

# Effectiveness of Direct Observation of Procedural Skills (DOPS) for Improving the Mini-Implant Insertion Procedural Skills of Postgraduate Orthodontic Trainees

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## ABSTRACT

**Background:** College of Physicians & Surgeons Pakistan (CPSP) has recently introduced different WBA tools in various specialties, but Directly Observed Procedural Skills (DOPS) is still required to be implemented in orthodontics which will improve learning and skills of the learner.

**Aim:** To determine the effect of applying DOPS for improving the mini-implant insertion procedural skills of postgraduate orthodontic trainees.

**Methodology:** This quantitative, quasi-experimental study was conducted at orthodontic department of de'Montmorency College of Dentistry (DCD), Lahore, from 1<sup>st</sup> July 2021 to 1<sup>st</sup> November 2021. Twenty trainees were selected and assessed over a period of 3 months which included 3 DOPS encounters with one-month interval between each encounter for mini-implant insertion. The trainees were assigned to faculty for each DOPS encounter by randomization. At the end, the trainees' and the faculty' perception regarding feasibility and acceptability of DOPS were obtained by means of structured questionnaire. The pre-DOPS and post-DOPS mean scores of all the trainees were compared using paired t-test.

**Results:** Mean scores of all the orthodontic trainees significantly improved in the post-DOPS as compared to the pre-DOPS encounter, which may be linked to the feedback of 2<sup>nd</sup> DOPS session. As per results, the DOPS was perceived to be acceptable and feasible to both the faculty and trainees.

**Conclusion:** DOPS is an effective tool for assessing and improving the mini-implant insertion procedural skills of postgraduate orthodontic trainees.

**Keywords:** Direct Observation of Procedural Skills (DOPS); Mini-implants; Orthodontics.

## INTRODUCTION

In 1990 psychologist Miller presented the framework for assessment of clinical competence, where knowledge (knows) is at the lowest level of pyramid while competence (knows how), performance (shows how), and action (does) are at the highest levels.<sup>1</sup> The 'does' level is most relevant for assessing clinical competence, therefore due to shift from knowledge based to competency based postgraduate clinical training the competence level of the trainee has been improved manyfolds<sup>2</sup>.

Workplace-based assessment (WBA) assesses the resident in several ways from the assessment of resident's procedural skills to behaviors at place of daily clinical practice, which generates evidence of daily clinical competences.<sup>3</sup> There are multiple tools of this assessment strategy, including direct observation of procedural skills (DOPS)<sup>3</sup>.

College of Physicians & Surgeons Pakistan (CPSP) has recently started to sensitize supervisors about WBA and has introduced different WBA tools in some postgraduate medical specialties for competency assessment,<sup>4</sup> but DOPS has not been implemented in the specialty of orthodontics. Presently CPSP is assessing orthodontic competencies by TOACS, short and long clinical cases, own treated five cases and e-log book. Such assessment methods need to be monitored at a higher competence level, therefore it was in this background that orthodontic DOPS was implemented first at UK in 2010<sup>3</sup>.

Assessment of clinical competencies of postgraduate trainees is essential part of medical and dental postgraduate education. In the past, the competency assessment of postgraduate dentistry residents was done mainly through traditional methods. There are few studies in literature on implementation of different assessment methods in dental education, which showed that 62% of all current assessment instruments implemented in dentistry are traditional methods and only 3% are procedural observation.<sup>5</sup> However, since the introduction of DOPS in 2003, their use has spread rapidly around

the world as an appropriate instrument to assess technical skills of dental students.<sup>6</sup> Studies are also limited on application of DOPS in different postgraduate specialties of dentistry including orthodontics<sup>7-9</sup>.

Literature shows strengths, weakness, reliability and acceptability of DOPS used in medical and dental education<sup>5,7</sup>. Quality assurance is one of the weaknesses of DOPS<sup>7</sup> but there are several advantages such as: it is a procedural recording and assessment of trainee's actual performance at workplace rather than in artificial exam environment, in addition to providing structured feedback, it is objective and time saving assessment tool<sup>8</sup>.

Orthodontic DOPS can be applied to assess procedural skills of trainees' in simpler orthodontic settings for basic and routine chair-side orthodontic procedures<sup>9</sup>. However, minimal published literature is available related to effectiveness of DOPS in the specialty of orthodontics<sup>8,9</sup> and very little, if any work has been done in this context in our country because of which it is not yet implemented at wide scale at postgraduate orthodontic centers<sup>10-12</sup>. Educational researches are required to generate evidence that will justify and strengthen the use of DOPS in postgraduate orthodontic training which in turn may result in improvement in skills of trainees, and in addition to standardization of orthodontic training programs across the country; it may result in improvement in orthodontic patient care.

The rationale of present study was that currently assessment of postgraduate orthodontic trainees is mostly summative that includes SEQs, TOACS, and long cases, but these methods do not assess orthodontic procedural skills thus gap was identified in the present system of postgraduate orthodontic training. As DOPS is not in place for postgraduate orthodontic trainees thus gap was identified in literature about its implementation and effectiveness. Furthermore, this strategy was chosen as a tool to gather evidence about its effectiveness based upon the observation of growing interest of CPSP in this tool. More relevant studies may contribute to successful implementation of DOPS at postgraduate orthodontic centers, which ultimately can result in longitudinal development of trainees' skills, increase interaction with supervisors and thus

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improvement in orthodontic patient care.

Therefore, the aim was to determine the effectiveness of DOPS for improving the mini-implant insertion procedural skills of postgraduate orthodontic trainees.

## METHODOLOGY

After obtaining institutional ethics board approval (DCD No. 3625, dated 30.12.2020), this quantitative study (quasi-experimental) was conducted at orthodontic department of de'Montmorency College of Dentistry, Lahore (DCD), from 1<sup>st</sup> July 2021 to 1<sup>st</sup> November 2021. The study was conducted after obtaining informed consent from all the selected participants (trainees, patients and faculty members) and confidentiality of the data was ensured. The paradigm was post-positivism. The sampling strategy was non-probability, convenient. The study was conducted on 20 third & final year orthodontic trainees who were willing and had inserted at least 10 mini-implants as per E-log book record. Five orthodontic faculty members were included who were willing and were CPSP approved orthodontic supervisors.

An orientation session was conducted to sensitize and introduce the orthodontic faculty and trainees to DOPS. The orthodontic faculty was trained in applying DOPS as assessment tool using standardized structured scoring sheet using Likert scale of 1-5.

The selected orthodontic procedural skill was mini-implant insertion (3M Unitek, USA) in an orthodontic patient of fixed appliance therapy for anchorage. The mini-implants was inserted at interdental area between maxillary second premolar and first molar region using self-drilling method under local anesthesia (Medicaine, Korea). The orthodontic cases of similar complexity and difficulty were selected as per ABO's Discrepancy index (DI) to make the DOPS assessment as standardized as possible. Each trainee was assessed over 3 months with total of 3 DOPS encounters with one-month interval between each encounter. Each DOPS encounter was conducted over 20 minutes in which last 5 minutes were spent in providing feedback to the trainees about their performance. The selected trainees were allocated to faculty for each DOPS encounter by randomization.

Initially in the first DOPS encounter (Pre-DOPS), trainees were assessed using DOPS scoring sheet and pre-DOPS mean scores of all the trainees were obtained. This was followed by second DOPS encounter at interval of 1 month, with focus of skill improvement by providing immediate feedback using same scoring sheet. In the third DOPS encounter (Post-DOPS) at interval of 1 month from the second DOPS encounter, trainees were finally assessed again using same scoring sheet and post-DOPS mean scores of all the trainees were obtained. At the end, the trainees' and the faculty' perception regarding feasibility and acceptability of DOPS were obtained by means of structured questionnaire<sup>5,8-9</sup>. The questionnaire consisted of combination of closed and open-ended questions.

The data were analysed using S.P.S.S version 21.0. The scores per DOPS encounter of all the trainees were recorded and presented in form of mean and standard deviation. The pre-DOPS and post-DOPS mean scores of all the trainees were compared using paired t-test. A p-value of < 0.05 was considered as statistically significant and in such significant cases, the intervention of DOPS was considered as effective.

## RESULTS

Twenty orthodontic trainees were part of this research. Ten (50%) trainees were in third year, while 10 (50%) trainees were in final year of orthodontic training. Initially in the first DOPS encounter (Pre-DOPS), trainees were assessed using DOPS scoring sheet and pre-DOPS mean scores of all the trainees were obtained (Table 1, Figure 1). This first DOPS encounter was followed by second DOPS encounter at interval of 1 month, with focus of skill improvement by providing immediate feedback using same scoring

sheet. At the end, the third DOPS encounter (Post-DOPS) was conducted at interval of 1 month from the second DOPS encounter, trainees were finally assessed again using same scoring sheet and post-DOPS mean scores of all the trainees were obtained (Table 1, Fig. 1).

The results at post-DOPS showed significant improvement in overall skill to perform mini-implant insertion as compared to the first DOPS encounter (Pre-DOPS) (Table 2, Fig. 1).

Results about trainee's and faculty' perception regarding feasibility and acceptability of DOPS showed that there was no statistically significant difference between both and they appeared to be acceptable and feasible to both. All the faculty members and trainees perceived that these DOPS exercises resulted in improved performance of trainees because of discussion of strengths and weakness in formative feedback sessions.

Table 1: Performance of orthodontic trainees at 2 DOPS encounters. (n= 20)

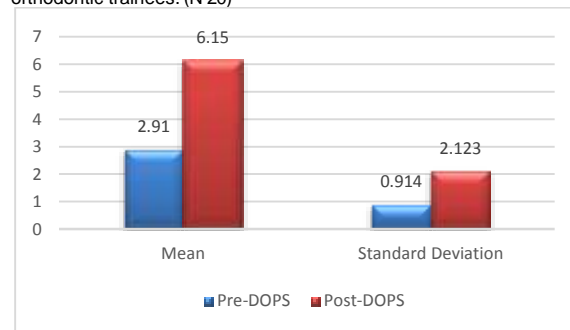
DOPS encounter	Mean	St. Deviation (SD)
Pre-DOPS	2.91	0.914
Post-DOPS	6.15	2.123

Table 2: Comparison of Pre-DOPS and Post-DOPS performance of orthodontic trainees for mini-implant insertion. (n= 20)

Comparison	Pre-DOPS – Post-DOPS encounter
Mean difference	-4.213
Difference in SD	2.013
P value	0.001*

\*P-value of < 0.05 statistically significant.

Figure 1: Comparison graph of Pre-DOPS and Post-DOPS performance of orthodontic trainees. (N 20)



## DISCUSSION

Keeping in view the principles of adult learning and self-regulated learning, DOPS is one of the useful tools to teach and evaluate procedural skills of trainees in real time hospital setting by direct observation followed by constructive and structured feedback by concerned supervisors.<sup>3</sup> DOPS shows a remarkable level of learning which is also evident by Miller's pyramid as the top of the pyramid demonstrates that the trainee has the potential to assess all four levels<sup>3</sup>.

CPSP is training and sensitizing supervisors about DOPS and mini-CEX by introducing these tools in some postgraduate medical specialties for competency assessment,<sup>4</sup> but it still needs to be incorporated the specialty of orthodontics as done in developed parts of the world shown by literature.<sup>13,14</sup> DOPS has potential not only as an assessment tool but also as a learning tool in dentistry.<sup>13</sup>

The results of the present study showed significant improvement in overall skill to perform mini-implant insertion after the exercise of DOPS. The significant improvement in skills can be linked to the second DOPS encounter at interval of 1 month from the pre-DOPS, with focus of skill improvement by providing immediate feedback. The results are in accordance with the other studies on DOPS in undergraduate orthodontics and dentistry that reports that DOPS enhances learning and clinical performance.<sup>5-9,15-17</sup> The metanalysis by Lorwald et al also proved that constructive

educational role of DOPS on the performance of students.<sup>18</sup> Furthermore, literature shows that knowledge, skills and attitudes get better measures in DOPS where learning environment is real and authentic workplace-based situations than traditional assessment systems of OSCE/TOACS, and long or short cases, where learning environment is usually artificial and controlled<sup>18</sup>.

Results also showed that DOPS was found to be acceptable and feasible to both the faculty and trainees. All the faculty members and trainees perceived that DOPS resulted in improved performance of trainees because of formative feedback sessions and creation of directly supervised learning environment. This is consistent with the other studies that showed that contextual feedbacks at the end of DOPS plays a significant role in skill enhancement.<sup>8,15,19</sup> However, it should be noted that DOPS require a lot of support from all the stakeholders<sup>19</sup>.

Kundra and Singh in their study on DOPS showed that DOPS is a feasible and acceptable tool as it enhances learning and skills of postgraduate dental residents because of feedbacks.<sup>20</sup> Singh et al also showed that DOPS can be implemented for assessment of dental students as DOPS was found to be having good feasibility and acceptability.<sup>16</sup> The metanalysis by Lorwald et al also showed positive educational impact of DOPS due to valuable and critical feedbacks at end of DOPS<sup>18</sup>. The structured feedbacks also includes an action plan for improvement of future clinical performance.

The present study on DOPS used American board of orthodontics' DI to select orthodontic cases of similar complexity and difficulty to make the DOPS assessment as standardized as possible. But it should be noted that this index is an objective method to find out the complexity of orthodontic cases and it does not cover certain cases e.g. impactions and there is no proper method to objectify complexity of orthodontic cases<sup>21</sup>.

The implications of this study are that it has generated the evidence that will justify and strengthen the use of DOPS in postgraduate orthodontic training for enhancing longitudinal skills of trainees, for improvement and standardization of orthodontic training programs across the country; and ultimately enhancement of orthodontic patient care. DOPS should be implemented in orthodontics as a method of formative and summative assessment in the postgraduate CPSP'S curriculum of orthodontics as DOPS can be conducted in outpatient orthodontic clinics with no further financial implications. Feedback further authenticate feasibility of DOPS from both trainers' and trainees' perspective. Having established the above, Post-graduate training Orthodontics programs can identify other procedures to be used for DOPS and other WBAs.

**Limitations:** There are several limitations of this study such as, the study was single centric study, involved residents of third and final year only with small sample size, the external validity and ability to generalize the findings of this study may not be possible due to small sample size, it involves testing of just one WBA tool only i.e. DOPS, the design is quasi-experimental, it involves testing of just one procedural skill of mini-implant insertion, the number of DOPS encounters, and, the difficulty to ensure standardization in patient selection.

## CONCLUSION

DOPS is effective tool for assessing and improving the mini-

implant insertion procedural skills of postgraduate orthodontic trainees.

**Conflict of interest;** None to declare

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