Medical students’ perception of the reliability, usefulness and feasibility of unproctored online formative assessment tests

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Abstract

Medical education has gone online because of the COVID-19 pandemic. Formative assessment is essential to facilitate the learning process in medical education. However, various challenges arise during online assessment, which include reliability, when done without monitoring and practical concerns like Internet connectivity issues. This study was done to assess the medical students’ perceptions of the reliability, usefulness, and practical challenges of online tests. One hundred first-year undergraduate medical students taking up online classes and tests in the subject of physiology were enrolled in this study. A questionnaire with items regarding practical challenges, reliability, and usefulness of the online tests, in general, and about different types of online assessment methods, in particular, were sent to the students online. Each item was rated on a five-point Likert scale, and the responses were analyzed anonymously. A large percentage of students used mobile phones (81.4%) to undertake online tests. Although most students (73.2%; \( P < 0.001 \)) felt that online tests helped them substantially in learning the subject, network connectivity issues were considered to be a matter of serious concern (85.5%, \( P < 0.001 \)). Among the assessment methods used, viva voce by video conferencing was thought to be most reliable (83%, \( P < 0.001 \)). Multiple-choice question-based assessment when done online was felt to be more practically feasible with faster feedback than classroom assessment. The results of the study suggest that medical students find online formative assessments helpful for their learning, despite their concerns about reliability and practical challenges.

INTRODUCTION

The COVID-19 pandemic, in addition to its effect on global health and economy, has had its impact on medical education too (1, 2). Medical institutions all over the world have resorted to online teaching platforms (3). Therefore, it has become essential for medical educators to devise new teaching-learning and assessment strategies to continue the medical education unhindered (4). Challenges to online medical education include those related to the use of technology, problems in communication, lack of prior exposure to online teaching, and student assessment (5). Because assessment drives learning, the need for valid and reliable online assessment tools cannot be overemphasized (6).

Formative assessment is an integral part of medical education, and the subsequent feedback on performance plays a vital role in improving student learning (7). In the prevailing circumstances, formative assessment is being done online in medical colleges, but it is largely unproctored. Hence, the reliability of these online tests is a matter of concern. Practical challenges that may arise because of lack of proper Internet connectivity also have to be considered when conducting an online test. Medical institutions have used online formative assessments before, and its advantages have been well appreciated when comparing it to conventional classroom tests, like automated marking and instant feedback to students (8). However, these online assessments were objective and supplementary to the existing assessment methods. In the current scenario, online being the only mode of assessment possible, the reliability and feasibility issues associated with it must be considered, especially if grading is done. This study aims to determine medical students’ perception of the reliability of the unproctored online assessments to evaluate their understanding of the subject, its usefulness in terms of the feedback they receive on their performance, and practical issues in taking these tests.

METHODS

The study was conducted in the Department of Physiology, ESIC Medical College in Chennai, India. One-hundred first-year undergraduate medical students who were taking online classes and tests conducted by the department were recruited for the study, after obtaining informed consent. Online assessment of the student’s knowledge of the subject was done by the faculty in the Department of Physiology using conventional assessment tools like multiple-choice questions, theory exam, and viva voce (oral test). Multiple-choice questions (MCQ) were sent through Google Forms, and students were
asked to submit their answers within a stipulated time. Pen-and-paper tests were conducted for the students similar in pattern to the classroom tests. An exam with structured essay, short answers, and problem-based questions was sent to them online, and they were asked to scan and submit their answers in Google classroom within the allotted time. Viva voce was conducted through videoconferencing on a one-to-one basis. Separate oral test sessions for each topic were conducted, during which time the student’s knowledge and understanding of various physiological concepts and their clinical applications were assessed.

Students’ perception on the various online formative assessments conducted by the department from July to September 2020 was assessed using a questionnaire with 37 items. Most of the items were rated using a five-point Likert scale. A few open-ended questions for students’ suggestions were also included to make the assessment more reliable and feasible. The questionnaire was sent to the students through Google Forms, and their response was assessed anonymously. No identifying data of the student was collected. Data were presented as percentage. Analysis was done using the \( \chi^2 \)-test, where a \( P \) value < 0.05 was considered statistically significant. Analysis and presentation of data were done using Microsoft Excel.

## RESULTS

Out of the 100 students to whom the questionnaires were sent, 97 responded. The questionnaire had a few items about the Student’s location, the device they use, and the availability of private space without disturbance at home. The majority of students were from urban (56.7%) and semiurban areas (32%), while a small proportion (11.3%) were from a rural area (Fig. 1). Most students (81.4%, Fig. 2) used mobile phones, and more than 80% of students had an undisturbed private at home to take online tests.

The questionnaire contained 31 items, which were rated on five-point Likert scale. The items were grouped as those related to practical issues, reliability factors, usefulness in learning, and affective factors. The five ratings on the Likert scale were strongly agree, agree, neutral, disagree, and strongly disagree. For performing statistical analysis using \( \chi^2 \)-test, the number of students who responded with “Agree” and “Strongly agree” were pooled. Similarly, “Disagree” and “Strongly Disagree” were pooled.

### Practical Issues

Network issues were considered to be a matter of serious concern by most of the students who participated in this study (\( P < 0.001 \)). About 47.4% of students have strongly agreed, and 38.1% have agreed with the item on network issues in the questionnaire (Table 1). Home environment was considered more distracting and not suitable to take online tests for 57.7% of students who participated in this study (\( P < 0.001 \)). Most of the students agreed (63.9%, \( P < 0.001 \)) that they could adhere to specified time limits while taking up the tests.

### Feedback and Usefulness in Learning

A majority of students perceived the online tests to have helped them learn the subject (73.2%; \( P < 0.000 \)) (Table 2). Regarding the adequateness of formative feedback, a considerable fraction of students chose to be neutral (33%), while an almost equal number of students had opposing views (\( P = 0.901 \)).

### Reliability

About half of the students who participated in the study (48.4%; \( P = 0.117 \)) felt that online tests are as reliable in knowledge assessment as classroom tests. A large percentage of students (30 to 40%) gave a neutral opinion for questionnaire items related to cheating (referring to textbooks and other resources during test, using a proxy) and fairness in online testing. Among others, a significant percentage thought that it was easy to cheat (43.3%; \( P < 0.05 \)), and 39.2% felt that monitoring is necessary (\( P = 0.218 \)) in the conduct of online tests (Table 3). Many students (60.8%) felt that they scored better in online tests than classroom tests (\( P < 0.001 \)).

### Affective Factors

Most students considered online tests to be as important as classroom tests (59.8%, \( P < 0.001 \)), and majority of them (72.1%, \( P < 0.001 \)) felt that they were motivated to study with the help of feedback they got from the online tests (Table 4). Opinions were mixed about the stress factor in online tests. Close to half the number of students (46.4%) felt online tests were less stressful than classroom tests, while 30.9% disagreed with this item on the questionnaire (\( P = 0.083 \)).
Various Online Assessment Methods

Regarding online assessment using MCQs, most students found it was more practically feasible (67%; \(P < 0.001\)), and feedback was much faster (82.5%; \(P < 0.001\)) than in classroom assessment. A large percentage (83%; \(P < 0.001\)) of students felt that viva voce was the most reliable among the various online assessment methods. Most students (82.5%; \(P < 0.001\)) felt it was difficult to cheat in viva voce, but a considerable fraction of students (55.7%; \(P < 0.001\)) felt this type of assessment was practically difficult because of network connectivity issues. About half of the students (51.6%; \(P < 0.05\)) felt that it was difficult to take a theory test online, while a large fraction of students (77.3%; \(P < 0.001\)) found it difficult to adhere to time schedule in pen-and-paper tests because of network issues (Table 5).

DISCUSSION

Assessment, both formative and summative, is an important part of medical education. It is timely that reliable online assessment methods are devised for medical education to continue effectively during this pandemic. A study conducted in the United Kingdom on final-year medical students reports that summative examinations and assistant-ship placements have been affected as a result of the current pandemic (9). There were instances in which summative assessments were done online during the SARS epidemic in 2013 (10), and during the current pandemic, U.K. medical schools have been using online assessments (9). For online methods to be used in summative assessments they have to be made reliable and feasible.

Assessment is not only essential for grading the performance of students, but it is also an important tool that drives learning. A paradigm shift has occurred in recent years regarding assessment in medical education; the focus is now on formative assessment rather than summative assessment. The goal of formative assessment is facilitation and consolidation of learning rather than grading the students (11). Medical institutions have conducted formative assessments in online platforms, even in the pre-COVID times to facilitate learning (12), and these were found to be well appreciated by the student community (13). However, those assessments were based on MCQs and were supplementary to the standard formative assessments conducted by the institutions in classroom settings. In the present scenario, the online assessment being a replacement for the standard classroom assessment, its reliability, and feasibility is of concern, especially when it is used for grading. The purpose of this study was to determine the first-year medical students’ perception about the usefulness, reliability and feasibility of the formative online assessment when used as a substitute for standard classroom assessment. Students also provided suggestions for improving the various online assessment methods so that they could become reliable and feasible tools, good enough to be used for summative assessment, if required.

One striking observation was that a very large percentage of the students who participated in the study used mobile phones for taking online assessments. Technological limitations of the mobile phone for scanning/uploading documents and the screen size are factors that might affect the performance and speed of the students when taking tests online. Most of the students were from urban and semi-urban areas and had the requisite private space at home to take online tests. A small fraction of students were from rural areas, which may have had poor network connectivity, and a similar percentage of students felt that privacy was not adequate in their home to take online tests. These issues have to be addressed to remove any unfair disadvantage to a certain proportion of students. A vast majority of students who participated in this study felt that network issues were a matter of concern in the conduct of online tests. The home

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**Table 1. Response of students to items related to practical issues in online assessment**

| Item                                                                 | Strongly Disagree, % | Disagree, % | Neutral, % | Agree, % | Strongly Agree, % | P Value<sup>+</sup> |
|----------------------------------------------------------------------|----------------------|-------------|------------|----------|-------------------|------------------|
| Taking up online assessment is, in practice, more difficult than classroom tests. Network issues are a matter of serious concern in the conduct of online tests. Home environment is more distracting and not suitable for taking online tests. Adherence to time schedule is as strict in online tests as in classroom tests. | 4.1                  | 37.1        | 20.6       | 28.9     | 9.3               | 0.732            |
|                                                                      |                      |             |            |          |                   |                  |
|                                                                      | 0.0                  | 8.2         | 6.2        | 38.1     | 47.4              | <0.001*          |
|                                                                      |                      |             |            |          |                   |                  |
|                                                                      | 6.2                  | 19.6        | 16.5       | 30.9     | 26.8              | <0.001*          |
|                                                                      |                      |             |            |          |                   |                  |
|                                                                      | 2.1                  | 14.4        | 19.6       | 46.4     | 17.5              | <0.001*          |

<sup>+</sup>For computing P values, the number of “agree” and “strongly agree” responses were pooled. Similarly, “disagree” and “strongly disagree” were pooled. *Significant difference, \(P < 0.001; n = 97\).

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**Table 2. Response of students to items related to the usefulness of online assessment in enhancing learning**

| Item                                                                 | Strongly Disagree, % | Disagree, % | Neutral, % | Agree, % | Strongly Agree, % | P Value<sup>+</sup> |
|----------------------------------------------------------------------|----------------------|-------------|------------|----------|-------------------|------------------|
| Online assessment has helped me substantially in learning the subject. Feedback from online assessment is not as adequate as classroom assessment. | 2.1                  | 6.2         | 18.6       | 58.8     | 14.4              | <0.001*          |
|                                                                      |                      |             |            |          |                   |                  |
|                                                                      | 8.2                  | 24.7        | 33         | 28.9     | 5.2               | 0.901            |

<sup>+</sup>For computing P values, the number of “agree” and “strongly agree” responses were pooled. Similarly, “disagree” and “strongly disagree” were pooled. *Significant difference, \(P < 0.001; n = 97\).
A comparatively larger number of students felt online tests to be as reliable as classroom tests, although the difference among the responses was not statistically significant. Despite the data being collected anonymously, a considerable percentage of students chose to remain neutral for questionnaire items regarding cheating, and the necessity for monitoring by a proctor. Among other students, a 

environment was felt to be more distracting than the classroom and was considered not suitable for taking online tests by many students.

A comparatively larger number of students felt online tests to be as reliable as classroom tests, although the difference among the responses was not statistically significant. Despite the data being collected anonymously, a considerable percentage of students chose to remain neutral for questionnaire items regarding cheating, and the necessity for monitoring by a proctor. Among other students, a

Table 3. Response of students to items related to the reliability of online assessment

| Item                                                                 | Strongly Disagree, % | Disagree, % | Neutral, % | Agree, % | Strongly Agree, % | P Value |
|---------------------------------------------------------------------|----------------------|-------------|------------|----------|-------------------|---------|
| Online assessment is as reliable in assessment of knowledge as classroom assessment. | 8.2                  | 25.8        | 17.5       | 40.2     | 8.2               | 0.117   |
| It is easier to cheat in online tests than classroom tests.         | 5.2                  | 14.4        | 37.1       | 35.1     | 8.2               | 0.003*  |
| It does not matter if there is cheating when the online test is given unmonitored for internal assessment. | 11.3                 | 33.0        | 40.2       | 14.4     | 1.1               | 0.0002* |
| Monitoring is necessary while doing an online test.                | 6.2                  | 22.6        | 32.0       | 33.0     | 6.2               | 0.218   |
| Fairness in the conduct of test taking can be ensured in online tests. | 9.3                  | 20.6        | 27.8       | 38.1     | 4.1               | 0.151   |

*For computing P values, the number of “agree” and “strongly agree” responses were pooled. Similarly, “disagree” and “strongly disagree” were pooled. *Significant difference, P < 0.05; n = 97.

Table 4. Response of students to items related to affective factors in online assessment

| Item                                                                 | Strongly Disagree, % | Disagree, % | Neutral, % | Agree, % | Strongly Agree, % | P Value |
|---------------------------------------------------------------------|----------------------|-------------|------------|----------|-------------------|---------|
| Online tests are as important as classroom tests.                   | 1.1                  | 8.2         | 30.9       | 45.4     | 14.4              | <0.001* |
| Online tests are less stressful than classroom tests.              | 10.3                 | 20.6        | 22.7       | 37.1     | 9.3               | 0.083   |
| Feedback on the performance that I receive after online tests has motivated me to study. | 0                    | 7.2         | 20.6       | 49.5     | 22.7              | <0.001* |

*For computing P values, the number of “agree” and “strongly agree” responses were pooled. Similarly, “disagree” and “strongly disagree” were pooled. *Significant difference, P < 0.001; n = 97.

Table 5. Response of students to items related to various online assessment methods

| Item                                                                 | Strongly Disagree, % | Disagree, % | Neutral, % | Agree, % | Strongly Agree, % | P Value |
|---------------------------------------------------------------------|----------------------|-------------|------------|----------|-------------------|---------|
| Online MCQs                                                          |                      |             |            |          |                   |         |
| This type of assessment is more practically feasible when done online. | 1                    | 9.3         | 22.7       | 54.6     | 12.4              | <0.001* |
| Feedback on performance is faster when this assessment is conducted online. | 1                    | 3.1         | 13.4       | 59.8     | 22.7              | <0.001* |
| Adhering to time schedule is better when this type of assessment is done online. | 2.1                  | 7.2         | 14.4       | 59.8     | 16.5              | <0.001* |
| Online Theory Test (Essay, Short Answer, Problem-Based Questions)   |                      |             |            |          |                   |         |
| This type of test is reliable in assessment of knowledge when used online. | 3.1                  | 12.4        | 27.8       | 47.4     | 9.3               | <0.001* |
| There are more practical difficulties when doing a written theory test online. | 4.1                  | 24.7        | 19.6       | 39.2     | 12.4              | 0.012*  |
| Adhering to time schedule is not possible because of network issues in this type of test. | 4.1                  | 7.2         | 11.3       | 44.3     | 33                | <0.001* |
| Online Viva Voce by Videoconferencing                                |                      |             |            |          |                   |         |
| Viva voce is the most reliable in knowledge assessment when used online. | 2.1                  | 6.2         | 9.3        | 43.3     | 39.7              | <0.001* |
| Viva voce when done online is, in practice, more difficult because of network issues. | 3.1                  | 17.5        | 23.7       | 37.1     | 18.6              | <0.001* |
| Cheating is difficult in this type of online assessment.            | 4.1                  | 3.1         | 10.3       | 43.3     | 39.2              | <0.001* |
| Online viva voce is less stressful than a direct oral test.         | 8.2                  | 21.6        | 25.8       | 28.9     | 15.1              | 0.896   |

*For computing P values, the number of “agree” and “strongly agree” responses were pooled. Similarly, “disagree” and “strongly disagree” were pooled. *Significant difference, P < 0.001; n = 97.
majority of them agreed that it was easy to cheat, and only a small percentage of students felt that it did not matter if there was cheating in formative assessment. Most students perceived that online tests and the formative feedback had motivated them to study and helped them substantially in learning physiology.

An overwhelming majority of students felt that among the various tools online, viva voce through video conferencing was the most reliable, and cheating was difficult in this assessment form. The classical pen-and-paper test with recall and problem-based questions, when conducted online, was perceived to be difficult, in practice, by students, as adherence to time is challenging because of network connectivity issues. Students who participated in this study appreciated the feasibility and quickness of feedback in the online MCQ-based test. MCQ-based assessments have been done previously through various online software, and the response from the students has been favorable (14). Ease of administration, even in large groups, cost-effectiveness, and instant feedback are a few of the advantages of online MCQ assessment over paper-and-pen-based assessments (13). However, significant disparity has been found to occur between proctored and unproctored assessment scores in online courses (15).

While answering to open ended questions, students had mixed opinions about the use of the online tools in summative assessment. Some students felt it was necessary and safer under the current circumstances of the pandemic, but they emphasized the need for strict monitoring. A considerable number of students did not prefer the online mode for summative assessment because of practical challenges related to Internet connectivity issues. However, they considered it essential to do formative assessments in the online mode during the present circumstances because it has facilitated their learning.

## CONCLUSIONS

The results show that medical students who participated in this study appreciated the usefulness of the online formative assessment tests in enhancing learning. However, practical challenges, mainly due to network connectivity issues, have to be considered. Online viva voce is perceived by the students to be the most reliable assessment method, with little opportunity for cheating. To make online assessment reliable, the students suggest that tests should be conducted with strict monitoring.

## DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the authors.

## AUTHOR CONTRIBUTIONS

S.S. conceived and designed research; S.S., S.M.M., S.A.M., K.U., G.S. and K.S. performed experiments; S.S. analyzed data; S.S. interpreted results of experiments; S.S. drafted manuscript; S.S., S.M.M., S.A.M., K.U. and K.S. edited and revised manuscript; S.S. approved final version of manuscript.

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