

## Comparison between undergraduate dental students' self-assessment of pre-clinical crown preparation and assessment by two tutors.

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**Abstract:** Background: The ability of undergraduate medical sciences students to self-assess is a critical skill, which all health professionals must master. Aim: The aim of this study was to compare the students' self-grading versus tutors' grades and to assess inter-examiner grade variation in preclinical crown preparations of plastic teeth. Materials and Methods: A cross sectional study among fifty 4<sup>th</sup>-year undergraduate dental students, at semester 7 (2014-2015), at the University of Medical Sciences and Technology, Sudan; and two tutors from the department of restorative dentistry with differing years of experience. Each student prepared a crown of porcelain fused to metal on a plastic molar. After one week students were asked to rate their preparation using the "glance-and-grade" marking system, out of 20 marks. The two examiners also assessed the preparation separately by the same method. A comparison between different variables was done by paired sample t-test and Person's correlation test with the level of significance set at  $p$ -value $\leq$ 0.05. Results: The mean of students self-grading (13.4 $\pm$ 3.37) of the prepared teeth was higher than the mean grades (12.0 $\pm$ 3.67) of the junior tutor ( $p$ =0.007) and moderate correlation (0.376). The mean of students self-grading is much higher than the mean grades (9.64 $\pm$ 3.37) by the senior tutor ( $p$ =0.001) and with moderate correlation (0.450). Comparison between the grades means of the prepared teeth by the two tutors revealed statistical significant different ( $p$ =0.000) and strong correlation (0.647). The overall mean grades (10.82 $\pm$ 5.25) by the two tutors and self-grading (13.40 $\pm$ 3.375) by the students were statistically significantly different ( $p$ =0.00). Conclusion: Students tended to grade their preparations of porcelain fused to metal crowns on plastic teeth higher than tutors. Inter examiner variation in grading were observed between the junior and senior tutors. Training students in self-assessment methods and the setting of criteria by the faculty is recommended.

**Keywords:** Dental education; prosthodontics; students self-assessment; skill; learning.

### INTRODUCTION.

Assessment is an integral part of the educational process at any level and in any discipline. Self-assessment is not new and in fact has been of interest to researchers for decades; yet adoption into educational settings, such as dental education in this case, has been slow at best.<sup>1</sup> Self-assessment is an essential and crucial tool in building today's health care professionals.<sup>2</sup> Dentists and dental students, in particular, practice largely as self-regulating, solo practitioners, lifelong self-directed learners, and self-regulating practitioners, making self-assessment critical to their success.<sup>3,4</sup>

Self-assessment skills are rarely taught and the ability to self-assess is seldom tested.<sup>1</sup> A dental student not only has to understand the biology, physiology and pathology of the oral structures but also has to develop psychomotor skills like good hand-eye coordination and the ability to visualize three dimensional objects in fine detail.<sup>5</sup> Understanding the evaluation criteria, being able to visualize the ideal and being able to evaluate against the ideal are skills that need to be developed.<sup>6</sup>

Proper tooth preparation is fundamental for accomplishing successful fixed partial denture work.<sup>7</sup> Clinical crown preparation is a critical task in dentistry as it sometimes involves healthy non-defective teeth, which may be used as abutments for fixed partial dentures. In preclinical practice, dental students use manikins that have synthetic teeth and cheeks, to learn the technical skills prior to treating actual patients.<sup>8</sup> Gaining psychomotor skills in crown preparations involves a long training process during preclinical phase, which should result in students competent to treat patients in a safe manner.

In dental education, self-assessment is widely accepted as a best practice and is performed after preclinical projects or clinical procedures, for both formative and summative activities.<sup>9</sup> Unfortunately, studies on self-assessment have been largely pessimistic, with many reports finding that the ability to self-assess was generally poor, with low performers overestimating their abilities and high performers underestimating theirs.<sup>10,11</sup>

At the Faculty of Dentistry at the University of Medical Sciences and Technology (UMST), Sudan, students' self-assessment has not yet been adopted into the curriculum. Simultaneously, the "glance-and-grade" system, which is a subjective method of grading employed by the faculty staff is the only method used for formative and summative assessment.

No previous studies have been conducted to assess the ability of undergraduate dental students from Sudan in self-assessment of restorative or prosthodontics preclinical psychomotor skills. The purpose of this study was to compare the student's self-grading in preclinical crown preparation with experienced examiner's grades and to assess inter examiner variations in the grading system.

## MATERIALS AND METHODS.

A cross-sectional institutional based study among undergraduate students at the Faculty of Dentistry, University of Medical Sciences and Technology (UMST), Sudan. The study was conducted at the end of semester 7 (mid fourth year) during preclinical fixed Prosthodontic course (2014-2015), after completion of the requirements of preclinical tooth preparation on plastic teeth. The total number of the students was 50 (13 males and 37 females) ranging in age 20 to 21-years-old. All 50 students participated voluntarily and they signed informed written consent. The study was approved by the Ethical Committee of the UMST, Sudan.

Two tutors participated in the assessment; one junior, with one year of teaching experience, and a senior one with over 10 years of teaching experience. Both the students' and examiners' grades were recorded on a check list on a predesigned evaluation form. An attempt was made to cover all aspects of tooth preparations within the form following the principles stated by Rosenstiel *et al.*,<sup>12</sup> and Shilengberg *et al.*<sup>13</sup> A maximum score of 20 marks and a minimum of zero for each evaluator per tooth. The criteria for scoring included the grades for occlusal reduction, axial reduction, proximal contact, taper and finish margins placement as shown in Table 1. This modified type of grading system has been adopted from studies done by Cho *et al.*,<sup>5</sup> and Habib *et al.*<sup>6</sup>

The students prepared one plastic molar tooth for full coverage with a porcelain fused to metal crown within the allocated time of 40 minutes. The dental simulation units (KaVo Dental GmbH, Germany), (manikin's heads) and cutting diamonds (Switzerland) were used by all the students, in order to standardize and eliminate any confounding factors.

After completion of the preparations each tooth was kept in plastic pouch with the students' index number. The following week at the beginning of the practical session students were asked to grade their preparations using the form provided, within ten minutes. Two faculty staff members specialized in fixed prosthodontics also assessed the preparations by the same method and form. One of the researchers (co-author EAA) who was not involved in the assessment organized the grading system to blind the examiners.

**Table 1.** Form with criteria used for scoring the prepared tooth  
 (Max. Score = 20) according to prepared surface, taper and finishing line placement.

Surface	Criteria	Score	Grades
Occlusal reduction	Clearance, depth, contour, beveling	4	
Axial reduction	Two plains, inclination, undercut, beveling	4	
Proximal reduction	Touch neighboring tooth, follow gingival contour, conservative, nearly parallel wall	4	
Taper	Angles of convergence, conservation of tooth structure	4	
Finish margins placement	Position, follow gingival contour, type of finishing line, angles of finishing line	4	
<b>Total</b>		<b>20</b>	

**Table 2.** Comparison of mean grades of the two examiners *versus* students.

Evaluators	No. of teeth assessed	Min. grades	Max. grades	Mean (grades) ± SD	Pearson's Correlation	p-value
Tutor 1	50	6	20	12.00±3.670	0.376*	007**
Students	50	6	19	13.40±3.375		.
Tutor 2	50	2	18	9.64±3.379	0.450*	001**

Min: Minimum. Max: Maximum. SD: Standard Deviation. \*: Moderate correlation. \*\*: Highly significance.

**Table 3.** Inter-examiners comparison of mean grades for prepared teeth by paired sample statistics.

Examiner	Mean ± Std.	Pearson's Correlation	p-value
Tutor 1	12.00±3.670	0.647	0.000
Tutor 2	9.64±3.379		

All grades were entered and analyzed by SPSS version 16 (SPSS Inc., Chicago, IL, USA). Analysis included the mean values and standard deviations for the grades from students and from the two examiners. Comparisons between different variables was done by Paired Sample T-test and Pearson's Correlation Coefficient. The level of statistical significance difference was set at  $p < 0.05$ .

## RESULTS.

All 50 students of batch 16 (fourth year- 2014-2015) participated in this study, with a response rate of 100%. The difference between the means of grades by students and the grades by the two tutors was statistically significant as displayed in Table 2. It was observed that senior examiner, who is the most experienced, performed an evaluation with a lower score assignment compared to the junior examiner, with a significant difference, as shown in Table 3.

The overall grading results mean (10.82±5.25) by the two tutors and mean grades (13.40±3.375) by the students, were statistically significant ( $p=0.00$ )

## DISCUSSION.

The primary goal of the preclinical training course is to develop the students psychomotor skills needed for clinically preparing patients teeth to receive artificial crowns or retainers so as to restore aesthetics and function. Students' improved abilities to perform self-assessment of their psychomotor skills should facilitate their attainment of the desired outcomes.<sup>14</sup> "Glance-and-grade" assessment (based on principles taught for tooth preparation to receive a porcelain fused to metal crown) was used by the students and by the tutors in this study. Accurate self-assessment is the ability to accurately assess one's own strengths and weaknesses and is fundamental to self-directed lifelong learning and to continued competence in the health professions.<sup>5,15</sup> From the results, it appears that the students were unable to assess their own preparations realistically compared to the tutors, who are considered to be the experts in this domain. Although previous research suggests that self-assessment of practical skills tends to result in high accuracy,<sup>1</sup> our students tended to overrate themselves compared to the examiners assessment.<sup>6,9,16,17</sup>

Our results show inconsistency among examiners (junior *versus* senior tutor) in regards to the grading of the prepared teeth. The reasons for these discrepancies in self-assessment and tutors' assessment may include not understanding the taught material, self-deception, lack of clear criteria, and not to the clinical performance *per se*.<sup>1</sup>

Also the calibration among examiners which is often overlooked may be the reason for such discrepancies. The two examiners were not intentionally calibrated in this study, as one of the objectives was to test the difference in assessing according to years of experience, and the results of the study indicates a relationship exists.

It is not simple to establish evaluation methods for the students' technical performance during preclinical practice, but the objective method employed in the present study could possibly solve some of the issues related to the subjective methods. The different evaluations methods (self-assessment and tutors' assessment) can help students to improve their understanding of certain principles and improve the teaching effectiveness in the field of fixed prosthodontics.<sup>5</sup>

One of the strengths of this study was its unbiased evaluation; since the junior tutor (Tutor 1) supervised the students during their preclinical course, they conducted the scoring first. The senior tutor (Tutor 2), who assessed the preparations second, is senior lecturer who taught the students the didactic and theoretical material. Tutor 2 acted as an external examiner and the results reflected real

differences in assessments when compared to the junior tutor and the students. The limitation was that assessment by these traditional methods possesses a significant subjectivity problem; the introduction of newer electronic computed devices recently aim to provide objectivity.

Although this application has recently been successfully implemented in several educational environments focusing on prosthetic dentistry,<sup>18</sup> and operative dentistry,<sup>19</sup> it still requires further development before an ideal assessment tool is created.<sup>20,21</sup>

This was the first study in this university that assessed students self-grading on tooth preparations; without previous training, as the ability of self-assessment requires faculty experts for the development of appropriate and valid criteria, and for the guidance of students on the how and why of the criteria.

In addition, this study took place at one dental school and with only one group of students, so the findings cannot be generalized to others.

## CONCLUSION.

Students tended to grade their teeth preparations in preclinical fixed prosthodontic higher compared to the tutors' grades. Inter examiner variation in the grades existed between tutors. Subjectivity of the self-assessment method, difficulties in tutors' calibration warrant further training of the students and staff members with a set of clear criteria for assessment.

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