exam duration was one of the main concerns of the students so that 90.5% (38) of students believed that less than one minute for each multiple-choice question would be more stressful, and 88.4% (37) of participants believed that 1 to 2 minutes for each multiple-choice question would reduce their stress (Table 1).

Female students tended to formative assessment more than male students, but this relationship was not significant ( $P = 0.4$ ). Men experienced greater stress when the summative assessment score was higher in the cardiac physiology course ( $P = 0.3$ ). The percentage of students who agreed with the multiple-choice questions were higher in female ( $P = 0.1$ ), and male student preferred essay-type questions ( $P = 0.1$ ), but this relationship was not significant (chi-square statistic).

## 5. Discussion

Due to the prevalence of COVID-19, many universities today prefer virtual assessments for cardiac physiology assessments. This study examined the satisfaction of medical students with virtual assessments during the COVID-19 epidemic.

Since the cardiac physiology course is difficult, medical students in this study prefer multiple-choice questions in their virtual summative assessments. This study showed that female students are more inclined to answer multiple-choice questions of the cardiac physiology course in the virtual summative assessment.

Uddin et al. have stated that E-exams are more stressful for some students because of problems with fast typing during answering essay questions (12). One of the E-exam concerns for instructors is cheating, especially in multiple-choice formats (25). Therefore, many solutions have been

proposed to solve this problem such as using a camera, giving students less time but simpler questions on tests, and examination personalization (25-27).

Elsalem et al. concluded that the essential factor associated with exam stress is exam duration (time limit) (6). The time limit from a long time ago has been a concern for students during E-exams (10, 28, 29). Factors affecting the test duration include entering the password, waiting for admission, required time to orientate the test, and time-consuming scrolling between questions, and confusing, putting more stress on students (30, 31). Students believe the time allowed for each multiple-choice question in cardiac physiology should not be less than one minute, and they need more time to answer.

The virtual formative assessment is accepted in the cardiac physiology course and helps reduce stress in students, and female students were more inclined to the formative assessment of cardiac physiology course than male students.

Okoye showed that female students exposed to the formative assessment performed better than male chemistry students (32). However, Matilda and Helen found no significant difference in the scores of males and females exposed to the formative classroom assessment (33). This finding is consistent with that of several studies, which significantly improved in students' academic performance after implementing formative assessments (34-39). Moreover, Bijol et al. suggested that interactive online formative assessments for the kidney pathology course improve the overall Medical Students' learning experience (40). Students are assessed formatively throughout the course to determine their progress. This assessment strategy helps educators improve student inadequacy and test their knowledge (41). Students can plan their strategies for further study on the topic with the feedback from formative assessment (42).

Formative assessment is often considered a valuable tool, which shapes curricula to enhance learning (43). The satisfaction with clinical simulation was higher when nursing students were assessed using formative assessment (41).

According to first-year medical students, online formative assessment, along with online classes, are valuable educational activities, which give them learning feedback and motivation to read more about the topic. Furthermore, online formative assessments helped them identify their learning weaknesses and motivated them to read more (42).

In this study, the students were worried about not having access to the internet or internet outage at the time of the online summative assessment.

The organizations need to develop programs to support students in achieving a reliable connection and look

**Table 1.** Medical Students' Satisfaction with the Virtual Assessment Method of the Cardiac Physiology Course<sup>a</sup>

No.	Statement	A	B	C	D	E
1	The percentage of virtual formative assessment scores should be higher than the summative assessment.	13 (31)	19 (45.2)	6 (14.3)	3 (7.1)	1 (2.4)
2	The virtual summative assessment causes me more stress.	13 (31)	20 (47.6)	5 (11.9)	3 (7.1)	1 (2.4)
3	The virtual formative assessment causes me more stress.	5 (11.9)	4 (9.5)	10 (23.8)	14 (33.3)	8 (19)
4	A higher percentage of virtual formative assessments should relate to class quizzes.	13 (31)	16 (38.1)	6 (14.3)	4 (9.5)	2 (4.8)
5	A higher percentage of virtual formative assessments should relate to class assignments.	17 (40.5)	14 (33.3)	4 (9.5)	3 (7.1)	3 (7.1)
6	I prefer virtual class assignments where students are encouraged to read updated articles.	5 (11.9)	12 (28.6)	6 (14.3)	13 (31)	5 (11.9)
7	A percentage of the virtual formative assessments should relate to the timely submission of class assignments.	11 (26.2)	15 (35.7)	11 (26.2)	3 (7.1)	2 (4.8)
8	All virtual summative assessment questions should be multiple-choice.	34 (81.6)	5 (12)	1 (2.4)	1 (2.4)	1 (2.4)
9	All virtual summative assessment questions should be essay-type questions.	1 (2.4)	0 (0)	2 (4.8)	7 (16.7)	32 (76.2)
10	All virtual summative assessment questions should be sortable.	1 (2.4)	2 (4.8)	11 (26.2)	12 (28.6)	15 (35.7)
11	All virtual summative assessment questions should be true-false.	1 (2.4)	6 (14.3)	6 (14.3)	14 (33.3)	15 (35.7)
12	A higher percentage of questions should be multiple-choice for the virtual summative assessment.	20 (47.6)	14 (33.3)	3 (7.1)	4 (9.5)	1 (2.4)
13	Virtual summative assessment should include all multiple-choice, sortable, true-false, and essay-type questions equally.	1 (2.4)	2 (4.8)	10 (23.8)	12 (28.6)	16 (38.1)
14	I prefer a virtual formative assessment as a combination of several assessment methods (assignments, quizzes, and group discussions).	10 (23.8)	19 (45.2)	8 (19)	4 (9.5)	1 (2.4)
15	I am constantly worried about not having access to the internet during the virtual summative assessment.	15 (35.7)	15 (35.7)	7 (16.7)	2 (4.8)	2 (4.8)
16	I will be highly stressed when I have less than one minute to answer each multiple-choice question.	29 (69.1)	9 (21.4)	4 (9.5)	0 (0.00)	0 (0.00)
17	The best time to answer each multiple-choice question is 45 seconds.	1 (2.4)	0 (0)	4 (9.5)	7 (16.7)	28 (66.7)
18	I will be less stressed when I have between one and two minutes to answer each multiple-choice question.	20 (47.6)	17 (40.8)	3 (7.2)	2 (4.8)	0 (0.0)
19	Virtual assessment is better than face-to-face assessment.	4 (9.5)	9 (21.4)	15 (35.7)	8 (19)	6 (14.3)

<sup>a</sup> Values are expressed as No. (%). A, strongly agree; B, agree; C, neutral; D, disagree; E, strongly disagree.

for strategies allowing all students to learn and experiment easily based on the Internet availability(44). All these E-exam problem solutions together help instructors and universities to use the best methods for highly productive online evaluations(45). A more productive assessment would require more research on solving these problems that students face most often. Small sample sizes are one of the limitations of the study, and it is recommended to generalize the study in the entire country with a larger sample size.

### 5.1. Conclusions

According to the results, virtual formative assessment had an accepted position in the cardiac physiology course and helped students reduce stress and learn more. Students preferred most of the summative assessment questions to be multiple-choice due to the difficulty of the cardiac physiology course. For medical students, a multiple-choice question in cardiac physiology should not take less

than one minute, and a time between one and two minutes is suitable. Future studies are recommended to investigate this subject further.

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### Footnotes

**Authors' Contribution:** Study concept and design: ER, SZGH; Analysis and interpretation of data: FM, ER; Drafting of the manuscript: ER, SZGH, SM; Critical revision of the manuscript for important intellectual content: ER, SZGH, SM, FM.

**Conflict of Interests:** The authors have no conflicts of interest to declare.



**Ethical Approval:** This study was approved (Ethical approval ID: IR.ABADANUMS.REC.1399.087) by the Ethics Committee of AUMS (link: [ethics.research.ac.ir/ProposalCertificateEn.php?id=150603](https://ethics.research.ac.ir/ProposalCertificateEn.php?id=150603)).

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