



Original Article

International Journal of Educational Research and Technology

P-ISSN 0976-4089; E-ISSN 2277-1557

IJERT: Volume 5 [1] March 2014: 126-134

© All Rights Reserved Society of Education, India

ISO 9001: 2008 Certified Organization

Website: www.soeagra.com/ijert/ijert.htm

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)

¹Dandannavar Vijaya S., ²Schwartz Alan

¹Department of Physiology, Jawaharlal Nehru Medical College, Belgaum – 590 010.

²Professor and Associate Head, Department of Medical Education, Research Professor, UIC, Department of Pediatrics (UIC-DME Advisor)

CONSTRUCT

Assessment should measure cognitive, learning mastery of essential practical skills and the ability to communicate effectively while using data in both thinking and problem solving processes.¹ Evaluation should be fair, specific and documented. Students need to know very clearly, the specific objectives by which they are being evaluated and one type of assessment which meets this criteria is a performance based assessment.² Miller described a framework for the development of clinical competence which outline four levels at which a learner can be assessed that is, knows, knows how shows how and does.

OSCE/OSPE confirms to the third level of shows how level of Miller's pyramid which focuses on assessment of performance of specific skills in a controlled setting.²

In OSPE procedures are standardized so objectivity is ensured and also maximizes reliability in assessment.³ OSPE is a modification of Objective Structured Clinical Examination (OSCE) which consists of number of stations usually connected in series. This tool evaluates a set of predetermined clinical competencies where in each competency is broken down into smaller compartments like history taking, performing clinical examination, communicating, interpretation etc. In turn, each component is assessed and marks are allotted according to predetermined checklists.⁴

The term OSPE is derived from OSCE. In 1975 Harden and Gleeson modified OSCE and extended to practical examination. OSCE is a method of assessment of skills of medical students in clinical settings whereas OSPE is a method of assessment of skills of medical students in para clinical settings. OSPE is being increasingly used not only in developing world but also in the developing countries like India due to the benefits like objectivity and reliability.⁵ This method of assessment is an approach in which clinical competencies are evaluated in a comprehensive consistent and structured manner with close attention to the objectivity of the process⁶ and is widely accepted tool for measuring clinical skills with a high degree of technical fidelity.²

This type of student evaluation is useful to assess the Knowledge, Skills and Attitudes. Every assessment method possesses its own merits and demerits and each has a place depending on the context, relevance and resources.⁷ The mode of assessment influences the learning style of student,⁸ and type of learning activity in which the students are engaged is primarily determined by the type of assessment used.⁹ A change in the assessment procedure can result in a change in learning behaviour.¹⁰

OSPE is used as an objective tool for assessment of laboratory exercises because of its high reliability.² Students have differing strength and weaknesses and each components tests different aspects of knowledge, understanding and abilities.¹¹

Purpose or goal of resource (Objectives)

- To provide a more uniform and reliable tool for assessing students practical knowledge of physiology that will be perceived as acceptable and valid both by students and faculty.
- To develop competency based discriminatory assessment method for physiology practical examinations.
- To evaluate competency of OSPE compared to TPE in assessment of practical skills.

CONCEPTUAL BACKGROUND

Clinical competence has three components viz knowledge, skill and attitudes. All the three components

need to be assessed. Assessment should measure cognitive, learning mastery of essential practical skills and the ability to communicate effectively while using data in both thinking and problem solving processes.¹

Assessment tools commonly employed in for medical first year undergraduates in India include 1). Theory paper – long essay, short essay short essay; short answer type of question and multiple choice questions (Knowledge is assessed by theory and two practicals) which consists of actual performance of four experiments in the form of long and short cases (each a case of Haematology major, Haematology minor, human and clinical practical examination, interpretation of graphs, charts and problem solving) viva-voce.

The major drawback of traditional practical examination is that;

1. Reliability
 - a. Inter-rater reliability: Many variables are operating together like examiner variability, patient variability, disease and student variability. The examiners who are there to assess students have their own personal preferences, prejudices and their own questions which are not standardized. The end point of such questions are not clearly defined and it has been observed that, very frequently post graduate questions are asked to the undergraduates. By the end of the day examiner fatigue takes its toll, inter-rater reliability is poor, there is poor agreement between examiners about marks to be awarded to the same student.
 - b. Inter-case reliability: The element of luck plays an important role in deciding the fate of students. Lottery method is adopted for allotting cases to the students, so some may get easy while some of them may have difficult ones. Therefore there is high variability in student rating. There may be substantial variation of the same student across different places and therefore the inter-case reliability is poor.
 - c. Inter-patient reliability: Patient behavior may also vary. By the end of the day a co-operative patient may turn to become non co-operative.
 - d. Internal examiners have equal say in the assessment and this result in both construct under representation and construct irrelevant variance due to differences in the type and degree of content that tested from student to student.
2. Validity: The practical examinations that are conducted are meant for assessing clinical skills, communication skills and attitudes. Assessment is an important component of education and each learning objective belongs to specific domain of learning and will need to be measured and assessed to determine if they have successfully learnt. Assessment has powerful influence on learning and evaluation system has profound impact on what students what ultimately learn. This type of traditional practical examination ends up assessing the knowledge, that is a case is assigned to the student and after a stipulated time the student presents the case to examiner. Based on the presentation and subsequent questions and answers marks are awarded to the students. The actual technique of history taking (communication skills) and eliciting the physical signs remains unobserved. Therefore the validity of the current tool of clinical examination is poor and does not measure what it should have measured and what it was intended to measure.

Realizing the inadequacy of the traditional practical examinations the objective structured practical examinations is being widely used in many medical schools because of its objectivity and reliability over traditional practical examinations.⁵

Objective structured practical examination can be a reliable tool with good capacity to differentiate between different categories of student. It is uniform and a fair method of assessment as there is uniformity of questions and in scoring students. Individual competencies are tested (clinical skills and attitudes). Attitude towards learning and communication skills are tested and also improved the quality of students performance in laboratory exercises.

TARGET POPULATION

This comparative study was done in the Department of Physiology, Jawaharlal Nehru Medical College, Belgaum on 200 first phase medical under graduates studying in academic year 2011-12 at Jawaharlal Nehru Medical College, Belgaum. Students not willing to participate and undergoing only one examination that is, OSPE or TPE were excluded from the study.

The ethical clearance for the study was obtained from Institutional Ethics Committee, Jawaharlal Nehru Medical College, Belgaum. After obtaining the written informed consent the student were enrolled for the study.

TYPE OF ASSESSMENT INSTRUMENT

The effectiveness of OSPE in comparison with TPE was done by comparing the performance scores. Assessment, analysis of student evaluation, perception of validity and reliability of OSPE, and faculty perspectives about OSPE was done by feedback through self administered paper based questionnaire.

Implementation

Present pattern of assessment includes for first year medical undergraduates three internals and one final assessment. Students are made aware of the OSPE but is not routinely practiced as a method of formative assessment and more weightage is given to TPE.

Blue print of OSPE stations was an important process. Test contents were planned against learning objectives.⁵ Formulation of question for each station, model keys and checklists for each station were prepared. Blue printing ensured a representative sample of what the student is expected to achieve. It was essential for getting a higher construct validity for OSPE. This was achieved by defining the problems which the student encountered and tasks within the problem which he was expected to perform. Competencies were tested in a grid. The correct balance between different domains of skill were tested and obtained. Content validity was thus ensured wherein each test was standardized and itemization of it component was done using appropriate scoring checklist (Table 1 and 2).

Standards for passing OSPE were setup by using borderline approach¹² wherein observer scored each examinee at each station according to a standardized checklist and then gave a global rating for each student's overall performance. Student was rated as pass / borderline / fail or above expected standard. To have valid and reliable pass marks and also to increase the reliability of this OSPE, all the expert judges were subject experts and several examiners examined at each station. Objectivity of OSPE, was determined by the skill of subject experts who were involved in preparing OSPE stations and checklists. Validity was ensured by proper blue printing.⁶ Each task were standardized and itemized for its components using approach scoring checklist. Feedback from the examiners (observer) and the students further helped in improving validity.

Regarding implementation of OSPE in the department for faculty was done by discussion with the head of the department in detail about new method of practical assessment and its implementation procedure. Arranged for a faculty development meeting, within department for orientation and this newer method of student assessment by OSPE was briefed to all faculty members. All faculty members were involved in preparation of the checklists and standardized viva-cards and blue print of OSPE. Feedback was taken from them and worked on the stations accordingly. Menial staff like laboratory technicians, Class IV workers were taken into confidence and ensured that how important they were to us in the process.

After seeking permission from Head of the Department, orientation programme for OSPE was arranged for students, consisting MOCK test. It was done for three consecutive days where students were divided into three batches (Batch A and B [n=65 each]; and C [n=70]). It was done for the duration of three hours each consisting of orientation for one hour where the students were detailed about the procedure, stations, time, OSPE grids, instruction and other details of OSPE were given. In the next one hour ten stations were arranged of which three procedure, four were problem and three were rest stations. Ten students were randomly picked and made to undergo OSPE examination. With five minutes duration for each station the entire process was completed in 50 minutes. In the last one hour active discussion was done with students to address the difficulties encountered, mistakes were highlighted and how to prevent them were also discussed.

Currently in our set-up the first year medical curriculum is divided into four terms of three months each. At the end of each term, students undertake two examinations one in theory and the other in practical. Hence we assessed the students by OSPE at the end of the first block as formative assessment and students underwent the routine TPE at the end of second block as formative assessment.

Development

Pierre *et al.*⁸ (2004) OSCE evaluation questionnaire was adapted in this study. This consists of 32 items grouped into four sections. For the purpose of this study, 27 items of Pierre *et al.*⁸ questionnaire were used. The questionnaire used in the current study consists of three main sections viz. student feedback, evaluation and perception of validity and reliability of OSPE, and faculty perspectives and feedback about OSPE. First section assessed students feedback about OSPE. Students were asked to rate their responses for eight items on three point Lickert's scale ranging 'Not at all', 'Neutral' and 'To great extent'. Section Two looked at students evaluation of OSCE performance which comprised of 13 items. Students were asked to rate their responses on four point Lickert's scale ranging 'Agree', 'Neutral', 'Disagree' and 'No comment'. Section Three comprising of six items were assessed for perception of validity and reliability of OSPE on three point Lickert's scale ranging 'Not at all', 'Neutral' and 'To great extent'. Faculties gave their perspective regarding OSPE on 13 items five point Lickert's scale questionnaire ranging from 'Strongly

agree', 'Agree', 'No opinion', 'Disagree', and 'Strongly Disagree'. Their feedback about OSPE was collected on 13 items based on 'yes' or 'no' criteria. Alpha Cronbach test was used to test the reliability of the questionnaire. Alpha score for the questionnaire (sections 1, 2 and 3) was 0.79 which indicates that the tool is reliable.

Validity

Of the 200 students five and two were absent for OSPE and TPE examination respectively hence were excluded from the study as they could not satisfy the selection criteria. A total of 195 student underwent OSPE which was conducted at the end of first term in the month of November 2011 according to the schedule as shown in Figure 1. All stations were prepared with experimental material. For each step marks were awarded. Observer checked the steps and gave marks using 15 station of five minute duration each. Procedure or observed (5); problem unobserved (5) and rest stations (5). Each station was designed to test a component of clinical competency; Procedure or observed station task were given to perform on themselves or on the simulated patients. Observers with agreed checklists to scored the students. At the problem station student responded to question of objective type; interpret data; recording finding etc. Since all the resources were available within the department, this method was feasible and carried out without any hindrance. The TPE was done in the month of February 2012. A total of 198 students underwent the TPE, which consisted of 25 students each day for consecutive eight working days in two batches of 13 and 12 who underwent the examination in morning and afternoon sessions.

Content

Of the 200 students only 196 have appeared for both traditional practical examination and OSPE (n=196). The mean TPE and OSPE scores are as shown in Table.

	TPE (n=197)	OSPE (n=198)
Mean	49.28	68.18
Standard deviation	14.89	13.48
Minimum	11	34
Maximum	89	92

Paired 't' test t= 17.278

DF=195

p<0.001

Wilcoxon signed Rank Test

Z=11.25

p<0.001

The mean OSPE scores were high compared to TPE (68.18 ± 13.48 vs 49.28 ± 14.89). Since both TPE and OSPE did not follow normal distribution non parametric test was used to make paired comparison between TPE and OSPE scores. This difference using paired 't' test and Wilcoxon Signed Rank test was statistically significant (p<0.001).

The mean of paired difference was 18.74 ± 15.18 and this difference was statistically significant with 95% C.I. for mean difference from 16.61 to 20.88.

OSPE score were positively correlated with TPE scores in clinical (r=0.291), human (r=0.286), HT Major (r=0.385), TPE HT Minor (r=0.463) and TPE Total (r=0.489). All of these were significantly higher than 0 at p<0.01. n=193 for all except n=192 for HT Major/Minor. The scatter plot shows the strong relationship between the OSPE and TPE scores.

There was no difference on OSPE scores by gender (male n=79, mean=33, SD=6.2; female n=116, mean=34, SD=7.2; unequal-variance t (183.1)=1.54, p=0.115) and TPE scores as well (Scatter plot graph 1).

The inter-item reliability for OSPE was α=0.67. Further the exploratory factor analysis showed correlation between the underlying factors one containing the problem station and the other containing the procedure stations.

The data set including faculty rater numbers were fitted in some mixed effects model using SAS 9.2 that is, one model on the TPE part-scores and other on OSPE procedure stations. In each, fixed effects were part/station (4 TPE sections or 5 OSPE procedures), student (200 levels), and rater (4 for TPE, 17 for OSPE). Rater was also a random effect within part/station, which controls for the clustering of scores within raters in each station. For both exams, there were main effects of part/station (OSPE F(4,18)=3.6, >p=.03; TPE F(3,7)=4.9, p=.04), and student (OSPE F(194,742)=2.4, p<.001; TPE F(196,580)=3.4, p<.001). Hence, the stations/parts were differently difficult/ scored, and students varied in their scores. Neither exam, however, showed an effect of rater (OSPE F (16,18)=1.7, p=.15; TPE F(2,7)=2.8, p=.14) suggesting that scores do not differ substantially by rater.

Student feedback, evaluation, perception, validity and reliability of OSPE was positive as shown in Table 3,4,5.

Table 1. OSPE Blue Print

Stations	Skill	Content	Assessment
1	Clinical skills (Abdominal examination)	Instruments Simulated patient	Observer
2	Problem solving	Data given - Chart	Interpretation
3	Rest		
4	Human practical skill oriented (Lung volume and capacities)	Instruments Simulated patient, graph paper	Observer
5	Identification of test done (ESR)	Instrument / Test already done charts with sub questions	Interpretation
6	Rest		
7	Haematology practical skill (RBC Count)	Blood sample / pricking apparatus / sterilization material, slides apparatus, test tubes, microscopes	Observer
8	Identification, Amphibian graphs	Charts with sub questions	Interpretation
9	Rest		
10	Clinical examination heart sounds	Simulated patient, clinical setting, instrument	Observer
11	Case history (Anaemia)	Problem Chart with sub questions	Interpretation
12	Rest		
13	Human practical (BP Recording)	Recording instrument, graph paper, scale	Observer
14	Problem solving (Identification of cells)	Chart with sub questions	Interpretation
15	Rest		

Table 2. OSPE domains

Station	Content and Task Area	Cognitive (Knowledge)	Psychomotor (Skills)	Attitude
1	Clinical; Abdominal examination	+	+++	++
2	Problem solving: A case scenario related to any system	+++		
3	REST			
4	Human: Recording lung volume and capacities	++	+++	
5	Problem solving (ESR) test done identification	+++		
6	REST			
7	Haematology: RBC Count	++		
8	Graph identification amphibian chart	++	+++	+++
9	REST			
10	Clinical: Auscultation of heart sounds	++	+++	+++
11	Problem: Haematology (Anemia)	++		
12	REST			
13	Human Practical: Recording of arterial BP	++	+++	+++
14	Problem solving: Identification of arterial BP	++	+++	++++
15	REST			

Table 3. Student feedback about OSPE

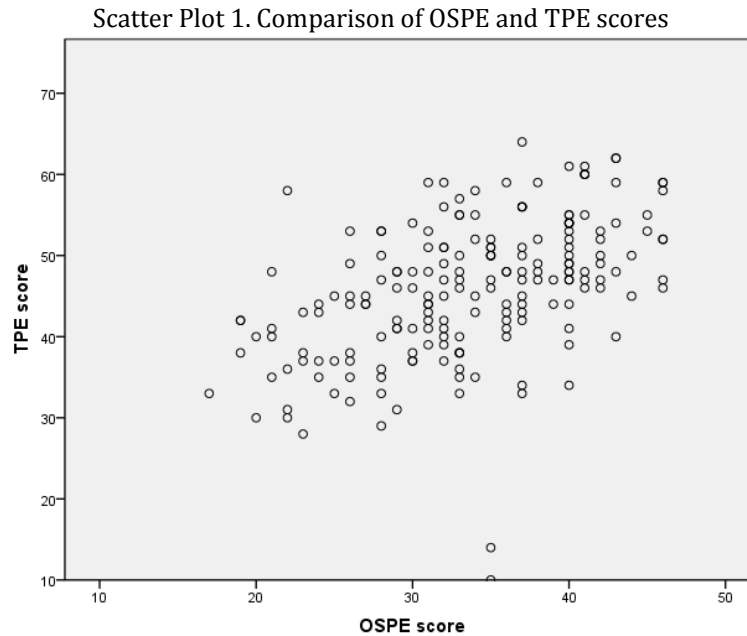
Questions	Not at all		Neutral		To great extent	
	No	%	No	%	No	%
Fully aware of nature of examination	4	2	62	31.3	132	66.7
Tasks reflected those taught	4	2	67	33.8	127	64.1
Time at each station was adequate	23	11.6	102	51.5	73	36.9
Setting and context at each station felt authentic	5	2.5	73	36.9	120	60.6
Instructions were clear and unambiguous	4	2	42	21.2	152	76.8
Tasks asked to perform were fair	6	3	43	21.7	149	75.3
Sequence of stations logical and appropriate	11	5.6	60	30.3	127	64.1
Examination provided opportunities to learn	13	6.6	52	26.3	133	67.2

Table 4. OSPE evaluation by students

	Agree		Neutral		Disagree		No comment	
	No	%	No	%	No	%	No	%
Examination was fair	160	80.8	33	16.7	1	0.5	3	1.5
Wide knowledge are covered	99	50.0	78	39.4	15	7.6	5	2.5
Needed more time at station	87	43.9	70	35.4	36	18.2	4	2.0
Examination well administered	145	73.2	47	23.7	1	0.5	4	2.0
Examination very stressful	58	29.3	77	38.9	57	28.8	5	2.5
Examination well structured and sequenced	139	70.2	49	24.7	5	2.5	4	2.0
Examination minimized chance of failing	130	65.7	44	22.2	17	8.6	6	3.0
OSCE less stressful than other examinations	141	71.2	37	18.7	14	7.1	5	2.5
Allowed student to compensate in some areas	118	59.6	59	29.8	13	6.6	7	3.5
Highlighted areas of weakness	116	58.6	59	29.8	17	8.6	5	2.5
Examination intimidating	55	27.8	102	51.5	30	15.2	10	5.1
Student aware of level of information needed	103	52.0	78	39.4	13	6.6	3	1.5
Wide range of clinical skills covered	111	56.1	70	35.4	11	5.6	5	2.5

Table 5. Students perception and validity and reliability of OSPE

Questions	Not at all		Neutral		To great extent	
	No	%	No	%	No	%
OSPE examination scores provide true measure of essential clinical	30	15.2	76	38.4	91	46.0
OSCE score are standardized	11	5.6	49	24.7	137	69.2
OSCE practical and useful experience	9	4.5	45	22.7	143	72.2
OSPE was a useful experience	10	5.1	42	21.2	145	73.2
Personality, ethnicity and gender will not affect OSCE score	25	2.6	40	20.2	132	66.7
OSPE should be used more often in practical examination to assess students	12	6.1	50	20.3	135	68.2



DISCUSSION

Several studies have demonstrated OSPE as a reliable assessment tool. It has several advantages namely, avoids examiners bias and gives equal opportunity to all candidates. OSPE examination can be modified as per institutional circumstances. Process of OSPE is so educative that it is being recommended for formative assessment as well.¹

The present study showed that, mean OSPE scores were significantly high compared to TPE [68.18 ± 13.48 versus 49.28 ± 14.89 ; $p < 0.001$] suggesting OSPE is an effective tool in discriminating between good and poor performers in physiology practical examinations. OSPE score were significantly higher when correlated with TPE scores in clinical ($r = 0.291$), human ($r = 0.286$), HT Major ($r = 0.385$), TPE HT Minor ($r = 0.463$) and TPE Total ($r = 0.489$). A similar study¹³ from King Faisal University Medical School also reported a marked improvement in the mean scores for the laboratory component of the final examinations in the physiology courses. Another study³ from Manipal, Karnataka reported that approximately 63% of the students showed a performance in the scores obtained using the OSPE and TPE within the acceptable limit of 8; 32% of the students scored much above the anticipated difference in the scores, and the rest scored below the anticipated difference in the scores on the OSPE and TPE.

There was no difference in OSPE scores by gender ($p = 0.115$) and TPE scores as well whereas earlier studies have reported gender difference in OSPE examination. A study¹⁵ reported that, female students performed significantly better in OSPE than male students in 4/5 and 3/5 physiology I and II examinations. However such gender differences were not observed in the written examinations. Another study¹⁴ reported no difference in scores of written or practical (OSPE) examinations between female and male students in either student-led or faculty-led tutorial groups.

Students overwhelmingly perceived that the OSPE in MBBS Part I physiology practical examinations had good construct validity. This was demonstrated by the favorable responses concerning transparency and fairness of the examination process and the authenticity of the required tasks per station. Excellent levels of acceptance of OSPE by students have been previously described in the literature.

Consequences of OSPE for Learner would be assessment becomes more objective, focused, uniform and fair assessment, boosts confidence, positive impact on academic performance, helps in preparing for future endeavor, and provision of feedback to improve upon. The curriculum is more standardized, valid, reliable tool for practical examination and provides uniformity in assessment with use of check list. For society it imparts improved quality of the out-coming doctor, who are highly skilled and competent enough to improve delivery of patient care.

The limitation of OSPE include resistance from faculty to participate in tedious procedure, convincing students to participate as both can become reluctant, resistance from policy makers in committee at college level, availability of adequate number of observers, who is keen to evaluate students with patience, expensive and intensive man-power could limit practicality and feasibility.¹⁵ Task specific checklists may not exactly replicate an actual clinical encounter, limits validity.¹⁶ If number of procedure

stations are not appropriate, (lesser number) lesser clinical competencies can be tested. Skill of person, preparing the checklist may hamper objectivity: Limits validity and reliability Assessing only one component at a time limits validity.¹⁷ Minimum number of stations 14 – 18 lesser the number – lesser the reliability¹⁸ and lesser the content validity. If patients are unreliably standardized that may alone limit reliability and validity

CONCLUSION

OSPE is a reliable device with good capacity to differentiate between different category of student. It is uniform and a fair method of assessment as there is uniformity of questions and in scoring students. For performance discrimination OSPE is important as individual competencies are tested (clinical skills and attitudes), attitude towards learning and communication skills are tested and also improved the quality of students performance in laboratory exercises. Also OSPE provides careful specification of content is present (*Validity*), observation of wide sample of activities (*Reliability*), can be conducted within the available resources and time (*Feasibility*) and each student has to perform same task (*Acceptability*).

RECOMMENDATIONS

OSPE does not always offer an opportunity to assess practical skills like physical examination, interpretation of data and time management which are considered key components of clinical competence.¹⁶ OSPE is also associated with technical problem and to overcome these drawbacks semi objective structured practical examination call be followed.¹⁸ One experiment (Long case) to know the general performance and attitude can be continued as before. Then a 20 station OSCE could be introduced. Some questions could have short case and structural viva questions.

REFERENCES

1. Editorial. A brief overview regarding various aspects of objective structured practical examination (OSPE): Modifications as Per Local Needs. Pak J Physiol 2007;3(2):1-3.
2. Byrne E, Smyth S. Lecturers' experiences and perspectives of using an objective structured clinical examination. Nurse Educ Pract. 2008; 8(4): 283-9.
3. Abraham RR, Raghavendra R, Surekha K, Asha K. A trial of the objective structured practical examination in physiology at Melaka Manipal Medical College, India. Adv Physiol Educ. 2009 Mar;33(1):21-3.
4. Dissanayake AS, Ali BA, Nayar U. The influence of the introduction of objective structured practical examinations in physiology on student performance at King Faisal University Medical School. Med Teach. 1990;12(3-4):297-304.
5. Bartfay WJ, Rombough R, Howse E, LeBlance R. The OSCE in nursing education: objective structured clinical examinations can be vehicles for nursing education and practice by promoting the mastery of clinical skills and decision making in controlled and safe environments. The Canadian Nurse 2004; 100: 18-27.
6. Nayar U, Malik SL, Bijlani RL. Objective structured practical examination: a new concept in assessment of laboratory exercises in preclinical sciences. Med Educ. 1986; 20(3): 204-9.
7. Mcleod PJ, Cuello C, Capek R, and Collier B. A multidimensional evaluation system in a basic science course in medicine. Med Teach 19–22, 1996.
8. Pierre R, Wierenga A, Barton M, Branday JM, Christie C. Student evaluation of an OSCE in pediatric at the University of the West Indies, Jamaica. BMC Medical Education 2004; 4(22): 1-7.
9. A-Latif A. An examination of the examinations: the reliability of the objective structured clinical examination and clinical examination. Med Teach. 1992; 14(2-3): 179-83.
10. Hilliard RI, Susan TE. The use of an objective structured clinical examination with postgraduate residents in pediatrics. Arch Pediatr Adolesc Med 1998; 152: 74-8.
11. Sloan DA, Donnelly MB, Schwartz RW, Strodel WE. The objective structured clinical examination. The new gold standard for evaluating postgraduate clinical performance. Ann Surg 1995; 222: 735-2.
12. Harden RM, Gleeson FA. Assessment of clinical competence using an objective structured clinical examination (OSCE). Med Educ. 1979; 13(1): 41-54.
13. Dissanayake AS, Ali BA, Nayar U. The influence of the introduction of objective structured practical examinations in physiology on student performance at King Faisal University Medical School. Med Teach. 1990;12(3-4):297-304.
14. Kassab S, Abu-Hijleh M, Al-Shboul Q, Hamdy H. Gender-related differences in learning in student-led PBL tutorials. Educ Health (Abingdon). 2005 Jul;18(2):272-82.
15. Smee SM, Blackmore DE. Setting standards for an objective structured clinical examination: the borderline group method gains ground on Angoff. 2001; 35 (11): 1009–10.
16. Gleeson F. The effect of immediate feedback on clinical skills using the OSLE. In: Rothman AI, Cohen R, eds. Proceedings of the sixth Ottawa conference of medical education 1994. Toronto: University of Toronto Bookstore Custom Publishing, 1994: 412-15.

17. Dissanayake AS, Ali BA, Nayar U. The influence of the introduction of objective structured practical examinations in physiology on student performance at King Faisal University Medical School. *Med Teach.* 1990;12(3-4):297-304.
18. Geetanjali B. The other side of OSPE. *Indian Journal of Pharmacology.* 2004; 36 (6): 388-9.

Citation of This Article

Dandannavar Vijaya S., Schwartz Alan. 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.* Vol 5 [1] March 2014. 126-134