

Comparative Analysis of Students' Scores: Objective Structured Practical Examination Versus Traditional Practical Examination in Physiology

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Abstract: A cross-sectional comparative study was conducted at Rajiv Gandhi Medical College, Kalwa, Thane, in Maharashtra state, India on 61 first-year MBBS students to compare the scores obtained by students in Objective Structured Practical Examination (OSPE) with that obtained in Traditional Practical Examination (TPE). In the TPE, each student performed red blood cell count, which was followed by viva-voce on the same procedure and marks out of 30 were assigned by the examiners. Students were oriented regarding OSPE and the marking system. At the "procedure station" of the OSPE (maximum marks = 20), the examiners were provided with a pre-validated checklist containing 10 steps for performing red blood cell count within an allotted time of 10 minutes. Two marks were given for correct performance of each step mentioned in the checklist. At the "question station" (maximum marks = 10), students had to write answers to 10 short-answer type questions carrying one mark each. The total marks obtainable during OSPE were out of 30. The mean OSPE score was 23 +/- 2.41 (95% CI: 22.40 – 23.60) while that for TPE was 17 +/- 3.58 (95% CI: 16.10 – 17.90). The difference in the mean OSPE and TPE scores was highly significant ($Z=10.859$; $p<0.00001$). The gender difference in TPE scores was statistically significant ($p=0.017$) but that in mean OSPE scores was not significant. Although the stations where most students committed identical mistakes were noted and feedback regarding their performance was given, extra training may be required for few students with lower scores. Periodically conducted faculty development programmes would assist in creating a pre-validated OSPE question bank.

Keywords: OSPE, Physiology, RBC Count, Traditional practical examination.

INTRODUCTION

The traditional practical examination (TPE) has multiple drawbacks. Ideally, the student scores exclusively reflect the variability in student performance. However, in TPE, the variations in the experiment and examiner subjectivity also influence scoring [1]. The marks awarded in TPE reveal only the overall performance of the student and are not based on demonstration of individual competencies, communication skills, or attitudes [1].

The learning behaviour of students is driven by the method of assessment [2,3] and changes in the student evaluation method can alter learning behaviour [4]. Student evaluation methods have their own advantages, disadvantages, and worth, based on the situation, relevance and the available resources [5]. At present, there is no "gold standard" [6] or single pattern of examination that can evaluate students on the basis of their knowledge, comprehension, psychomotor skills, communication skills and attitudes [7].

The Objective Structured Practical Examination (OSPE) consists of several stations that should be synchronously completed (about 4-5 minutes each). The students move to the next station when a signal is given and should rotate through all stations in a pre-determined sequence. Often, the stations are independent and the students can start at any of the stations and complete the cycle. Each station is designed to test a component of competence. At "procedure stations", students are asked to perform tasks. At "question stations", students respond to questions or record their findings of the previous procedure station. Observers with pre-validated check lists are deployed at all stations to score the student's performance [1].

First described by Harden *et al.* [8] from the University of Dundee, Scotland in 1975, the OSPE has undergone subsequent improvements [9,10]. 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 [11,12]. OSPE is currently conducted as a formative examination in select Indian medical colleges [13] and has been introduced as summative assessment in a small number of Indian universities [14,15]. Since OSPE is not yet authorized by the Maharashtra University of Health Sciences, OSPE has not yet been used as a routine evaluation tool during MBBS practical examinations in Maharashtra State.

The OSPE appraises a assortment of competencies [14,16], measures practical psychomotor skills, enables uniformity in student assessment, decreases stress levels among students [15], eliminates subjectivity [14] and examiner bias [17], reduces total time for practical examination, has a broader discrimination index and high reliability [18] and helps students to understand several elements of competencies and also to take feedback [7]. Use of computer-assisted OSPE (COSPE) that expedited the evaluation process has been described [19]. The hurdles in using OSPE include its labour-intensive nature, snags in maintaining identical difficulty levels, and observer fatigue [13]. Despite these shortcomings, OSPE has led to an improvement in student assessment [14].

Practical examination on red blood cell count was selected for this comparative study since it is in the “must know” category during the first-year MBBS course. The objective of the present study was to compare the scores obtained by students in Objective Structured Practical Examination (OSPE) with that obtained in Traditional Practical Examination (TPE) in red blood cell count.

MATERIALS AND METHODS

This complete enumeration, cross-sectional comparative study was conducted at Rajiv Gandhi Medical College, Kalwa, Thane, in Maharashtra state, India. After obtaining permissions from the Institutional Ethics Committee (IEC), the study objectives and the OSPE procedure was explained to first-year MBBS students and written informed consent was taken from willing participants. In the TPE, each student performed red blood cell count, which was followed by viva-voce on the same procedure and overall marks (out of 30) were assigned by the examiners. Before conducting OSPE, students were oriented regarding OSPE and the checklist-based marking system. At the “procedure station” of the OSPE, the examiners were provided with a pre-validated checklist containing the below-mentioned 10 steps for performing red blood cell (RBC) count within an allotted time of 10 minutes –

1. Selecting RBC pipette correctly
2. After aseptic finger prick, sucking blood up to 0.5 mark and wiping the tip of the pipette
3. Sucking the diluting fluid up to 101 mark (with no air bubble)
4. Mixing the contents of the pipette thoroughly and placing it horizontally on the table
5. Cleaning the Neubauer's Chamber and placing the cover slip on the central platform of the Chamber
6. Discarding the first two drops of fluid from the pipette
7. Placing the tip of the pipette on the surface of the Chamber
8. Allowing the diluted blood to spread by capillary action
9. Calculating the total RBC count using microscope (under correct magnification)
10. Cleaning the laboratory table and returning the cleaned RBC pipette

Two marks were given for correct performance of each step mentioned in the checklist (maximum marks for “procedure station” = 20). After the “procedure station”, the students moved to the “question station” wherein they had to write answers to 10 short-answer type questions carrying one mark each within an allotted time of 10 minutes (maximum marks for “question station” = 10). The marks obtained at “procedure” and “question” stations were added. The total marks obtainable during OSPE were out of 30.

The data were entered in Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and were statistically analyzed using EpiInfo Version 7.0 (public domain software package from the Centers for Disease Control and Prevention, Atlanta, GA, USA). Mean, Standard Deviation (SD) and standard error of difference between two means (Z) were calculated for continuous data. The 95% Confidence interval (CI) was stated as: [Mean-(1.96)* Standard Error] - [Mean+(1.96)* Standard Error]. The statistical significance was determined at $p < 0.05$.

RESULTS AND DISCUSSION

A total of 61 students (28 females; 45.90% and 33 males; 54.10%) participated in the study. Out of a maximum score of 30, the overall mean OSPE score was 23 ± 2.41 (95% CI: 22.40 – 23.60) while that for TPE was 17 ± 3.58 (95% CI: 16.10 – 17.90). The difference in the overall mean OSPE and TPE scores was highly significant ($Z=10.859$; $p < 0.00001$).

Table-1: Gender-wise mean scores (out of 30)

Parameters	OSPE		TPE	
	Females (n=28)	Males (n=33)	Females (n=28)	Males (n=33)
Mean	23	22	18	16
SD	2.14	2.61	2.46	4.04
95% CI	22.21 - 23.79	21.11 - 22.89	17.09 - 18.91	14.62 - 17.38
Z value	1.644		2.372	
P value	0.101		0.017 *	

SD = Standard deviation; CI = Confidence Interval; TPE = Traditional Practical Examination
 OSPE = Objective Structured Practical Examination; Z = Standard error of difference between two means
 *Statistically significant

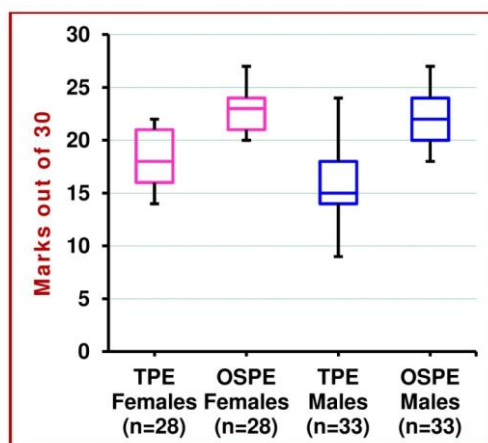


Fig-1: Boxplot of scores obtained in TPE and OSPE

TPE = Traditional Practical Examination; OSPE = Objective Structured Practical Examination

The maximum and third quartile scores in OSPE were nearly identical for both males and females (Fig. 1). However, in TPE, the female students obtained higher third quartile, median, first quartile and minimum scores (Fig. 1). The gender difference in TPE scores was statistically significant ($p=0.017$) but that in mean OSPE scores was not significant. (Table-1) The higher scores of female students in TPE in the present study may be ascribed to the non-standardized nature of questions in a TPE [20]. The TPE, being subjective, evaluates only the “knows” and “knows how” (the base of Miller’s Pyramid) whereas the OSPE focuses on evaluating the performance of particular skills (“shows how” and “does” - the higher levels of Miller’s Pyramid) [14,18]. Though one study [21] has corroborated the findings of the present study by reporting lack of significant gender difference in OSPE scores, other studies [22-25] have found that female students performed significantly better, as compared to their male counterparts.

CONCLUSION

The difference in the overall mean TPE and OSPE scores was highly significant. The gender differences in mean OSPE scores were not significant while that for TPE were significant. Although the stations where most students committed similar mistakes were noted and feedback regarding their

performance was given, extra training may be required for few students with lower scores. The present study also drew attention to the need for recurrent faculty development programmes for creating a pre-validated OSPE question bank. A larger study would be needed in order to generalize the results.

REFERENCES

1. Ananthakrishnan, N. (1993). Objective structured clinical/practical examination (OSCE/OSPE). *Journal of Postgraduate Medicine*, 39(2), 82-84.
2. Pierre, R. B., Wierenga, A., Barton, M., Branday, J. M., & Christie, C. (2004). Student evaluation of an OSCE in pediatric at the University of the West Indies, Jamaica. *BMC Medical Education*, 4(22), 1-7.
3. A-Latif, A. (1992). An examination of the examinations: the reliability of the objective structured clinical examination and clinical examination. *Medical Teacher*, 14(2-3), 179-183.
4. Hilliard, R. I., & Tallett, S. E. (1998). The use of an objective structured clinical examination with postgraduate residents in Pediatrics. *Archives of Pediatrics and Adolescent Medicine*, 152(1), 74-78.
5. McLeod, P. J., Cuello, C., Capek, R., & Collier, B. (1996). A multidimensional evaluation system

- in a basic science course in medicine. *Medical Teacher*, 18(1), 19-22.
6. Collins, J.P., & Gamble, G.D. (1996). A multiformat interdisciplinary final examination. *Medical Education*, 30(4), 259-265.
7. Abraham, R. R., Rao, R., Kamath, S., & Kamath, A. (2009). A trial of the objective structured practical examination in physiology at Melaka Manipal Medical College, India. *Advances in Physiology Education*, 33(1), 21-23.
8. Harden, R. M., Stevenson, M., Downie, W. W., and Wilson, G. M. (1975). Assessment of clinical competencies using objective structured clinical examination. *British Medical Journal*, 1(5955), 447-451.
9. Harden, R. M. (1979). How to assess clinical competence: An overview. *Medical Teacher*, 1(8), 289-296.
10. Harden, R. M., & Gleeson, F. A. (1979). ASME Medical Education Booklet No. 8: Assessment of clinical competence using an objective structured clinical examination. *Medical Education*, 13, 41-54.
11. Nayar, U. (1983). Objective structured practical examination. In R.L. Bijlani, & U. Nayar (Eds.) *Teaching Physiology, Trends and Tools* (pp. 151-159). New Delhi: All India Institute of Medical Sciences.
12. Nayar, U., Malik, S. L., & Bijlani, R. L. (1986). Objective structured practical examination: A new concept in assessment of laboratory exercises in preclinical sciences. *Medical Education*, 20(3), 204-209.
13. Gupta, P., Dewan, P., & Singh, T. (2010). Objective Structured Clinical Examination (OSCE) Revisited. *Medical Education*, 47(11), 911-920.
14. Miller, G. E. (1990). The assessment of clinical skills/competence/performance. *Academic Medicine*, 65 (9 Suppl), S63-S67.
15. Kundu, D., Das, H. N., Sen, G., Osta, M., Mandal, T., & Gautam, D. (2013). Objective structured practical examination in Biochemistry: An experience in Medical College, Kolkata. *Journal of Natural Science, Biology and Medicine*, 4(1), 103-107.
16. Charles, J., Janagond, A., Thilagavathy, Rajendran, Ramesh, & Vidhya. (2016). Evaluation by OSPE (Objective Structured Practical Examination) – A good tool for assessment of medical undergraduates – A study report from Velammal Medical College, Madurai, Tamilnadu, India. *IOSR-JRME*, 6(3), 1-6.
17. Reznick, R. K., Smee, S., Baumber, J. S., Cohen, R., Rothman, A., Blackmore, D., et al. (1993). Guidelines for estimating the real cost of an objective structured clinical examination. *Academic Medicine*, 68(7), 513-517.
18. Byrne, E., & Smyth, S. (2008). Lecturers' experiences and perspectives of using an objective structured clinical examination. *Nurse Education in Practice*, 8(4), 283-289.
19. Torke, S., Upadhya, S., Abraham, R. R., & Ramnarayan K. (2006). Computer-Assisted Objective-Structured Practical Examination: An innovative method of evaluation. *Advances in Physiology Education*, 30(1), 48-49.
20. Vijaya, D. S., & Alan, S. (2014). A Comparative Study to Evaluate Practical Skills in Physiology Among 1st Phase Medical Under Graduates At Jnmc Belgaum: Traditional Practical Examinations Versus Objective Structure Practical Examinations (TPE V/S OSPE). *Int J Educat Res. Technol*, 5(1), 126-134.
21. Dissanayake, A. S., Ali, B. A., & Nayar, U. (1990). The influence of the introduction of objective structured practical examinations in physiology on student performance at King Faisal University Medical School. *Medical Teacher*, 12(3-4):297-304.
22. Petko, P., Knuth-Herzig, K., Hoefer, S., Stehle, S., Scherer, S., Steffen, B., ... & Gerhardt-Szép, S. (2017). The reliability and predictive validity of a sixth-semester OSPE in conservative dentistry regarding performance on the state examination. *GMS journal for medical education*, 34(1).
23. Jacques, L., Kaljo, K., Treat, R., Davis, J., Farez, R., & Lund, M. (2016). Intersecting gender, evaluations, and examinations: Averting gender bias in an obstetrics and gynecology clerkship in the United States. *Education for Health*, 29(1), 25.
24. Sagoo, M. G., Smith, C. F., & Gosden, E. (2006). Assessment of anatomical knowledge by practical examinations: The effect of question design on student performance. *Anatomical Sciences Education*, 9(5), 446-452.
25. Trivedi, R. S., Diwan, J. S., Shah, C. J., Jani, R. D., & Anand, A. K. (2014). The influence of objectively structured practical examination (OSPE) on scoring pattern. *International Journal of Biomedical Advance Research*, 5(2), 87-89.