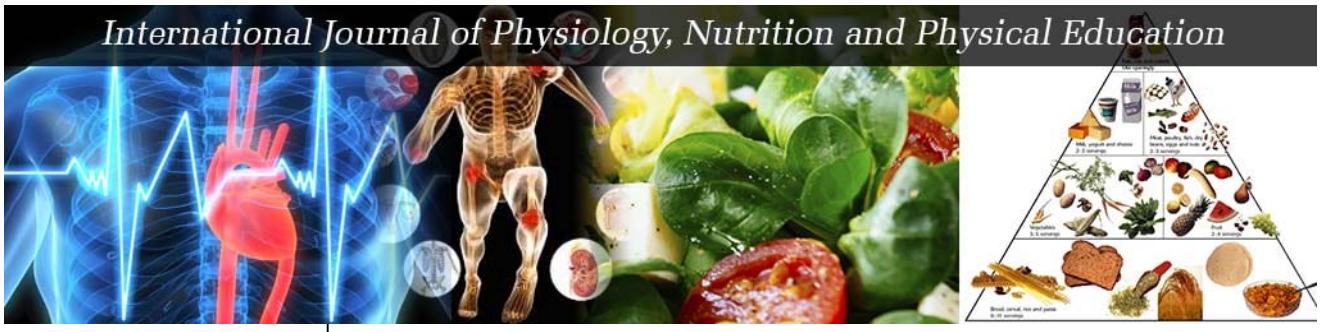

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Gender differences in student scores in objective structured practical examination (OSPE) on measurement of blood pressure in clinical physiology

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Abstract
This complete enumeration, cross-sectional comparative study was conducted in the Physiology Department of a medical college in Maharashtra to determine the gender differences in scores obtained by students in objective structured practical examination on measurement of blood pressure. First-year MBBS students (n=61; 52.46% females and 47.54% males), who had prior exposure to traditional practical examination on the same topic, rotated through a procedure station and question station. The results of the study revealed that the gender differences in average scores were not significant (*P*=0.065) at the procedure station that assessed the psychomotor domain. However, female students obtained significantly (*P*=0.041) higher average scores at the question station that chiefly evaluated the cognitive domain. This implied deficit of knowledge (cognitive domain) among male students, as compared to their female counterparts.

Keywords: Gender, OSPE, blood pressure, physiology

Introduction
The Objective Structured Practical Examination (OSPE), a modification of Objective Structured Clinical Examination (OSCE), was first described by Harden *et al* [1] from the University of Dundee, Scotland in 1975 and further developed in 1979. [2] OSPE was first introduced in India as a teaching and evaluation tool and standardized in 1986 by Nayar *et al* to assess the practical skills of students in Physiology. [3] The OSPE involves appraisal of the student by direct observation of the student's performance in a flexible examination setting comprising laboratory stations [4].

In 1990, psychologist George Miller proposed a framework for assessing levels of clinical competence and described four levels – "knows", "knows how", "shows how", and "does". [5] The traditional practical examination is subjective and principally examines the cognitive (knowledge) component viz. "knows" and "knows how" aspects while the OSPE also evaluates the psychomotor (competence) component - the "shows how" level. Student performance has to be assessed across a range of situations to ensure a reliable skill-based evaluation [4].

The OSPE evaluates a range of competencies, [6, 7] measures practical psychomotor skills, eliminates subjectivity [6] and examiner bias, [8] reduces total time for practical examination, enables uniformity in student assessment, decreases stress levels among students, [9] has a wider discrimination index and helps students to grasp various components of competencies and also obtain feedback [10].

The barriers to use of OSPE include its labour-intensive nature, difficulties in maintaining identical difficulty levels, and observer fatigue [11]. Despite these limitations, OSPE brings about a change for the better in student assessment [6] Currently, OSPE has been introduced in select Indian universities [6, 9]. However, till date, OSPE has not yet been used as an evaluation tool during MBBS practical examinations in Maharashtra State since it is not yet recommended as an evaluation tool by the Maharashtra University of Health Sciences.

Measurement of blood pressure was selected for OSPE in the present study because this is

classified in the "must know" segment of the first-year MBBS curriculum in Physiology. Moreover, measurement of blood pressure tests the psychomotor skills of the student. The objective of the present study was to determine the gender differences in scores obtained by students in OSPE.

2. Materials and Methods

2.1 Study setting: This complete enumeration, cross-sectional comparative study was conducted at Rajiv Gandhi Medical College, Kalwa, Thane, located about 30 kms from Mumbai, Maharashtra state, India.

2.2 Inclusion criteria: All first-year MBBS students, aged 18 years and above, of either sex, who gave written informed consent to participate in the study.

2.3 Exclusion criteria: Students who did not give written informed consent.

2.4 Procedure: After obtaining permissions from the Institutional Ethics Committee (IEC) and institutional authorities for conducting the study, the purpose of the study was explained to first-year MBBS students and written informed consent was obtained from those willing to participate in the study. All the participants had prior exposure to traditional practical examination on measurement of blood pressure. Each participant moved across a procedure station and question station.

2.5 Procedure station: The students measured the systolic and diastolic blood pressure at this station. The allotted time was 5 min. The observer in the procedure station, who was provided with a pre-validated 10-step checklist, appraised the students while they performed the procedure and awarded one mark for each correct step.

2.6 Question station: A pre-validated multiple choice questionnaire, comprising 10 questions, was answered by the student at this station. The allotted time was 5 min.

2.7 Pre-validation: Pre-validation of the 10-step checklist and the multiple choice questionnaire was done by university-approved senior teachers.

2.8 Statistical analysis: The data were statistically analyzed using EpiInfo Version 7.0 (public domain software package from the Centers for Disease Control and Prevention, Atlanta, GA, USA). Categorical data were presented as percentages and continuous data as Mean and Standard Deviation (SD). 95% Confidence interval (CI) was stated as: [Mean-(1.96)* Standard Error)] - [Mean+(1.96)* Standard Error)]. Karl Pearson's Chi-square test with Mantel-Haenszel correction (where required) was used. The standard error of difference between two means was calculated. Statistical significance was determined at $P<0.05$.

3. Results and Discussion

A total of 61 students (females: n=32; 52.46% and males: n=29; 47.54%) participated.

3.1 Gender differences in scores obtained at the procedure station: The average score (out of 10) obtained by female students (n=32) at the procedure station was 8.56 ± 0.84 (95% CI: 8.27-8.85), while that for male students (n=29) was 8.93 ± 0.73 (95% CI: 8.65-9.20). The gender difference between the mean scores at the procedure station was not significant (Z=1.84; P=0.065). However, in the step-wise scores, the gender-difference was significant (P=0.047) only for the 5th step (feeling for the pulsations of the brachial artery), wherein female students considerably outscored their male counterparts. (Table 1)

Table 1: Gender differences in scores obtained at the Procedure Station

Step	Procedure expected	Females (n=32)	Males (n=29)	Chi square value #	*P* value	Odds Ratio
1	Explains about measurement of BP; requests supine or sitting position, allows for physical rest	07	03	1.451	0.228	2.427
2	Checks BP apparatus & stethoscope, exposes upper arm	24	21	0.053	0.819	1.143
3	Wraps cuff firmly with middle of cuff above brachial artery; ensures support to entire upper limb	16	10	0.033	0.856	0.9
4	Places BP apparatus at level of subject's heart	11	11	0.083	0.772	0.857
5	Feels for pulsations of brachial artery	18	09	3.921	0.047 *	2.857
6	Places ear piece of stethoscope in direction of external auditory canals	09	10	0.287	0.592	0.744
7	Checks stethoscope by lightly tapping diaphragm of stethoscope	18	13	0.794	0.373	1.582
8	Measures and records systolic BP by palpatory method in mm Hg	20	19	0.060	0.806	0.877
9	Inflates the cuff rapidly above systolic BP reading obtained in Step 8	18	15	0.126	0.723	1.2
10	Measures and records the systolic and diastolic BP by auscultatory method in mm Hg	09	03	2.994	0.084	3.391

Karl Pearsons's Chi square test with Mantel-Haenszel correction where required; * Statistically significant

Though the maximum (10), third quartile (9) and minimum (6) scores in the box plot (Fig. 1) are identical for both sexes, the first quartile (8) score for females has merged with the median (8) indicating higher scores for females. Though the gender difference between the mean scores at the procedure station was not statistically significant, the first quartile score for males was lower (7).

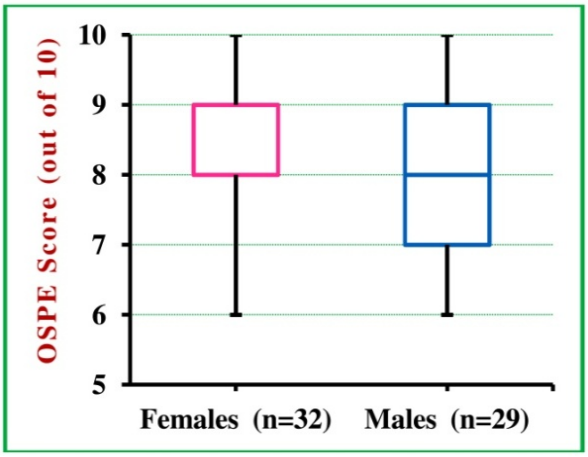

Fig 1: Box plot of OSPE scores obtained at the Procedure Station

3.2. Gender differences in scores obtained at the question station: The average correct responses (out of 10) for female students (n=32) was 4.69±1.51 (95% CI: 4.14-5.21) while that for male students (n=29) was 3.93±1.39 (95% CI: 3.43-4.44). When the average correct responses at the question station were considered, the gender difference was significant (Z=2.04; *P*=0.041). In the question-wise scores, though female students obtained higher scores in most questions, the gender-difference was statistically significant (*P*=0.044) only for one question. (Table 2)

Table 2: Gender differences in mean question-wise scores obtained at the Question Station

Q. No.	Females (n=32)	Males (n=29)	Z value #	p value
	Mean ± SD	Mean ± SD		
1	0.22 ± 0.42	0.10 ± 0.31	1.277	0.200
2	0.75 ± 0.44	0.72 ± 0.45	0.263	0.794
3	0.50 ± 0.51	0.34 ± 0.48	1.262	0.207
4	0.34 ± 0.48	0.38 ± 0.49	0.322	0.749
5	0.56 ± 0.50	0.31 ± 0.47	2.013	0.044 *
6	0.28 ± 0.46	0.34 ± 0.48	0.497	0.617
7	0.56 ± 0.50	0.45 ± 0.51	0.849	0.395
8	0.63 ± 0.49	0.66 ± 0.48	0.241	0.810
9	0.56 ± 0.50	0.52 ± 0.51	0.309	0.756
10	0.28 ± 0.46	0.10 ± 0.31	1.807	0.070

SD = Standard deviation; # Standard error of difference between means; * Statistically significant

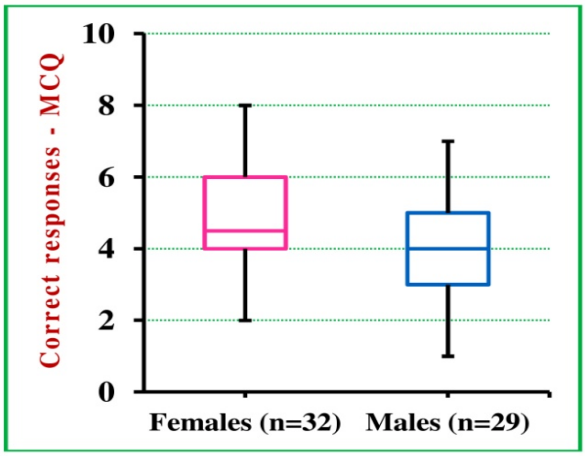

Fig 2: Box plot of scores obtained at the Question Station

The maximum, third quartile, median, first quartile and minimum scores of female students were higher than that for their male counterparts. (Fig. 2)

Other studies [12-17] from varied geographical areas have also reported that female students performed significantly better, as compared to male students. In contrast, a study [18] from Belgaum, Karnataka reported that there was no significant (*P*=0.115) gender difference in OSPE scores.

3.3. Limitations: The present study was conducted on only one batch of 61 first-year MBBS students. A larger study would be necessary in order to generalize the interpretation of results.

4. Conclusion

The results of the study revealed that the female students obtained significantly higher average scores at the question station (that primarily evaluated cognitive domain at the "knows" and "knows how" levels) but the gender differences in average scores were not significant at the procedure station (that assessed the psychomotor domain at the "shows how" level of Miller's Pyramid). This implied deficit of knowledge (cognitive domain) among male students, as compared to their female counterparts.

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