



Assessing the Role of Gender in Objective and Subjective Question Outcomes in Medical Physiology Among First Year Medical Students

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ABSTRACT:

Context: Several studies have indicated that female medical students tend to outperform their male counterparts in subjective assessments. Studies in other subjects like Physics and Mathematics, as well as entrance exams, suggest that male students perform better in Multiple Choice Question (MCQ)-based assessments. Limited research has been conducted on gender differences in performance across objective and subjective assessments in medical education. Our study aims to examine the differences in performance between male and female students in Physiology assessments.

Aims: To compare the performance of male and female students in MCQ based and subjective assessment in Physiology.

Settings and Design: The study was conducted as a retrospective cross-sectional study. Marks obtained by all 299 students from 2 batches 2021-2022 and 2022-2023 in the prefinal exams of Physiology were collected.

Methods and Material: Marks obtained in MCQ and descriptive sections of both Paper I and Paper II together were converted to percentage (%) score and was analyzed with respect to gender.

Statistical analysis used: Comparison of percentage marks obtained by male(n=141) and female students(n=158) is done by Student T- test. Correlation between the marks obtained in MCQ and descriptive sections is done by Pearson Correlation.

Results: Students obtained significantly more percentage marks in MCQs (60.97%) as compared to Subjective questions (47.43%). Female students scored significantly more marks in descriptive part having subjective questions as compared to male students (Females-47.3%, Males- 44.95% p<0.001). Male students scored slightly higher percentage marks in MCQs; the difference is not statistically significant. There is statistically significant correlation of subjective and MCQ (objective) marks of all students put together.

Conclusions: Our study indicates that female students perform significantly better than their male counterparts in subjective tests, whereas no significant difference is observed between the genders in MCQ marks.

Introduction

Assessment in medical education is multifaceted. It drives and stimulates learning, provides information on educational efficacy to institutions and teachers, and protects patients.¹ Three broad domains of education,

knowledge (cognitive), skills (psychomotor), and attitude (affective) are important definers of a medical student's success.² Cognitive domain deals with how a student acquires processes and utilizes the knowledge. It is the "thinking" domain. This domain focuses on intellectual skills.³



There are various methods to assess the knowledge domain which include Free response or Subjective examinations (Long Essay Questions, Short answer Questions, Modified Essay questions) and objective examinations which mainly includes Multiple choice questions. No single method of evaluation is superior to other and probably a reliable and valid evaluation requires a combination of these methods.⁴

Research indicates that female medical students tend to outperform their male counterparts in subjective assessments.^{5,6} Studies in subjects like Physics and Mathematics, as well as entrance exams, suggest that male students perform better in Multiple Choice Question (MCQ)-based assessments.^{7,8,9} Limited research has been conducted on gender differences in performance across objective and subjective assessments in medical education.

Our study aims to examine the differences in performance between male and female students in Physiology assessments.

Objectives:

1. To compare the performance of male and female students in MCQ based and subjective assessment.
2. To assess the correlation of one type of assessment with the other.

Materials and Methods:

The study was conducted as a retrospective cross-sectional study. Marks obtained by all 299 students from 2 batches 2021-2022 and 2022-2023 in the prefinal exams of Physiology were collected. Approval of the Institution Ethics Committee was obtained before initiation of the work. Prefinal exam has two question papers- Paper I and Paper II, together covering entire Physiology syllabus for first year. First section of both papers has 20 MCQs. MCQs are of recall type, case based, application based and analysis type. Each MCQ has 4 options, best option has to be marked. Students get 30 min to answer 20 questions. Each question carries 1 mark and there is no negative marking. The second section has descriptive questions which include Modified Long Essays, Short Essays and Short Answers carrying 10, 5 and 3 marks respectively. This section is evaluated by different valuator however evaluation is

done with model answers and rubric to minimize inter-evaluator bias.

Marks obtained in MCQ and descriptive sections of both Paper I and Paper II together were converted to percentage (%) score and was analyzed with respect to gender. Comparison of percentage marks obtained by male(n=141) and female students(n=158) is done by Student T- test. Correlation between the marks obtained in MCQ and descriptive sections is done by Pearson Correlation. Analysis is done by SPSS Version 25 and a p value of 0.05 or less was considered statistically significant.

Results:

MCQ and Subjective marks obtained in Prefinal Physiology Exam, converted into percentage were analyzed in total 299 students (males- 141, females- 158). Students obtained significantly more percentage marks in MCQs (60.97%) as compared to Subjective questions (47.43%). Similar results were observed in male students (MCQ- 61.61%, Subjective- 44.95%) and female students (MCQ- 60.41%, Subjective-49.45%)

Fig.1

Female students scored significantly more marks in descriptive part having subjective questions as compared to male students (Females-47.3%, Males-44.95% $p < 0.001$). Male students scored slightly higher percentage marks in MCQs; the difference is not statistically significant. **Table1, Fig. 2**

There is statistically significant correlation of subjective and MCQ (objective) marks of all students put together (r value- 0.482, $p < 0.001$). **Table 2**

Discussion:

Performance of the students in theory examination showed highly significant difference between the performance in MCQ & Subjective questions with better performance in MCQs. Similar findings of greater scores in multiple-choice questions as opposed to subjective questions were published by Pepple DJ et al,¹⁰ Oyebola et al.,¹¹ Mujeeb et al.¹² Some of these researchers have attributed getting less marks in subjective questions to bias in the evaluation of subjective questions by different examiners, compared with more objective MCQ marking. However, we believe that subjective questions like structured long essays and short essays are sensitive



and demand that students engage in higher-order cognitive abilities like application, interpretation, and analysis in addition to information recall whereas MCQs are mostly of recall type unless properly constructed.

Female students had a significantly better performance in subjective questions as compared to the male students. These results are similar to that obtained by Pai P, Sanji N et al⁶, Sinha M et al⁵, A. Al-Mulhim et al where girl students performed better in subjective tests. Better performance by female students in subjective tests has been attributed to the fact that they have inherent better ability at reading and comprehension, better speed of perception and associative memory skills.¹⁴ They are also more sincere and put greater efforts in medical courses.^{15,16}

There was no significant difference between MCQ marks between male and female students. This is as against the findings of the studies done in objective tests in Physics, Mathematics and in entrance exams.^{7,8,9} Results as ours have been obtained by some researchers in Medical students.^{5,6,17} Our study has also shown co-relation between subjective and MCQ marks indicating that those who have put- in hard work have scored well in both type of tests. Also, there is no negative marking for our MCQs. It has been shown that tests with negative marking have shown significant difference in performance between the two genders, female students have shown less risk-taking behaviour resulting in less attempts and lesser marks in MCQ based tests.¹⁸

Conclusion:

Our study indicates that female students perform significantly better than their male counterparts in subjective tests, whereas no significant difference between the genders is observed in MCQ marks. So well-constructed MCQs are a better addition to descriptive questions for Theory Exams as they do not show gender bias. However, studies involving larger sample size and other subjects of Medical Discipline are recommended to generalise our findings.

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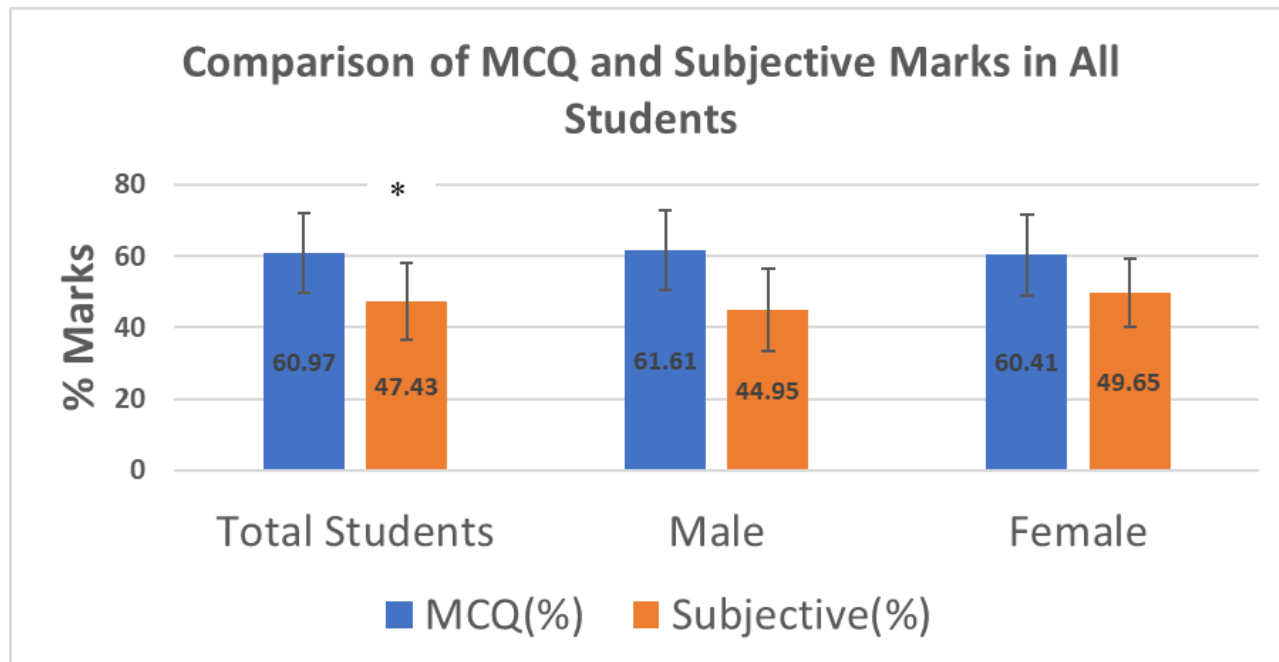


Fig 1: Comparison of % marks of MCQ and Subjective questions obtained by total students and by both genders

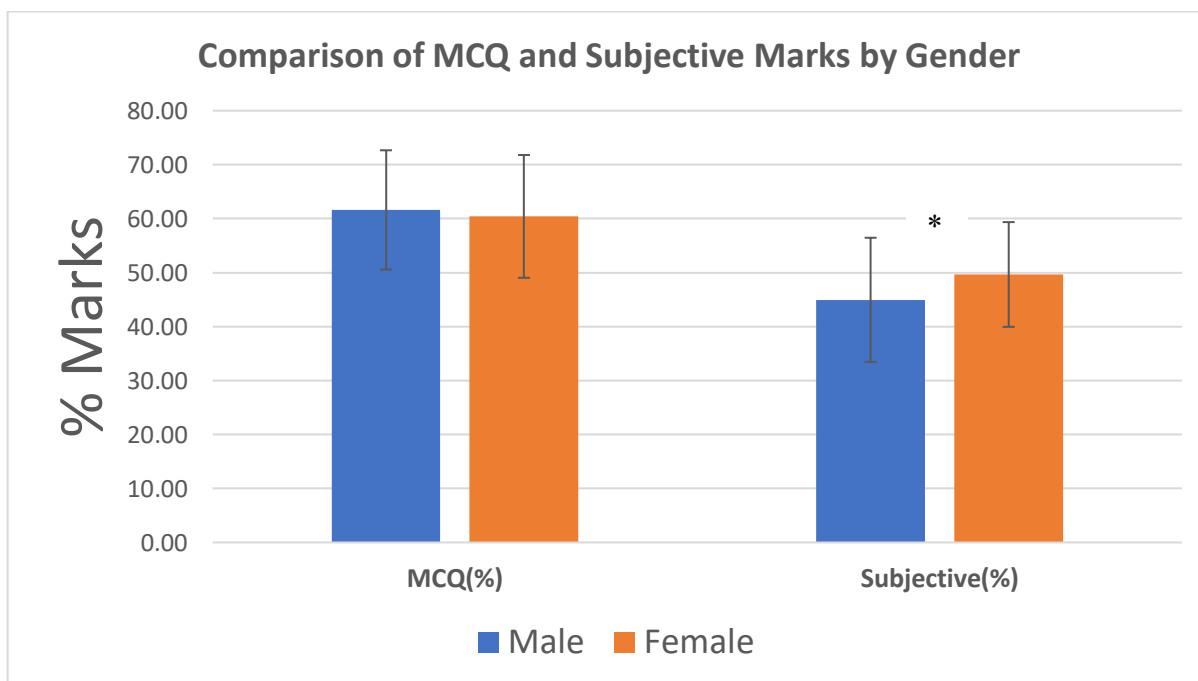


Fig 2: Comparison of MCQ and subjective percentage marks in Male and Female students, female students have significantly higher subjective marks(p<0.001)

% Marks	Males(n=141)	Females(n=158)	p value
MCQ	61.61% ±11.05	60.41% ±11.37	0.356
Subjective	44.95% ±11.50	49.65% ±9.70	<0.001*

*Statistically significant

Table 1: Comparison of MCQ and subjective marks in Male and Female students

Pearson’s Correlation	Total students(n=299) r value	p value
MCQ vs. Subjective	0.482	<0.001*

*Statistically significant

Table 2: Correlation of MCQ and subjective marks in all students