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Comparison of Inter-Rater Reliability of Objective Structured Practical Examination (OSPE) and Conventional Non-Standardised Practical Examination (CNPE) in Assessing Practical Skills.

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ABSTRACT

The objectives of the present study were to perform the evaluation of inter rater reliability of Objective Structured Practical Examination and Conventional Non standardized Practical Examination in assessing the practical skills for performing Differential Leukocyte Count. The present study was performed in the haematology division of Department of Physiology and it consisted of 45 students who have undergone instruction and procedures of DLC. The mean scores and standard deviations by the two sets of examiners are tabulated. The Intra-class correlation coefficient between Examiner Set1 and Examiner Set 2 for Conventional Non standardized Practical Examination was 0.490. ($p=0.054$, F-test with True Value = 0). For Objective Structured Practical Examination, the Intra-class correlation coefficient between Examiner Set 1 and Examiner Set 2 was 0.895. ($p<0.001$, F-test with True Value = 0). Cohen's Kappa was determined for the agreement between Examiner Set 1 and Examiner Set 2 on Pass-Fail categorical outcomes was 0.353 for Conventional Non standardized Practical Examination ($p<0.05$) and for Objective Structured Practical Examination was 0.545 ($p<0.01$). The present study observed that the Objective Structured Practical Examination ensures greater reliability than Conventional Non standardized Practical Examination and can be considered as an effective assessment tool in the evaluation of haematology practical.

Keywords: Objective Structured Practical Examination, Haematology, Leukocyte Count, Medical Education

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INTRODUCTION

The education brings desirable changes in the student behaviour with respect to acquisition of knowledge, skills and attitude [1]. The Knowledge and skill should grow simultaneously, and these forms acquired by the student are assessed by conducting the exams. The main purpose of assessment in the undergraduate medical course is to measure a student's progress in an on-going way so that both the student and the teacher are informed on the effectiveness of learning and teaching, and to measure overall performance against some agreed criteria of competence for professional practice. Generally, one of the major perils of an assessment and evaluation of present system is its subjectivity. When two or more examiners evaluate a student the variability between them tends to be large and there are differences in opinion based on the subjective perception of the examiners [2]. Further, in conventional practical examinations, the students pick up a chit, to know which experiment they have to do. The lucky ones may get an easier and less skilful experiment while the unlucky ones may land up with a tough experiment. In the last few decades, there is rapid evaluation of assessment method used in medical education from traditional ones (CNPE) to towards more sophisticated evolution strategies. In early 70s, University of Dundee, UK after pioneering the intense research in medical education introduced Objective Structured Clinical Examination (OSCE)/Objective Structured Practical Examination (OSPE) method [3]. OSPE is a tool which assesses the components of practical skills like simple procedures, communication interpretation and laboratory results. They are determined using standard checklists and this involves rotation of students around a number of stations in examiners will be with checklist. OSPE assessments have been the main core in assessment during the clinical courses for several years. They facilitate the assessment of theory, practical and problem-solving approach at several stations. The evaluation/marks criteria are given well in advance and are clearly structured. So every student receives the same test and interaction with different teachers/examiners. It was believed that this will be a more suitable assessment for the medical students during their practical and communication training, which enhances their employability and prepares them for the future projects. However, there is ongoing debate on implementation of OSPE for assessment of laboratory exercises in pre- clinical sciences especially for haematology[4].

In this context, the present study attempts to evaluate and compare the two types of practical assessment methods for haematology experiment. The objectives of the present study were to perform the evaluation of inter rater reliability of OSPE (Objective Structured Practical Examination) and Conventional Non standardized Practical Examination (CNPE) in assessing the practical skills for performing Differential Leukocyte Count (DLC).

MATERIALS AND METHODS

The present study was undertaken in the haematology division of Department of Physiology. The study consisted of 45 students who have undergone instruction and procedures of DLC under the same team of faculties who are included in the study. Students were informed about the exam a week prior but were blind about method of examination. For the assessment of this experiment the students were divided into two groups of 25 and 20 each.

Group I (n=25) was assessed using Conventional Non-standardized Practical Examination (CNPE) method where scoring was entered independently. Under the CNPE method, four examiners were selected and paired to form 2 sets (S I and SII). Pairing of teachers was done by asking them to pick chits, lottery fashion. Group I was again divided into 2 subgroups of 12 and 13 students each. One subgroup is assigned to one set of teachers (S I) and the other subgroup to other set of teachers (S II). Students were asked to perform the DLC experiment, time given to complete the practical was 45 minutes, and they were then assessed by the set of examiners assigned to them. Assessment was done on the basis of the quality of smear, identification of leukocytes and ability to answer questions.

The same experiment was assessed using OSPE method for Group II (n=20) students. The same set of examiners was appointed. During OSPE, the students were instructed to move through 6 stations, among which 3 had questions, which tested their knowledge and critical thinking and the remaining 3 stations were having skills which the student had to perform in front of the examiner. For the skilled station a series of checklists were prepared. The checklists were validated with senior colleagues and accordingly they were edited.

Students were given 3 minutes at every station. Group II (n=20) students were also divided into 2 subgroups of 10 students per subgroup. The same two sets of examiners were assigned for the 2 subgroups. Since there were 2 sets of examiners, another set of 6 stations was duplicated so that examination for both the subgroups was conducted simultaneously. In each station, each set of examiners assessed the skill of each student and then follow them to all the 3 skilled stations. The questions and time limit were same for both subgroups. The questions and checklists are attached at the end in annexure.

Statistical Analysis

All data was analysed in SPSS v16. Student performance in the Conventional Non-standardized Practical Examination (CNPE) and Objective Structured Practical Exam (OSPE) format tests were scored by a given Examiner for a maximum of 30 marks. Scores from Examiners 1 and 3 were pooled together into ExaminerSet1 and scores from Examiners 2 and 4 were pooled together into ExaminerSet2. Students were categorized into Pass (P, score >= 15) and Fail (F, score< 15) for each exam type.

Intra-class correlation coefficient (ICC) was assessed for the pooled data for agreement between ExaminerSet1 and ExaminerSet2 for each of the exam types (CNPE and OSPE). The absolute "Absolute Agreement" measure of ICC was determined using the two-way random effects model as data from two sets of examiners (raters) was pooled. Further, the null hypothesis that the ICC is 0 was tested using a F-test at probability threshold of 0.05.

Inter-rater reliability was also tested for the pass-fail categorization data using Cohen's Kappa statistic. An asymptotic significance level of 0.05 was used to test significance of this agreement measure.

RESULTS

The mean scores and standard deviations by the two sets of examiners are given in Table 1. The Intra-class correlation coefficient (Absolute agreement) between Examiner Set1 and Examiner Set 2 for CNPE was 0.490. ($p=0.054$, F-test with True Value = 0). For OSPE, the Intra-class correlation coefficient (Absolute agreement) between Examiner Set 1 and Examiner Set 2 was 0.895. ($p<0.001$, F-test with True Value = 0).

Table 1: Mean scores awarded by the two sets of examiners in Conventional Non-standardized Practical Examination (CNPE) and Objective Structured Practical Examination (OSPE)

	Examiner Set 1	Examiner Set 2	
	Mean ± SD	Mean ± SD	P' value
CNPE	16.91 ± 3.96	18.64 ± 4.3	0.173
OSPE	16.33 ± 3.89	17.05 ± 3.2	0.524

N=22 for CNPE and 20 for OSPE; SD: Standard Deviation; No significant differences between Examiner sets (Independent samples t-test)

Cohen's Kappa was determined for the agreement between Examiner Set 1 and Examiner Set 2 on Pass-Fail categorical outcomes was 0.353 for CNPE ($p<0.05$) and for OSPE was 0.545 ($p<0.01$).

ANNEXURE I

The three stations in which students had to perform a task were composed of questions such as
Station I- Preparation of blood smear for performing DLC.
Station II- Stain the smear given for DLC.
Station III- Focus the smear provided to you under oil immersion objective and focus any leukocyte.

Q: Prepare a blood smear for performing Differential Leukocyte Count **(Station I)**

Roll No.	Step 1 0.5 Mark		Step 2 1.0 Mark		Step 3 0.5 Mark		Step 4 1.0 Mark		Step 5 1.0 Mark		Step 6 1.0 Mark		Total 05 Marks
	Take 4 clean slides, select one as a spreader		Under aseptic precautions, pricks the fingertip and discards the first drop of blood		Place a drop of blood at one end of the slide		Puts the spreader on the surface of the slide just in front of the blood drop at an angle of 45°		Draws the spreader gently backwards and allows the blood to run along its full width		Moves the spreader slowly and smoothly to the other end of the slide maintaining an angle of 45°		

Q: Stain the given smear for DLC **(Station II)**

Roll No.	Step 1 1.0 Mark		Step 2 1.0 Mark		Step 3 1.0 Mark		Step 4 1.0 Mark		Step 5 1.0 Mark		Total 05 Marks
	Place the slide horizontally across the 2 glass rods on the staining tray		Select the leishman's Stain		Put 8 – 12 drops of stain on the smear .Wait for 1.30 minutes.		Wait for 1.30 minutes. Add distilled water, about double the amount of stain on the smear, taking care not to spill		Mix the stain with water by blowing gently with a pipette		

Q: Focus the smear provided to you under oil immersion objective and focus any leukocyte **(Station III)**

Roll No.	Step 1 1.0 Mark		Step 2 1.0 Mark		Step 3 1.0 Mark		Step 4 0.5 Mark		Step 5 0.5 Mark		Step 6 1.0 Mark		Total 05 Marks
	Checks for staining and cells distribution first under low power and then under high power objective		Places a drop of cedar wood oil on the blood smear and swings the oil immersion objective into position		Carefully lowers the objective until it touches the oil drop while looking from side		Keeps the iris – diaphragm fully opened with condenser in the top position		Focusses the smear using fine adjustment		Focusses a leukocyte in an area with not much overlapping of cells and cells are uniformly distributed		

ANNEXURE II

The other three were knowledge stations and had questions such as

Station I

a) Identify the focused leukocyte.   (1 mark)
b) State the normal differential count of the identified leukocyte. Mention one function of it (2 Marks)
c) Mention two conditions in which its count increases.   (2 Marks)

Station II

a) Name the stain used for DLC?   (1 Mark)
b) Name two dyes present in the stain?   (2 Marks)
) List two identification features of basophils.   (2 Marks)

Station III

a) State the normal differential count for neutrophils and lymphocytes (1 Mark)
b) List two functions of neutrophils   (2 Marks)
c) List two functions of lymphocytes   (2 Marks)

DISCUSSION

The competency in medicine is the judicial use of communication, knowledge, clinical reasoning to benefit the people along with the community [5,6]. The medical school should involve in providing the best training, to make the student a better doctor. The present study compared the inter rater reliability of OSPE and CNPE, the two forms of assessment tools of practical examinations by assessing the agreement between evaluation of two sets of examiners. Analysis showed that inter rater reliability is significantly higher in OSPE form of assessment compared to that of CNPE. A few studies have assessed scores and feedback of the single study for these two methods of examination tools and compared, however not many studies have addressed the inter rater reliability of OPSE and CNPE. According to a previous study, the students gave the best positive opinion about the OSPE in comparison to the TPE [7]. The student feedback gave the scope about the improvement and OSPE was started for the first time during the university examination. A study, concluded that OSPE is feasible, ensures objectivity, reliability and validity in assessment [8]. Findings of this study also suggests that OSPE is better tool for assessing practical skills than CNPE in terms of inter rater reliability and can be used as a part of summative and formative assessment. Despite of greater reliability and objectivity, the cons of implementing this method are issues like framing specific checklists, availability of examiners, technical staffs and prior arrangement of stations. However, the advantages of OSPE overweigh its disadvantage as an evaluating tool. The higher agreement between the two sets of examiners obtained in OSPE in this study could be due to the proportional distribution of marks for both cognitive and psychomotor tasks as well as the evaluation was entirely based on preset specific checklists which were lacking in CNPE method of evaluation. It was reported that the introduction of O.S.P.E in pharmacology, a second year MBBS subject was successful [9]. The present study also opines that the OSPE is the best tool in evaluating the students of physiology.

CONCLUSION

The present study performed the evaluation of inter rater reliability of OSPE and CNPE in assessing the practical skills for performing the DLC. It is observed that the OSPE ensures greater reliability than CNPE and can be considered as an effective assessment tool in the evaluation of haematology practical.

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