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ORIGINAL ARTICLE

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Self-assessment skills of undergraduate dental students in the preclinical course of complete removable prosthodontics at Tehran University of Medical Sciences

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Abstract

Introduction: This study evaluated the self-assessment skills of third-year dental students regarding their performance in complete removable prosthodontics (CRP) preclinical course.

Methods and Materials: This cross-sectional study was conducted on all third-year dental students attending the International Dental College of Tehran University of Medical Sciences. The students were requested to self-assess their performance in primary impression making, custom tray fabrication, border moulding, final impression making, master cast fabrication, record-base fabrication and tooth arrangement in CRP preclinical course. The performance of dental students in each step was scored by themselves and their mentors. Data were analysed by the Mann–Whitney *U*, Pearson's correlation and *t*-tests ($\alpha = 0.05$).

Results: Totally 25 male (55.6%) and 20 female (44.4%) dental students were evaluated. Significant differences were noted between male and female dental students in self-assessment scores regarding adequate extension of the custom tray ($p = .027$), the correct position of tray handle ($p = .020$), visibility of vestibular width and depth on the cast ($p = .011$), the coincidence of upper and lower midlines ($p = .005$) and correct orientation of maxillary and mandibular planes in the articulator ($p = .036$). The mean self-assessment score of female students was significantly higher than that of male students ($p = .01$). The scores given by the mentors were not significantly different for male and female students ($p = .975$). The difference between the self-assessment score of students and the mentor score was not significant ($p = .067$) either in males or in females ($p > .05$).

Conclusion: Undergraduate dental students favourably self-assessed their performance in all steps of the preclinical course of CRP, comparable with their mentor assessment.

KEYWORDS
dental education, removable prosthodontics, self-assessment

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1 | INTRODUCTION

Edentulism results from dental caries, periodontal disease, trauma, or oral cancer. Complete dentures are one of the most common treatment options for fully edentulous patients to rehabilitate their comfort, function and aesthetics in the maxilla, mandible, or both jaws.[1]

Fabrication of a complete denture has several clinical steps and laboratory processes; only if all steps are performed correctly would the denture have a precise fit.[2] Considering the high prevalence of edentulism,[3] and the significance of complete denture treatment for rehabilitating edentulous patients, dental students are expected to acquire knowledge, skills and proficiency in the fabrication of complete dentures.

In dental educational curricula, students receive both structured preclinical training and clinical courses in CRP.[4] In preclinical CRP courses, the emphasis is on learning primary impression making, custom tray fabrication, border moulding, final impression making, master cast and record base fabrication, tooth arrangement and denture processing.[5]

Assessment of the quality of performance of dental students during their education is often performed at the mid-term or at the end of each semester by the mentors.[6] In preclinical courses, student performance is predominantly measured by instructors and formative or summative feedback is provided to them. This is the traditional way of assessment, and peer assessment or self-assessment are less common methods.[7] A previous study showed that dental students often consult their instructors to assess the quality of their performance in preclinical courses instead of self-assessing their practice. Nonetheless, self-assessment skills are imperative for efficient and active learning and improved training.[8,9] Different assessments (self-assessment and mentor assessment) can help students to improve their understanding of treatment principles and enhance the efficiency of dental instruction.[10]

The self-assessment method, through which the required level of proficiency is measured based on the perception of students from their performance, is a necessary skill for the lifelong learning of dental clinicians.[2,5] All dental clinicians should be able to self-assess their proficiency and competence reliably and accurately for a successful career and improved performance.[10,11] Thus, it appears to be a fundamental skill for the self-improvement of dental students.[7]

Developing self-assessment skills in students can improve the outcome of oral health promotion programs. Accordingly, the Commission on Dental Accreditation announced that dental graduates should be able to efficiently self-assess their practice.[12] Competency self-assessment surveys, designed to measure impressions of students' educational experience, are considered a key component of monitoring the quality of academic programs.[13]

Furthermore, understanding the criteria, precise observation and superior assessment skills are all required for self-assessment.[5] Self-assessment is believed to be influenced by some predefined criteria, test scores and assessment by the instructors.[11] Dental students often have better self-assessment skills in clinical courses.[10] However, self-assessment by students can be employed to assess the technical skills of novice dental students in preclinical courses.[9]

Considering the critical role of self-assessment in the improvement of learning efficiency, this study aimed to assess the self-assessment skills of third-year dental students regarding their performance in the CRP preclinical course at the International Dental College of Tehran University of Medical Sciences.

2 | METHODS AND MATERIALS

This cross-sectional study was carried out on third-year (5th term) dental students of the International Dental College of Tehran University of Medical Sciences in 2017. The study was approved by the university's ethics committee (IR.TUMS.DENTISTRY.REC.1397.133).

The undergraduate dental curriculum of Tehran University of Medical Sciences, including theoretical and practical courses regarding complete removable prosthodontics, is presented in Table 1.[14] The preclinical course of complete removable prosthodontics was involved in this study.

A researcher-designed questionnaire in the form of a checklist with specific evaluation criteria for each step was used for data collection (Table 2). The questionnaire, including 27 questions, was designed using learning objectives stated in the course's lesson plan and based on the educational curriculum approved by the Iranian Ministry of Health and Medical Education, the related textbooks and scientific literature. To assess the content validity of the questionnaire, three faculty members of the Prosthodontics Department of the International Dental College of Tehran University of Medical Sciences were requested to rate each question according to a 3-point scale of 'necessary', 'beneficial but not necessary' and 'not necessary'. Finally, questions that did not achieve the required score were removed from the questionnaire.

After confirming the validity of the questionnaire, it was distributed among all dental students in the 3rd year ($n=45$) who took the CRP course and were familiar with the criteria from previous instruction. The steps to rate included primary impression, custom tray fabrication, border moulding, final impression, master cast and record base fabrication, tooth arrangement and denture processing. In Table 2, the evaluation criteria related to each step are illustrated.

Participation of students in the study was voluntary, and they signed informed consent forms before participation. After conducting each step, the students were allowed 10 min to rate their performance according to the self-assessment criteria for each work step. The students filled out the questionnaire and rated their performance in each item using a four-point scale of 'excellent', 'good', 'moderate', 'weak' and 'I cannot rate my performance in this item' scored as 4, 3, 2, 1 and 0 respectively. The total self-assessment score was calculated as the sum of scores given to each item out of 108.

Two faculty members also rated students' performance. They were trained on how to score students' performance in each item

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TABLE 1 Theoretical and practical courses of complete removable prosthodontics at dental school of Tehran University of Medical Sciences.

Course name	Credit	Term
Preclinical Course of Complete Removable Prosthodontics	2	5
Clinical Course of Complete Removable Prosthodontics 1	2	6
Clinical Course of Complete Removable Prosthodontics 2	2	9
Theoretical Course of the Treatment of Completely Edentulous Patients	1	8
Theoretical Course of Complete Removable Prosthodontics	1	6

TABLE 2 Detailed description of items rated in the checklist.

How do you rate your performance in ***Primary Impression*** step for each evaluation criteria?	• Proper tray selection • Optimal alginate thickness (3–5 mm) • Uniform alginate thickness
How do you rate your performance in ***Custom Tray Fabrication*** step for each evaluation criterion?	• Adequate extension (2-3 mm shorter than the vestibular depth) • Adequate coverage of ridges with special tray • Appropriate location of tray handle • Appropriate shape, size and thickness of tray handle
How do you rate your performance in ***Border Moulding*** step for each evaluation criterion?	• Appropriate extension of borders • Correct recording of all vestibules • Correct recording of PPS (Posterior Palatal Seal) area
How do you rate your performance in ***Final Impression*** step for each evaluation criterion?	• Appropriate mixing of impression material • Complete coverage of border moulded areas • Absence of voids
How do you rate your performance in ***Master Cast Fabrication*** step for each evaluation criterion?	• Recording all denture areas (ridges and vestibules) • Optimal width and depth of vestibule visible on the cast • Absence of voids
How do you rate your performance in ***Record Base fabrication*** step for each evaluation criterion?	• Optimal relief and block-out of master cast • Filling the sulcus (appropriate thickness and extension) • Firmness and stability
How do you rate your performance in ***Tooth Arrangement*** step for each evaluation criterion?	• Tooth selection • Coincidence of upper and lower midline • Correct anterior and posterior overjet and overbite • Correct orientation of planes in the articulator • Optimal maximum intercuspation
How do you rate your performance in ***Denture Processing*** step for each evaluation criterion?	• Appropriate contour of smooth surfaces • Adequate thickness of borders • Absence of sharp edges

and were provided with the checklist mentioned above. The performance of students was rated by the mentors anonymously and based on their student numbers to prevent bias. Scoring by the mentors was independent of self-assessment by students. Calibration of faculty is of paramount importance for the evaluation process, as described by SL Oh.[15] Therefore, the two mentors were also calibrated before scoring, and each scored students' performance independently. In case of disagreement, the issue was discussed until a consensus was reached. The mentor-assessment score was calculated as the sum of scores given to each item out of 20.

2.1 | Statistical analysis

Data were analysed by SPSS version 25. The Kolmogorov–Smirnov test was used to assess the normality of data distribution. Comparisons were made using the Mann–Whitney *U* and *t*-tests. Pearson's correlation test was applied to analyse the correlations. $p < .05$ was considered statistically significant.

3 | RESULTS

A total of 45 dental students—25 male (55.6%) and 20 female (44.4%)—responded to the questionnaire. Table 3 presents the frequency and percentage of student responses to the self-assessment questionnaire.

In the primary impression step, a total of 91.1% to 93.3% of students declared excellent and good scores regarding all evaluation criteria. However, 6.7% and 8.9% of students selected moderate scores in tray selection and alginate thickness, respectively.

In the border moulding step, approximately one-third (26.6%–33.3%) of students' scores ranged from 0 (I cannot rate) to 2 (moderate). In an appropriate extension of borders, the total percentage of

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TABLE 3 Frequency distribution of student responses to self-assessment questionnaire.

		Excellent		Good		Moderate		Weak		I cannot rate	
Step	Item	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Primary impression	Proper tray selection	14	31.1	28	62.2	3	6.7				
	Optimal alginate thickness	20	44.4	21	46.7	4	8.9				
	Uniform alginate thickness	18	40	23	51.1	4	8.9				
Custom tray fabrication	Adequate extension	11	24.4	25	55.6	9	20				
	Adequate coverage of ridges	12	26.7	26	57.8	7	15.6				
	Appropriate location of tray handle	13	28.9	22	48.9	10	22.2				
	Appropriate shape, size and thickness of tray handle	12	26.7	21	46.7	10	22.2	2	4.4		
Border moulding	Appropriate extension of borders	7	15.6	22	48.9	14	31.1	1	2.2	1	2.2
	Correct recording of all vestibules	10	22.2	23	51.1	10	22.2	1	2.2	1	2.2
	Correct recording of PPS area	7	15.6	23	51.1	11	24.4	4	8.9		
Final impression	Absence of voids	10	22.2	22	48.9	12	26.7	1	2.2		
	Complete coverage of border moulded areas	9	20	27	60	6	13.3	3	6.7		
	Appropriate mixing of impression material	19	42.2	22	48.9	3	6.7	1	2.2		
Master cast fabrication	Recording denture areas	14	31.1	28	62.2	3	6.7				
	Absence of voids	11	24.4	26	57.8	8	17.8				
	Optimal width and depth of vestibule visible on the cast	14	31.1	22	48.9	8	17.8	1	2.2		
Record base	Filling the sulcus	17	37.8	20	44.4	8	17.8				
	Firmness and stability of denture	16	35.6	20	44.4	8	17.8			1	2.2
	Optimal relief and block-out of master cast	20	44.4	16	35.6	9	20				

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TABLE 3 (Continued)

Step	Item	Excellent		Good		Moderate		Weak		I cannot rate	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Tooth arrangement	Tooth selection	19	42.2	22	48.9	4	8.9				
	Coincidence of upper and lower midline	21	46.7	18	40	6	13.3				
	Correct anterior and posterior overjet and overbite	10	22.2	26	57.8	9	20				
	Correct orientation of planes in the articulator	13	28.9	21	46.7	11	24.4				
	Maximum intercuspation	12	26.7	25	55.6	8	17.8				
Denture processing	Appropriate contour of smooth surfaces	19	42.2	21	46.7	4	8.9			1	2.2
	Adequate thickness of borders	19	42.2	21	46.7	4	8.9	1	2.2		
	Absence of sharp edges	27	60	18	40						

good and excellent scores was 64.5% which was the lowest among all evaluation criteria of the questionnaire.

In the final impression step, although a total of 71.1% to 91.1% of responses was excellent and good scores, 26.7% of students declared moderate scores in the absence of voids, and 6.7% of them selected weak scores regarding complete coverage of border moulded areas.

The mean self-assessment score of students was found to be 58.02 out of 108. According to the Mann–Whitney *U* test, the mean self-assessment scores by students were significantly different in males and females in the adequate extension of the custom tray ($p = .027$), proper location of tray handle ($p = .020$), optimal visibility of vestibular width and depth on the master cast ($p = .011$), the coincidence of upper and lower midlines ($p = .005$) and correct orientation of maxillary and mandibular planes in the articulator parallel to the horizon ($p = .036$).

The overall mentor-assessment score was 16.31 (range 7 to 18.5) out of 20. Table 4 presents male and female dental students' mean self-assessment and mentor assessment scores. According to the *t*-test, the mentor assessment scores were not significantly different for male and female students ($p = .975$). However, the mean self-assessment score of female students was significantly higher than that of male students ($p = .01$). The Pearson's correlation test showed no significant difference between the self-assessment and mentor scores in females ($r = .066$, $p = .756$) and males ($r = .433$, $p = .056$).

4 | DISCUSSION

In dental education, which is based on experimental learning, clinical skills are instructed by an apprentice approach.[16] To improve self-directed learning, it is essential to engage students in the learning process actively. Self-assessment provides students with an opportunity to develop reflective skills, and students are required to build the capability to recognize, understand and learn from their errors.[12] Mays et al. suggested self-assessments should be started in the earliest possible preclinical experiences and continued in clinical courses using a similar structure to improve the predictive value of self-assessment.[12]

This study aimed to evaluate the self-assessment skills of third-year dental students regarding their performance in the CRP preclinical course at the International Dental College of Tehran University of Medical Sciences. The present results showed that the mean self-assessment score of students regarding their performance in the CRP preclinical course was relatively low (58.02 out of 108). Yazdani et al.[17] evaluated the professional skills of last year's dental students by self-assessment method and reported that dental students declared optimal skills in prosthodontics and acquired a self-assessment score of 60.3 out of 100. In their study, participants passed all theoretical, preclinical and clinical prosthodontics courses. However, the current study was conducted on third-year students who took CRP preclinical courses. This difference may be due to differences in students' level of experience, self-assessment

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TABLE 4 Mean scores of self-assessment and mentor assessment for male and female students.

Score	Gender of students	Number	Mean and std. deviation	*p* value
Mentor assessment	Female	20	16.300 ± 2.582 (out of 20)	.973
	Male	25	16.320 ± 1.223 (out of 20)	
Self-assessment by students	Female	20	61.600 ± 9.695 (out of 108)	.010
	Male	25	54.440 ± 8.041(out of 108)	

methods and learning quality, which can all affect the clinical proficiency of dental students.

In the present study, the highest total percentage of excellent and good scores was related to the elimination of sharp edges in the denture processing step (100), followed by appropriate tray selection for the primary impression and recording all denture-base areas in the final impression step (93.3). The highest score reported for the elimination of sharp edges may be due to students' concerns regarding tissue damage by a sharp edge. On the other hand, the lowest total percentage of excellent and good scores was declared in the border moulding step, and it was related to the appropriate extension of borders (64.5) and correct recording of the PPS area (66.7). The absence of buccal and lingual soft tissues and vestibules made it impossible to perform border moulding functions and the absence of the PPS area on the mannequin, which should be considered for the posterior extension of the denture, may be the reason.

In the present study, no significant difference existed between the self-assessment and mentor-assessment scores, which indicates that dental students favourably self-assessed their competency and performance in CRP preclinical course, comparable with the assessment done by the mentors. Kirov et al.[10] reported that dental students overestimated their performance in CRP preclinical courses. However, they demonstrated that students in clinical courses often underestimated their clinical skills. Clinical dental procedures are often difficult for novice dental students, who often become more responsible for performing irreversible clinical procedures.[10] In another study conducted by Habib and Sherfudhin,[18] it was demonstrated that the self-assessment score of students regarding their performance in the CRP preclinical courses was higher than the mentor assessment score, which was different from the present results. This difference may be due to different modes of assessment or different academic rankings of students in the two studies. Moreover, students not understanding what is expected of them contributes to inaccuracies in self-assessment.[19] Failure of the students to appropriately use the evaluation criteria, but instead inject more of their feelings about their performance, is another justification for self-assessment imprecision.[12]

In the present study, gender significantly affected the mean self-assessment scores. Female students gave significantly higher scores for their performance than males. This result was in contrast to the findings of some previous studies. Jabarifar et al.[20] reported equal clinical skills of male and female dental graduates. Yazdani et al.[17] showed that gender had no significant effect on students' proficiency. On the other hand, investigating the impact of gender on the accuracy of self-assessment in operative preclinical dentistry, Kornmehl et al. demonstrated that both genders overestimated their performance compared with mentor-assessment scores and males overestimated more significantly than females for Class II Amalgam preparation.[21] Additionally, in other healthcare training settings, previous studies considering gender influence on self-assessment demonstrated that female medical students and surgical residents underestimate their performance more often than their male counterparts.[22–24]

It should be noted that self-assessment may be inherently associated with social desirability bias.[25] Cultural background and personal characteristics can also affect self-assessment. For instance, self-confidence can affect the results of self-assessments and their accuracy. However, enhanced knowledge and practice increase self-confidence, and the ultimate goal of acquiring clinical skills is to reach an acceptable level of proficiency and confidence.[17] Puryer et al.,[26] Davey et al.,[27] and Horri et al.[28] reported that dental students succeeded in achieving their educational goals as they passed more courses. Bagherzadeh et al.[29] also showed that students' self-confidence could predict their clinical assessment scores. It appears that dental students' self-confidence is directly correlated with their clinical expertise. Training dental students increases their clinical expertise and, subsequently, their self-confidence in managing patients. It is imperative for dental students to have an accurate self-assessment of their clinical proficiency and related self-confidence and also seek post-graduation education to update their knowledge and skills.[26] Moreover, self-representation determines how students react to and process information about themselves.[30] Internal representation of some students' abilities is well developed, and they do not encounter the reality of their skills. Gradually, these self-representations increase resistance to change when inconsistent or contradictory feedback is obtained.[30] Furthermore, Cho et al.[5] and Gordon[11] reported that high-ranked students believed that they had a poorer performance while lower-ranked students believed that they had a superior performance. Students with superior performance were more conservative in their self-assessment, which means that more successful individuals judge themselves with more strict standards. Instead of comparing themselves with their peers, they often compare their performance with their potential.[5]

Based on the current results and preexisting evidence, self-assessment skills should be incorporated into the undergraduate dental curriculum by providing an educational environment through which students are motivated to understand their mistakes and actively improve learning and performance.[7,31]

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It is important to note that there are some limitations in our study. First, we did not employ subgroup analysis in regard to the performance status of students (high vs. poor performers). Second, the total number of participants in this survey was relatively low and conducted in a single dental school. Further studies with larger sample sizes and multi-institutional designs are recommended to confirm the generalizability of the current results.

5 | CONCLUSION

Considering the pivotal role of students' self-assessment ability in undergraduate dental education, the results of this study revealed that students could favourably evaluate their performance in all steps in the preclinical course of complete removable prosthodontics, comparable with their mentor assessment. The improved self-assessment ability would lead to enhanced reflective skills, self-directed learning, and improved clinical performance.

CONFLICT OF INTEREST STATEMENT

Hooriyeh Gholami, Mahnaz Arshad, Mohammad Javad Kharazifard, Rezvaneh Ghazanfari declare that they have no conflict of interest.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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