



COMPARISON BETWEEN STUDENT SCORES IN MULTIPLE CHOICE QUESTIONS AND STRUCTURED ESSAY QUESTIONS AT III MBBS EXAMINATION IN OTORHINOLARYNGOLOGY IN A MEDICAL COLLEGE IN MAURITIUS

HS SHARMA*¹ AND MM MUTALIK²

¹Department of Otorhinolaryngology, Index Medical College, Indore (Madhya Pradesh) India

²Department of Pharmacology, MIMER Medical College, Talegaon, Pune (Maharashtra) India

ABSTRACT

Student evaluation is done by various methods like a multiple choice question (MCQ), Essay questions, Structured essay question (SEQ), Modified essay question (MEQ), Objective structured clinical assessment (OSCE) in assessment of MBBS students in various universities worldwide. The present retrospective study compared the student performance in single-response MCQs and SEQs in the subject of otorhinolaryngology at the III MBBS examination at SSR Medical College, Mauritius. Performance of 639 students was analyzed over a period of 6 years, using SPSS-16 software. Scores in SEQs averaged at 47.63% (SD 11.90), while those in MCQs averaged at 55.24% (SD 17.90). MCQ scores were significantly higher than the SEQ scores when analyzed by two-way ANOVA. Pearson correlation between SEQ and MCQ scores was strongly significant indicating the performance to be independent of the type of questioning. Analysis of the scores of top-20% scorers (n=128) and bottom-20% scorers (n=128) did not show significant correlation.

KEYWORDS: Evaluation Studies, MCQ, SEQ, Feedback, Medical Students, Undergraduate Medical Education



HS SHARMA

Department of Otorhinolaryngology, Index Medical College,
Indore (Madhya Pradesh) India

INTRODUCTION

Learning and progress of medical students is assessed worldwide by using theory, practical, and clinical examinations including written papers as well as objective structured clinical examinations (OSCE), case studies, and viva-voce examinations. Reliability and validity are important aspects of an assessment method. The written assessments are done with the help of MCQs (of various types such as single or multiple best response MCQs, single or multiple true or false questions) and subjective or descriptive open-ended questions. The descriptive questioning may be in the form of structured essay questions (SEQs), long essay questions or modified essay questions. SEQ is a type of questioning which has structured components containing open-ended questions, and expects specific answers to those components. These questions are used to test the knowledge as well as the capacities of analyzing, reasoning, application and integrating. There may be a freedom of flexibility of response and individuality of approach, and such questions help in evaluation of interpretative skills. The structured essay questions may be long-essay type, short-essay type or modified essay type.^{1,2} MCQs usually test the recall of information.³ MCQs are considered to be advantageous as far as the validity and ease of scoring.^{4,5,6} Multiple-choice questions take less time to answer (and grade) and would allow an examination made up entirely of multiple-choice to contain more questions and therefore be more reliable than an examination containing fewer open-ended questions.⁶ However, the reliability of MCQs may be questionable due to the possibility of guessing as well as a chance probability of choosing a right answer.⁷ The open-ended, descriptive, structured, and essay questions are considered useful in testing the higher-order thought process and interpretation skills.^{1,2,6,8} Essay questions provide scope for creativity and individuality of approach; however, to some extent leave a chance of subjectivity in assessment.⁹ While teaching medical students for many years, we observed that the students

who are consistently known to score low grades face difficulties in formulating descriptive answers. This is mostly due to lack of ability of forming concepts and expressing. We also experienced that top scorers in the class as well as the low scorers find it difficult to address MCQs. These experiences triggered a curiosity in us to make an effort to search the correlation in student performance at different forms of questioning. The literature search provided some basis for this work. Some studies in past found the student scores in MCQs and the descriptive questions to be closely related, supporting a thought that both methods of questioning essentially measured the same abilities.^{6,8,10} Some studies found that the student scores on these two different types of questioning were in a significant correlation, but not so closely related as to be called identical.^{11,12} SEQs are known to test the knowledge as well as the capacities of analysis and reasoning, and hence they are useful to evaluate how the students can apply and integrate the knowledge.^{1,2} Application of a more sophisticated statistical procedure called two-stage least squares suggested that the two different types of questioning were clearly measuring different dimensions of knowledge.¹³ A study related to MBBS stage I physiology examination showed higher scores in MCQs than in SEQs, and showed a strong correlation between MCQ scores and essay-question scores, indicating the student performance to be independent of the testing format; however, showed lack of such correlation amongst the students whose scores were at the ends of the performance spectrum.¹⁴ The present study was undertaken to search if there exists a correlation between the student scores at MCQ and SEQ examinations. The study was also aimed at searching whether the students score better in MCQs or in SEQs. Further, the search was done to find if there exists a basis for the general observation that the top-scorers as well as the low-scorers face difficulties in solving the MCQs.

MATERIALS AND METHODS

This was a retrospective study of scores of 639 students in the semester examinations of otorhinolaryngology during their fourth year of the 5-year MBBS program at the Sir Seewoosagur Ramgoolam Medical College, Mauritius. The study period was June 2006 to April 2011. Sir Seewoosagur Ramgoolam Medical College, Mauritius affiliated to University of Mauritius runs a 5-year MBBS program. Otorhinolaryngology is taught to the pre-final students during the third and fourth year. Student scores considered during the present study were from their semester examinations. The duration of semester examination is 3 hours, including the first 20 minutes allotted for solving 20 single-response, multiple-choice questions (MCQs), and the rest of the time for the SEQs. Pass grade is awarded to students scoring 50% or more marks. The comparison between MCQ scores and SEQ scores was undertaken. Since the students answered both types of questions at the same sitting and both types of questioning was related to same course content, analysis was carried out to search a correlation between MCQ scores and SEQ scores of entire population of students. The correlation was also searched between MCQ scores and SEQ

scores of the student groups such as failing students, passing students, top-20% scorers, and bottom-20% scorers. The data were analyzed using SPSS-16 statistical package to calculate means and standard deviation. Analysis of Pearson correlation coefficient (r) were done to know any correlation between MCQ scores and SEQ scores with setting of significance level at $p < 0.05$. Two-way ANOVA analysis and Tukey's test was also done to know the impact of examination format (MCQ or SEQ) and the various course grade (fail, pass, top 20% scores, and bottom 20% scores). Performance of student group of 50% to 60% score and more than 60% score group was also calculated. Item analysis of MCQs was not performed during this period.

RESULTS

Table 1 shows the average MCQ and SEQ scores of all student subgroups and their correlation. Figure 1 is a scatter plot showing correlation between MCQ and SEQ scores of all the students. Analysis of data from table 1 and the scatter diagram as seen in figure 1 showed strongly significant (Pearson correlation: $r = 0.454$, $p < 0.05$) correlation between MCQ and SEQ scores in all students.

Table 1
Various student subgroups: MCQ and SEQ scores and their correlation

Student subgroup	Number	MCQ score (SD)	SEQ score (SD)	MCQ score versus SEQ score	
				Correlation	p value
Total	639	55.24 (17.90)	47.63 (11.91)	0.454	0.000*
Pass	364	62.65 (16.09)	55.55 (6.40)	0.197	0.035*
Fail	275	45.44 (16.58)	37.15 (9.09)	0.127	0.035*
Top-20%	128	70.62 (12.60)	62.20 (5.31)	0.119	0.181
Bottom- 20%	128	40.08 (16.03)	30.05 (8.32)	0.037	0.682

Figure 1
Scatter diagram showing correlation between MCQ scores and SEQ scores of all the students

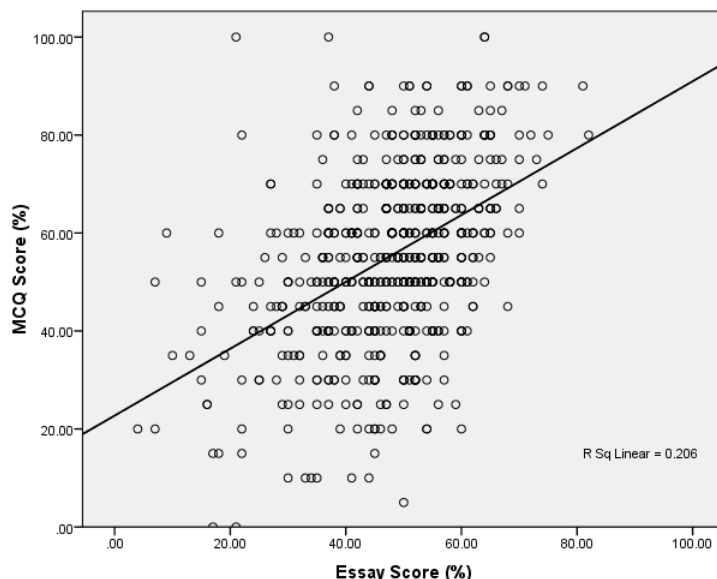


Figure 2 shows a scatter plot showing the correlation between MCQ scores and SEQ scores of the fail student subgroup. Analysis of the data in table 1 and the scatter diagram as seen in figure 2 showed that there is a strong positive correlation ($r = 0.127$) between the MCQ scores and SEQ scores of the student subgroup of fail students ($n = 275$) with $p < 0.05$.

Figure 2
Fail student subgroup: Correlation between MCQ scores and SEQ scores

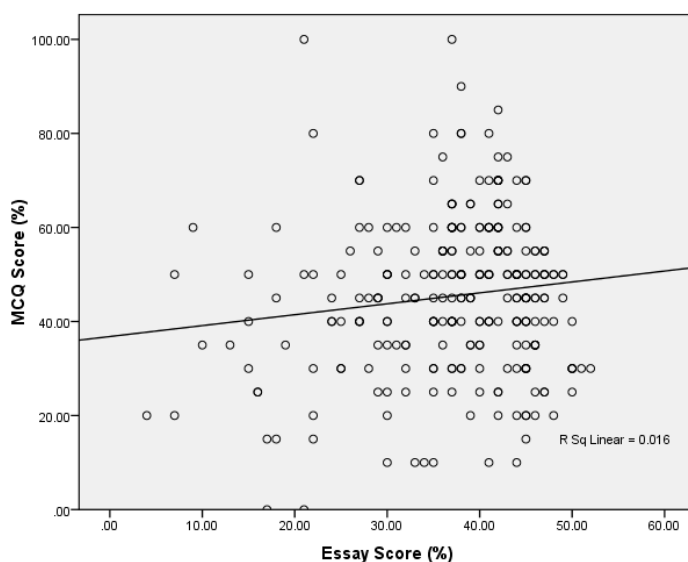


Figure 3 shows a scatter plot showing the correlation between MCQ scores and SEQ scores of the pass student subgroup. Analysis of the data in table 1 and the scatter diagram as seen in figure 3 showed that there is a strong positive correlation ($r = 0.197$) between the MCQ scores and SEQ

scores of the student subgroup of pass students (n = 364) with $p < 0.05$. In the top-20% student subgroup (n = 128), there was no significant correlation found in the MCQ scores and SEQ scores ($r = 0.119, p > 0.05$). Similarly in the bottom-20% student subgroup (n = 128), there was no significant correlation found between the MCQ scores and SEQ scores ($r = 0.037, p > 0.05$). Amongst the pass students, those scoring 60% or more marks (n = 275), no significant correlation between MCQ scores and SEQ scores was found ($r = 0.172, p > 0.05$). However, amongst the pass students scoring less than 60% marks (n = 534), there was a significant correlation between the MCQ scores and SEQ scores ($r = 0.308, p > 0.000$)

Figure 3
Pass student subgroup: Correlation between MCQ scores

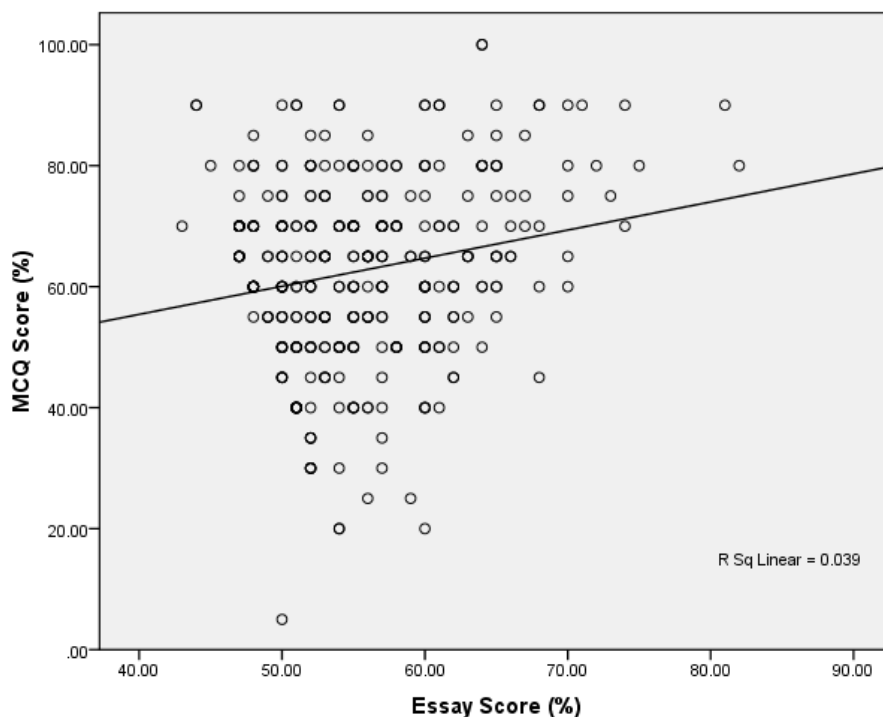


Table 2.1 and table 2.2 show group statistics to compare the subgroups of pass and fail students and the independent t-test results for these two subgroups for their MCQ scores and SEQ scores.

Table 2.1
Comparison between pass and fail student subgroups

Group Statistics					
	Groups	N	Mean	SD	SEM
MCQ Score (%)	Fail students	275	45.4364	16.58286	0.99998
	Pass students	364	62.6511	15.09079	0.79097
SEQ Score (%)	Fail students	275	37.1491	9.08695	0.54796
	Pass students	364	55.5467	6.40209	0.33556

Table 2.2
Independent t-test result for pass and fail student subgroups for their MCQ scores and SEQ scores

		T	df	p-value
MCQ Score (%)	Equal variances assumed	-13.680	637	0.000
SEQ Score (%)	Equal variances not assumed	-28.632	468.324	0.000

Since p -value for the t-test is less than 0.05, it indicates that there is significant difference in average MCQ scores of pass and fail students. The difference is also significant for average SEQ scores of pass and fail students.

Table 3.1 and table 3.2 show comparison between student subgroups scoring more than 60% and those scoring between 50% and 60%, and the independent t-test result of these subgroups for their MCQ scores and SEQ scores

Table 3.1
Comparison between student subgroups scoring more than 60% and those scoring between 50% and 60%

	Subgroups	N	Mean	Std. Deviation	Std. Error Mean
MCQ Score (%)	50 to less than 60	259	59.1699	14.67959	0.91215
	60 and above	105	71.2381	12.47653	1.21759
SEQ Score (%)	50 to less than 60	259	52.3629	3.51182	0.21821
	60 and above	105	63.4000	4.99538	0.48750

Table 3.2
Independent t-test result for student subgroups scoring more than 60% and those scoring between 50% and 60% for their MCQ scores and SEQ scores

		t	Df	p-value
MCQ Score (%)	Equal variances assumed	-7.408	362	0.000
SEQ Score (%)	Equal variances not assumed	-20.664	147.464	0.000

Since p -value for the t-test is less than that of 0.05, it indicates that there is significant difference in average MCQ scores of student subgroups scoring more than 60% and those scoring between 50% and 60%. The difference is also significant for the average SEQ scores of student subgroup scoring more than 60% and the student subgroup scoring between 50% and 60%.

DISCUSSION

The present study showed better student performance in MCQs compared to SEQs in all the student sub-groups. Keeping in mind that MCQs and SEQs both were from the same content domain, the finding clearly indicated

that the SEQ format was more difficult to score than the MCQ format. Higher MCQ scores were also reported in many other studies.^{14,15,16} This observation supports the view that students with strong factual recall capacity score better in

MCQs than in SEQs, since the SEQs demand higher intellectual capacity to analyse, organize, and apply the knowledge. The overall higher student performance in MCQs compared to SEQs suggested that some students may pass the examination if assessed only by MCQs, thereby justifying the need to also have SEQs for student assessment. Regarding the analysis of correlation between performance at MCQs and SEQs, the present study found strong significant correlation in the entire student population, which indicated that the students who performed well in MCQs also performed well in SEQs. Similar observations were noted by various researchers.^{14,16,17} For further analysis of this correlation between the various student sub-groups, correlation coefficients and regression coefficients were found to be significant in fail-student subgroup and pass-student subgroup; however, no correlation was seen in the top-20% student subgroup, bottom-20% student subgroup, subgroup between top-20% and bottom-20% as well as student subgroup with scores more than 60%. The student subgroup with scores between 50% and 60% (average scorers) showed significant correlation as well as regression coefficients. This observation indicated that average students (having scores between 50% and 60%) scored equally well in MCQs and SEQs. Students who were above average (top-20% subgroup) and those with low scores (bottom-20% subgroup) performed better in MCQs than in SEQs. Similar observations have been noted

in past.^{14,16,18,19} Higher scores in MCQ format were attributed partly due to elimination of examiner bias, and due to the fact that the MCQs offer clues to the answer, which is not the case with SEQs.¹⁶ The only limitation of the present study is in terms of lack of corroborative evidence for the various reasons of the typical pattern of scoring and the correlations. This was obvious because the methodology did not include other means such as the focused interviews of the students.

CONCLUSION

In summary, the present study found a strong correlation between student performance in MCQs and SEQs. There was a strong correlation between MCQ scores and SEQ scores in the average-scoring students; however, such correlation was not seen in the top-20% and the bottom-20% student groups. Higher scores in MCQs than in SEQs justify the use of both types of question formats for student assessment, since these two formats test the different skills in the students. Higher scores in MCQs than in the SEQs may increase the possibility of students passing an examination, if assessment is done only with the use of MCQs.

DECLARATION OF INTERESTS

Conflicts of interests declared None.

REFERENCES

1. Feletti GI. Reliability and validity studies on modified essay questions. *J Med Educ*, 55: 933-941 (1980).
2. Walubo A, Burch V, Parmar P, Raidoo D, Cassimjee M, Onia R, Ofei F. A model for selecting assessment methods for evaluating medical students in African medical schools. *Acad Med*, 78: 899-906, (2003).
3. Van Der Vleuten C. The assessment of professional competence: developments, research and practical implications. *Adv Health Sci Educ*, 1: 41-67, (1996).
4. Scouller KM, Prosser M. Students experiences in studying for multiple choice question examinations. *Stud High Educ*, 19 (3): 267-279, (1994).
5. Scouller K. The influence of assessment method on students' learning approaches: Multiple choice question examination versus assignment essay. *High Educ*, 35: 453-472, (1998).

6. Bridgeman B. A comparison of quantitative questions in open-ended and multiple-choice formats. *J Educ Meas*, 29 (3): 253-271, (1992).
7. Hassmen P, Hunt DP. Human self-assessment in multiple-choice testing. *J Educ Meas*, 31 (2): 149-60, (1994).
8. Walstad WB, Becker WE. Achievement differences on multiple-choice and essay tests in economics. *Am Econ Rev*, 84: 193-196, (1994).
9. Powers DE, Fowles ME, Farnum M, Ramsey P. Will they think less of my handwritten essay if others word process theirs? Effects on essay scores of intermingling handwritten and word-processed essays. *J Educ Meas*, 31(3): 220-233, (1994).
10. Lukhele R, Thissen D, Wainer H. On the relative value of multiple-choice, constructed response, and examinee-selected items on two achievement tests. *J Educ Meas*, 31(3): 234-250, (1994).
11. Thissen D, Wainer H, Wang XB. Are tests comprising both multiple-Choice and free-response items necessarily less unidimensional than multiple-choice tests? An Analysis of two tests. *J Educ Meas*, 31(2): 113-123, (1994).
12. Harris RB, Kerby WC. Statewide performance assessment as a complement to multiple-choice testing in high school economics. *J Econ Educ*, 28(2): 122-134, (1997).
13. Becker WE, Johnston C. The relationship between multiple choice and essay response questions in assessing economics understanding. *The Economic Record Econ Rec*, 75(231): 348-357, (1999).
14. Pepple DJ, Young LE, Carroll RG. A comparison of student performance in multiple-choice and long essay questions in the MBBS stage I physiology examination at the University of the West Indies (Mona Campus). *Adv Physiol Educ*, 34: 86–89, (2010).
15. Anyanwu GE, Ugochukwu AI, Okenwa WO, Ezemagu KU. The psychometric properties of various multiple choice question format and their role in assessment of academic performance of medical students. *African scientist*, 10(2): 109-115, (2009).
16. Moqattash S, Harris PF, Gumaa KA, Abu-Hijleh MF. Assessment of basic medical sciences in an integrated systems-based curriculum. *Clin Anat*, 8:139–147, (1995).
17. Oyebola DD, Adewoye OE, Iyaniwura JO, Alada AR, Fasanmade AA, Raji YA. Comparative study of students performance in physiology assessed by multiple choice and short essay questions. *Afr J Med Sci*, 29: 201-205, (2000).
18. Anbar M. Comparing assessment of students' knowledge by computerized open ended and multiple choice tests. *Acad Med*, 66: 420-422, (1991).
19. McCloskey DI, Holland RA. A comparison of student performance in answering essay-type and multiple choice examinations. *Med Educ*, 10: 382–385, (1976).