

Original Paper

Introducing Objective Structured Clinical Examinations for Undergraduate Orthoptic Education

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Abstract

Aim: Introducing the objective structured clinical examination (OSCE) to improve orthoptic education and clinical competence including the clinical attitude and skills of orthoptic students.

Methods: Subjects were thirty-one fourth grade orthoptic students from our department. Six basic examinations were included in stations for trial use of OSCE. The OSCE were performed and compared before and after the eight weeks clinical training. Ten items of clinical attitude and six examinations were evaluated respectively. Six experienced orthoptists evaluated students' clinical attitude and examination techniques while they were performing simulated patient (SPs) examinations according to the evaluation sheets we designed.

Results: After clinical training, both students' attitudes toward SPs and examination techniques including correction of refractive errors improved significantly ($p < 0.05$). However, the refractive correction score did not reach sixty. Attitudes toward SPs improved in eight areas out of ten. Safety procedures during examination and signaling the end of examinations did not attain a score of sixty.

Conclusion: We were able to evaluate objectively the effect of clinical training on the clinical competence (attitude toward patients and examination techniques) of students by OSCE. Improvements in the evaluation sheets and crossed-check system are still necessary.

Introduction

Since orthoptists are a co-medical profession engaged in clinical aspects, it is important for orthoptists to learn not only technical knowledge, but also to develop understanding of the moral and mental attitudes necessary for working with patients. Objective Structured Clinical Examination (OSCE) were initially established by Harden in 1975 [1] as an outstanding method of evaluating a student's skill and attitude during clinical examination in hospitals.

In Japan, OSCE was introduced into medical education for the first time in 1993. Since 2005, it has been commonly used by medical schools throughout Japan. Recently, OSCE has begun to be introduced not only in pharmacy [2] and dentistry [3], but also in other co-medical fields such as nursing [4], physiotherapy [5], occupational therapy [6] and speech therapy [7]. However, OSCE has only just begun to be introduced in orthoptic education in Japan. A preliminary report on the potential of OSCE for orthoptic students'

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education has been recently published [8].

Therefore, we aimed to develop and introduce OSCE for orthoptic education as well as to improve the clinical competence of students.

Methods

The present study was carried out with the help of thirty-one fourth grade orthoptic students at Kawasaki University of Medical Welfare during 2005. Eight weeks of clinical training outside the university is a requirement in order to take the national examination for orthoptists.

Trials using OSCE were carried out in order to evaluate the clinical competence of 31 students before and after clinical training in 32 different hospitals.

1. Design of the first trial for OSCE

Simulated patients (SP) and small rooms called stations are necessary for OSCE design. Six stations were prepared in order to inspect techniques of basic clinical examinations [9]: Station 1 - Correction of refractive error (Refractive correction); Station 2 - Binocularity and Eye movement (Bino. & E.O.M.); Station 3 - Skiascopy; Station 4 - Goldmann Perimetry (G.P.); Station 5 - Alternate Prism Cover Test (APCT) and Station 6 - Non-contact Tonometry & Automatic refraction (N.C.T. & Auto-refraction). These stations were arranged in the orthoptic training room using partitions.

Thirty-one students were divided into five groups (four groups of 6, one group of 7), and asked to perform examinations whilst being assessed by OSCE. Each student had to rotate through all of six stations and had to practice the subject prepared in each station on the SP. Each examination was completed in five minutes and one minute was necessary to move from one station to another. Sixteen third grade volunteers played the role of SPs. They were assigned to different stations. In station 4, SPs wore a senior citizen's clothes and deliberately moved slowly. In station 5, two exophoria students were required to be SPs. An operation manual was provided in each station. An example of the operation manual in Station 5 was provided as follows:

“Patient: A 20 years old female named Kurashiki Hanako. Her chief complains was asthenopia. You are a clinical practical student at the department of clinical ophthalmology. You meet with her for the first time. Please examine her eye alignment.”

2. Methods of evaluation

Evaluators used the evaluation sheets that were prepared for each station. The purposes of these sheets were to evaluate both students' clinical attitude and examination techniques while they were performing SP examinations. One of the evaluation sheets is shown in Table 1. Evaluators were six orthoptists (three were teachers and three were practicing orthoptists), and each evaluator was located in one of the six stations. The areas of evaluation for clinical attitude were as follows: ① Greetings, ② Self-introduction, ③ Appropriate language, ④ Good appearance, ⑤ Confirmation of SP's name, ⑥ Explanation of examination procedure to the SP, ⑦ Agreement for examination, ⑧ Safety procedures during examination, ⑨ Posture of SP while they were under examination, and ⑩ Information about the end of the examination. These ten areas of evaluation of the clinical attitude were the same in all six stations. Evaluation areas for examination techniques ranged from five to eight depending the particular examination. According to the evaluation sheets, evaluators gave one point if the clinical attitude or examination techniques were good, and zero points if the examination techniques were not good.

The total examination technical scores for each station are shown in Table 2. We summed the total

Table 1 The evaluation sheet for Goldmann Perimetry (Visual Fields)

Evaluation item of attitude	yes	no
① Did the student say hello?	1	0
② Did the student introduce themselves?	1	0
③ Did the student use appropriate language ?	1	0
④ Was the student's appearance good?	1	0
⑤ Did the student confirm the SP name?	1	0
⑥ Did the student explain the examination procedure?	1	0
⑦ Did the student obtain the agreement for examination?	1	0
⑧ Did the student performed the examination safely?	1	0
⑨ Did the student pay attention to the posture of SP while they were examined?	1	0
⑩ Did the student inform about the end of the examination?	1	0
Total score	()

Evaluation item of examination techniques	yes	no
1. Did the student occlude non-examined eye properly?	1	0
2. Was the projected stimulus moved from the periphery to the center?	1	0
3. Was the projection of a stimulus on the new meridian appropriate for detecting another threshold?	1	0
4. Did the pantograph handle moved smoothly?	1	0
5. Did the student monitor the fixation maintenance of SP?	1	0
6. Did the student draw an isopter line smoothly?	1	0
7. Did the student accomplish the measurement?	1	0
Total score	()

score of 31 students' scores for clinical attitude according to the ten evaluation areas in each station and adjusted these figures in relation to a possible total of one hundred points. In addition, the sum of the clinical examination scores obtained in each station were individually computed for each student; the sum of 31 students' scores according to six clinical examinations were also calculated. Then, both scores taken together counted towards a possible total of one hundred. The pass score was sixty. By this procedure, we got an examination technical score for each student in each station. We compared those scores before and after the clinical training in different hospitals by the Wilcoxon rank sum tests. We also calculated an improvement rate using the formula of $(\text{score of after clinical training} - \text{score of before clinical training}) / \text{score of before clinical training} \times 100 = \text{rate of improvement}$. Furthermore, a simple regression analysis of clinical competence and knowledge were performed.

Table 2 Station items and scores

Station	Examination items	Score
1	Alternate Prism Cover Test	6
2	Binocularity and Eye Movement	12
3	Non-contact Tonometry	10
4	Skiascopy	4
5	Correction of Refractive Error	5
6	Visual Fields (Goldmann Perimetry:G.P.)	7

Results

1. We were able to perform OSCE without being confused and carried out the tests within the scheduled time.
2. In relation to the scores of clinical attitude and examination techniques before and after clinical training, the following observations were made.
 - (1) The topics items included to evaluate the score of clinical attitude toward patient were as follows: ① Greetings, ② Self-introduction, ③ Appropriate language, ④ Good appearance, ⑤ Confirmation of SP's name, ⑥ Explanation of examination procedure, ⑦ Agreement for examination, ⑧ Safety procedure, ⑨ Posture of SP while they were under examination, and ⑩ Information about the end of the examination. The improvement rate of the score after clinical training were ① 4.5%, ② 30.9%, ③ 6.5%, ④ 8.9%, ⑤ -8.9%, ⑥ 4.5%, ⑦ 1.5%, ⑧ 45.7%, ⑨ -18.9%, and ⑩ 62.5%. Overall the attitude toward SPs improved significantly ($P < 0.05$) after clinical training. However, there were three items that did not pass the minimum score of sixty before clinical training; ② Self-introduction, ⑧ Safety procedure, and ⑩ Information about the end of the examination. Whilst after clinical training, the items that did not reach to the minimum required score were ⑧ Safety procedure during examinations, and ⑩ Information about the end of examination. In addition, the number of students that failed in attitude was reduced from three students before clinical training to two after clinical training (Fig. 1).

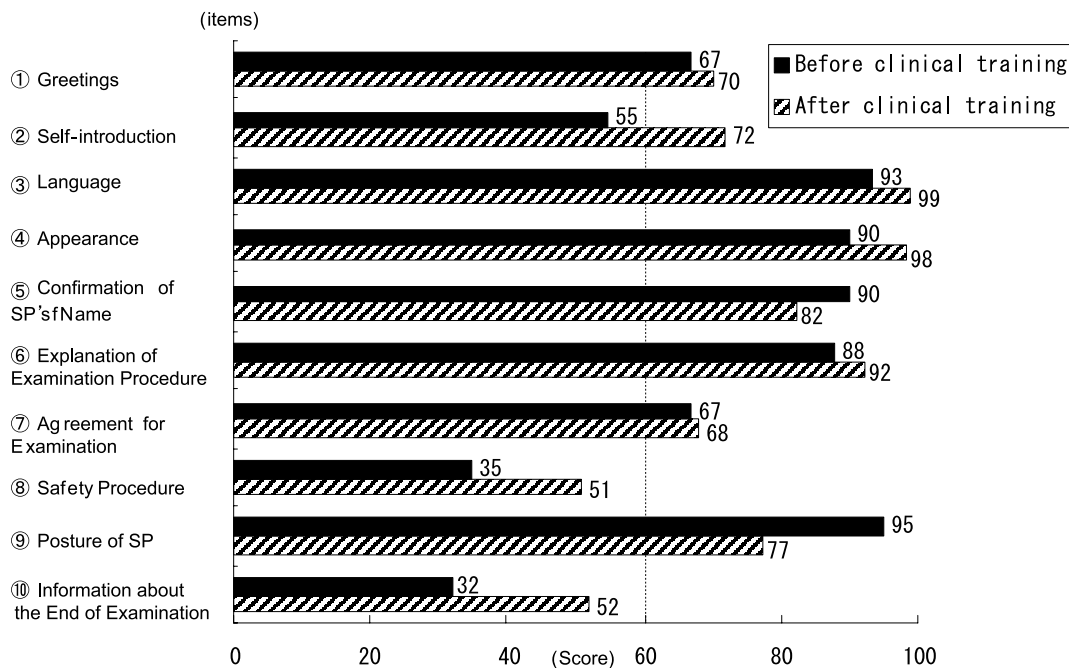


Fig. 1 Scores of clinical attitude
 Black bars show the scores before clinical training and striped bars show the scores after clinical training.
 The vertical dotted line indicates the pass mark.
 The clinical attitude toward SPs was improved significantly after clinical training. ($p < 0.05$)

- (2) The items included to evaluate the score of examination techniques were as follows: ① Refractive Correction, ② Bino. & E.O.M. ③ Skiascopy, ④ G.P., ⑤ APCT, and ⑥ N.C.T. & Auto-refraction. The improvement rate as a whole were ① : 78.3%, ② : 133.3%, ③ : 51.7%, ④ : 0%, ⑤ : 2.7%, and ⑥ : 1.1% respectively. In all areas the examination techniques improved significantly after clinical

training ($P < 0.05$). Twenty-five students failed to reach the minimum score before clinical training, however the number of students that failed decreased to three students after clinical practice, thus showing a remarkable improvement (Fig. 2).

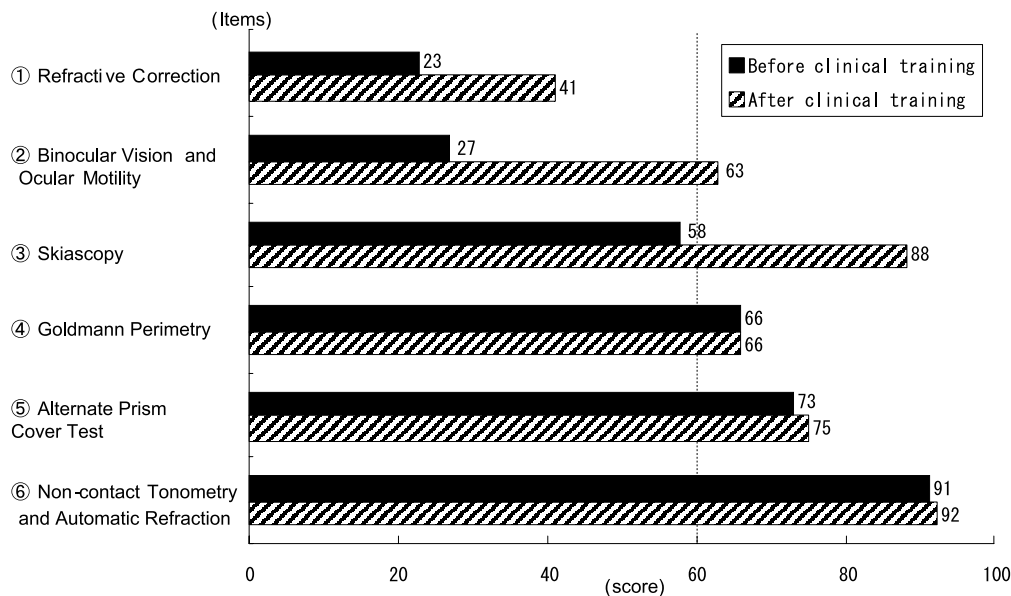


Fig. 2 Scores of examination techniques

Black bars show the scores before clinical training and striped bars show the scores after clinical training. The vertical dotted line indicates the pass mark.

The examination techniques were improved significantly after clinical training ($p < 0.05$)

3. In relation to changes in the minimum score of examination techniques and clinical attitude toward SPs before and after clinical training, the following observations were made.

When the scores of examination techniques and attitude toward SPs were more than sixty, we indicated this as $\oplus \oplus$ in Fig. 3. When the scores of examination techniques were more than sixty but clinical attitude toward SPs were less than sixty, we indicated this as $\oplus \ominus$. Conversely we used $\ominus \oplus$ to indicate that the examination techniques was less than sixty and the clinical attitude toward SPs were more than sixty. $\ominus \ominus$ indicated that both clinical attitude toward SPs and examination techniques were less than sixty.

Before clinical training, the following results were obtained: $\oplus \oplus$ six students (19.3%); $\oplus \ominus$ zero (0%); $\ominus \oplus$ twenty-two students (71.0%) and $\ominus \ominus$ three students (9.7%). After clinical training were as follow: $\oplus \oplus$ twenty-six students (83.9%); $\oplus \ominus$ three students (9.7%); $\ominus \oplus$ zero (0%) and $\ominus \ominus$ two students (6.4%). Nineteen of twenty-two students (86.3%) whose scores were $\ominus \oplus$ improved to $\oplus \oplus$ after clinical training. Two of three students who scored $\ominus \ominus$ before clinical training improved to $\oplus \oplus$ after clinical training. One student deteriorated from $\oplus \oplus$ to $\ominus \ominus$ and one students was still $\ominus \ominus$ after clinical training (Fig. 3).

4. The correlation coefficient with the score of written tests and OSCE that included the sum of scores of clinical attitudes and examination techniques of each student, were analyzed by simple linear regression. No correlation between the results of written tests (knowledge) and OSCE (clinical competence) was observed, ratio $r = 0.19037$.

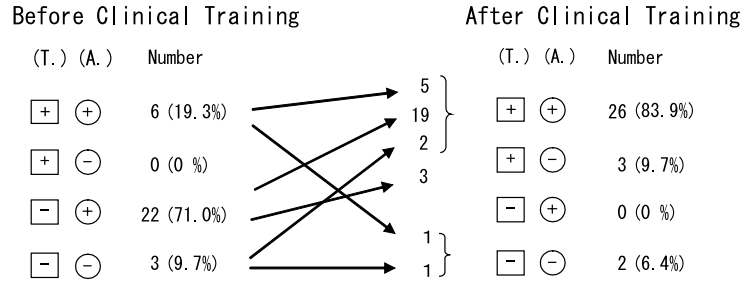


Fig. 3 Changes in the minimum score for clinical attitude and examination techniques
 T. : Examination technique, A. : Clinical Attitude.
 ⊕ ⊕ : Scores of T. and A. were more than sixty.
 ⊕ ⊖ : Scores of T. more than sixty and A. less than sixty.
 ⊖ ⊕ : Scores of T. less than sixty and A. were more than sixty.
 ⊖ ⊖ : Neither T. nor A. less than sixty.
 86.3% of students (19 of 22) whose scores were ⊖ ⊖ improved to ⊕ ⊕ after clinical training.

Discussion

It is difficult to evaluate the outcome of clinical training. In OSCE, objective evaluation can be performed by using evaluation sheets (Table 1). However, because the evaluators who perform the evaluation are staff, the subjective component can not be completely eliminated. As the main factors that affect the result of OSCE are considered to be patients (SPs), evaluators, and the evaluated students, it is necessary to make stable contribution of both SPs and evaluators in order to increase the objectivity of the present OSCE.

The evaluation sheets designed originally consist of two parts that included attitude and examination techniques. Since the evaluation list was simple, it might be also easily evaluated by an orthoptist with little experience. The evaluation areas of each examination referred to the notes of a basic ophthalmic examination textbook. Different check-lists were previously used to evaluate students' examination ability until last year [10]. However, the clinical attitude of the students could not be evaluated by the list. This is the first time that new OSCE evaluation sheets were used to evaluate the clinical competence of orthoptist students.

Increasing the number of stations makes reliable evaluation for the clinical competence of students [11]. It means that more stations need more evaluators. Since the number of evaluators was limited in our course study, one evaluator was located in each station. To avoid arbitrary scores, we confirmed the evaluation points for every sheet and obtained a consensus prior to OSCE.

SPs were trained to be as homogeneous as possible in their performance in each station. SPs were prepared for the ophthalmic examination stations but not for medical interview stations. One hour was enough for them to act as simulated patients. We thought that our evaluation ensured a good degree of objectivity by having carried out these works completely.

It is very interesting to evaluate objectively, whether ophthalmic examination techniques of students improve as the result of clinical training. Comparing the examination technique before and after clinical training, we found that scores of examination items that used automatic instruments such as N.C.T. Auto-refraction did not change significantly. In addition, we also found that most of the items to evaluate the examination skills improved dramatically after clinical training. However, the score of refractive correction, (forty-one), did not reach the minimum required score of sixty even after clinical training. Because refractive correction are indispensable for ophthalmology clinics, it is necessary to re-educate the theory and practice of refractive correction before the fourth graders go to different hospitals for their clinical training. In order to incorporate these findings in our training classes, we decided to increase individual lesson time for the third graders. Actually, we have already started this program.

OSCE is better than common technical examination, because it evaluates not only the techniques, but also attitudes while students are performing examination toward SPs. Among the ten areas of attitude toward SPs self-introduction, safety procedure during examinations, and signaling the end of the examination did not reach minimum required score before clinical training. These three items were improved in more than thirty percent of scores after clinical training. But only self-introduction reached the required score. Furthermore, only six students (19.3%) passed both the tests of examination techniques and attitude toward the SPs before clinical training and this increased to twenty six (83.9%) students after clinical training. These results suggested that students could have recognized that they improved their practical skills through the clinical training. Although one student who had passed both examination techniques and attitude before clinical training, yet scored lower than sixty for attitude after clinical training, it could be argued that such a student may require to check whether there was an emotional problem between the student and other clinical practitioners including orthoptist instructor.

In the present study, no correlation was observed between clinical competence and knowledge. This result agreed with that of Ban's report [12]. The above results suggest that clinical competence and knowledge are independent parameters. The present OSCE was applicable for the estimation of student's clinical competence. Since the evaluation sheets included more items of evaluation on attitude than techniques, re-considering the balance between attitude and techniques in future studies is highly recommended. Although alternative types of evaluation sheets are available, the results of OSCE depend on the chosen evaluation sheets. Therefore, we need to improve the quality of the sheets for a more precise evaluation. We have already begun to improve in these matters and research is in progress to improve the technical OSCE stations. In the near future, we would like to introduce and extend mutual evaluation with other universities.

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