



General Self-Efficacy and Self-Perceived Confidence of Dental Students in Performing Orthodontic Clinical Skills

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Abstract

Background: Evaluating the self-perceived confidence of students in their abilities to provide orthodontic services is crucial to measuring the effectiveness of the orthodontic curriculum.

Objectives: The purpose of this study was to investigate the relationship between general self-efficacy (GSE) in dental students and self-perceived confidence in performing orthodontic clinical skills.

Methods: A total of 100 dental students in their final-year at Shiraz University of Medical Sciences participated in the study in February 2017. They responded to a multiple-choice questionnaire consisting of two parts. The first part evaluated the students' self-perceived confidence in performing orthodontic clinical skills and the second part evaluated the students' GSE. The correlation between the two parameters was evaluated using the Spearman correlation test with an alpha level set at 0.05.

Results: More than 20% of the students reported being "not yet confident" in 8 out of the 18 skills evaluated. There was a medium correlation between the students' confidence in performing clinical skills and their GSE. There was no correlation between the students' grades in theoretical courses and their GSE scores ($P > 0.05$). The students' confidence in all aspects of clinical skills, however, was correlated with their grades.

Conclusions: The students' self-perceived confidence in performing orthodontic clinical skills is moderately correlated with their GSE; other factors such as exposure to orthodontic cases, and teaching methods seem to play a more influential part in their confidence.

Keywords: Orthodontics, Clinical Skills, Dental Education, Self-Efficacy, Self-Confidence

1. Background

Orthodontic treatment can potentially be included in a generalist practice; a major objective of dental curriculums has been to prepare the students to handle diagnosing and treatment planning for the less severe orthodontic problems.

Evaluating the self-perceived confidence of students in their abilities to provide orthodontic services is crucial to measuring the effectiveness of the orthodontic curriculum (1-3). This confidence has been shown to be associated with the individual's competence in performing clinical and technical skills (4). As a constantly developing process, a good curriculum takes advantage of contributions from such "feedbacks" and restructures itself towards improvement (5).

In a study by Greenwood et al., self-perceived competency was evaluated among dental graduates with two dif-

ferent curriculums. The significant differences between the two schools were discussed with reference to curricular differences, learning processes and feelings of competence (6). In their study assessing the influence of learning style preferences on academic performance among dental students, Akhlaghi et al. reported that different teaching techniques and learning processes act as influential variables on the self-perceived confidence of students (7).

While dental education literature is rich in discussions about various teaching strategies and learning processes and their effects on the self-perceived competencies of graduates (6, 8, 9), the possible influence of other variables such as student grades and personal characteristics on the development of one's professional confidence has been mostly neglected.

One of the variables that may be influential on a graduate's confidence in providing orthodontic care is his/her

perceived “General self-efficacy” (GSE). Self-efficacy refers to an individual’s self-perceived competence to successfully encounter difficult or novel tasks and to deal with any associated obstacles or setbacks (10). It is believed to influence the choice of tasks and the amount of effort put into performing them (11).

In a recent study by Saadat and Ghamarani the dark personality triad and wisdom of students were used to predict their academic self-efficacy. The authors concluded that these personality traits had influential effects on the academic self-efficacy of students (12).

2. Objectives

The aim of this survey therefore, was to gain an understanding of the graduating students’ self-perception of preparedness for basic orthodontic management of patients prior to graduation. Our interest was primarily to investigate the confidence of final-year students in their self-perceived competency and also to see whether it is correlated with their GSE and grades in orthodontics.

3. Methods

This study was approved by the Research Committee of the Dental School of Shiraz University of Medical Sciences. Participation in this study was voluntary and personal information and responses were kept confidential. A total of 124 final-year dentistry students attending the Shiraz University of Medical Sciences participated in this analytical cross-sectional study. These students completed their internship training at the end of January 2017 by passing a three-credit theoretical orthodontic course and a four-credit clinical orthodontic program. The students who failed to pass any of the theoretical or clinical orthodontic courses were excluded from our study. The questionnaires were mailed to all 124 students in the first week of February 2017. Non-respondents to the first mailing were sent a second questionnaire via email in the second week of February, and non-respondents to this prompt were telephoned in the third week of February to ask for their participation. Students were assured that their data would be reported only in aggregate and no individually identifiable information would be reported.

The questionnaire (Appendix 1 in Supplementary File) contained three sections: The first section collected the respondent’s demographic data; the second section comprised three particular domains of clinical skills: (1) examination and diagnosis (6 items including “history taking and recognizing the patient’s chief complaint”, “diagnosis of different classes of malocclusions”, “diagnosis of the

abnormal jaw in CI II and III malocclusions”, “diagnosis of malocclusions in the vertical plane”, “diagnosis of malocclusions in the transverse plane”, and “diagnosing stages of tooth development”), (2) Treatment planning skills (7 items including “functional treatment”, “maxillary protraction”, “serial extraction”, “space supervision”, “expansion”, “space maintenance”, and “diagnosis of necessity of referral to specialist”), and (3) procedural skills (5 items including “construction of acrylic removable appliances”, “adjustment of appliance retention” or “adjustment of headgear force vector”, “prescription of force in headgear and facemask therapy”, and “preparation of a functional construction bit”). The items in this section of the questionnaire were compiled using the educational curriculum provided by the Ministry of Health which listed the minimum routine technical skills a student is expected to perform competently before graduation from dental school. The students were asked to report their confidence for each of the 18 skills measured on a 4-point scale with “not yet confident to do un-supervised”, “fairly confident to do without supervision”, “confident to do without supervision”, and “confident to teach the skill” (representing the highest level of confidence).

The third section adopted from the original work of Schwarzer and Jerusalem (13), translated into English by Mary Wegner, was the General Self-Efficacy Scale (GSES). GSES is a ten-item scale in which the respondents are required to indicate the extent to which each statement applies to them. There is a four-choice response for each item, ranging from “not at all true”, which scores one, to “exactly true”, which scores four. The scores of each of the ten items were summed up for a total score in this part of the questionnaire.

There were 20 items in the primary questionnaire. To verify the validity of the questionnaire, it was submitted to four expert members of the Orthodontic Faculty of Shiraz Dental School. Then, the answers were calculated using content validity ratio (CVR). A CVR score lower than 0.42 was considered for the exclusion of questions.

Eighteen questions were finally approved by the experts, who were then asked about face validity. The questionnaire was pilot-tested on 20 students to evaluate its comprehensibility. After pilot-testing, Cronbach’s alpha was used to ensure the reliability of the attitude-related questions and reliability was confirmed (Cronbach’s alpha = 0.88).

This study used two statistical tests, namely the reliability test and the Spearman’s Rank Correlation test, as well as descriptive methods. The analyses for the reliability test were conducted in the SPSS V25.0 statistical software. A two-tailed alpha level of 0.05 was adopted for all analyses.

4. Results

One-hundred students (81%) returned the questionnaires, all of which were valid. Respondents comprised 76 females and 24 males, with a median age of 25 years. Based on these valid questionnaires, the Cronbach's alpha coefficient of the clinical skill confidence scale was 0.924, indicating satisfactory reliability. The students' self-reported confidence levels in 18 clinical skills are listed in [Table 1](#).

More than 60% students reported being "confident in doing without supervision" or "confident in teaching the skill" in only three out of 18 skills. More than 20% of the students reported being "not yet confident" in eight out of the 18 skills. The eight skills that students were not yet confident in were the diagnosis stages of tooth development, functional treatment, maxillary protraction, serial extraction, space supervision, construction of acrylic removable appliances, adjustment of headgear force vector and prescription of force in headgear and facemask therapy.

Out of a highest possible score of 40, the mean GSE score was calculated to be of 29 ± 6.4 .

The Spearman's Rank Correlation coefficients between self-reported confidence and GSE scores were computed for the three clinical skill sections. The correlation analysis results are presented in [Table 2](#) which illustrates that although the correlation coefficients were small to medium, all of the correlations between confidence in performing clinical skills and GSE were significant.

There was no correlation between the students' grades in theoretical courses and their GSE scores ($P > 0.05$). Student confidence in all aspects of clinical skills, however, was correlated with their grades.

The students' confidence levels in performing clinical skills were positively correlated with the number of patients visited during the practical course ($P = 0.039$).

5. Discussion

The self-perceived confidence of students in performing clinical skills has been investigated in several dental education studies as an important indicator of dental curriculum effectiveness (1, 3, 6).

Many of these studies primarily investigated various teaching techniques and learning processes as influential variables in self-perceived confidence in students (7, 14, 15).

It was our prime interest in this study, however, to see whether personal characteristics such as GSE in individuals could also be correlated with their confidence in performing clinical skills. Our secondary objective was to find correlations between student performances in the theoretical orthodontic course and their confidence in practical orthodontics.

In distinction to other related theoretical constructs such as self-esteem, locus of control, or self-concept of ability, GSE is of a prospective and operative nature, a characteristic that grants this construct an explanatory and predictive power in various research applications (11).

Though not very strong, the students' clinical confidence was significantly correlated with their general sense of self-efficacy. Since GSE represents the individual's personal judgment of competence to deal effectively with a variety of stressful situations (10, 11), it seems natural for the individual's confidence in clinical skills to be positively correlated with their GSE.

The correlation, however, is moderate to weak, highlighting the strong influence of variables other than the individual's participation, persistence and hard work (16).

Levels of student exposure to clinical skills (17), teaching methodologies (PBL, traditional) (6, 18), incidence of direct observation and feedback from faculty or residents (19) and learning environment of the school (20) are reported to be among important factors influencing the individual's self-perception of confidence in performing clinical skills. Clinical experience within a community-based clinical teaching program has also been shown to have positive effects on the confidence of dental students to perform a wide range of clinical tasks (21, 22).

In keeping with the results of our study, Saadat and Ghamarani demonstrated the influential effects of other personality traits, such as the dark personality triad and wisdom, on the academic self-efficacy of students (12).

In this study, the students' average grades in theoretical orthodontic courses were shown to be significantly correlated with confidence in performing all aspects of clinical skills. Despite the fact that orthodontic diagnosis and treatment planning are both almost entirely based on theoretical grounds and related to the practitioner's theoretical knowledge, the correlation between the students' grades and confidence in the first two sections of the questionnaire was also calculated to be moderate to weak.

Fattahi et al. (23), in line with Rock et al. (24), demonstrated that the students' perceived achievements of clinical orthodontic skills were lower than their perceived achievements of goals set for theoretical courses.

Therefore, it may be stated that even orthodontic diagnosis and treatment planning, as fundamentally theoretical skills, are strongly influenced by other previously mentioned variables.

While the mean GSE score among students was calculated to be 2.9, categorizing the students as having intermediate to high self-efficacy, confidence levels in eight out of 18 skills did not do as well. These included the diagnosis stages of tooth development, functional treatment, maxillary protraction, serial extraction, space supervision, con-

Table 1. Distribution of Self-Reported Confidence in 18 Clinical Skills from 100 Final-Year Dental Students^a

Clinical Skills	Not Yet Confident to Do Unsupervised	Fairly Confident to Do Without Supervision	Confident to Do Without Supervision	Confident to Teach The Skill	Total (N = 100)
Diagnosis and examination					
History taking and recognizing patient's chief complaint	6 (6)	31 (31)	58 (58)	5 (5)	100 (100)
Diagnosis of different classes of malocclusion	3 (3)	37 (37)	53 (53)	7 (7)	100 (100)
Diagnosis of the abnormal jaw in CI II and III malocclusions	12 (12)	44 (44)	37 (37)	7 (7)	100 (100)
Diagnosis of malocclusions in vertical plane	12 (12.1)	41 (41.4)	40 (40.4)	6 (6.1)	99 (100)
Diagnosis of malocclusions in transverse plane	13 (13)	41 (41)	36 (36)	10 (10)	100 (100)
Diagnosing stages of tooth development	45 (45)	40 (40)	13 (13)	2 (2)	100 (100)
Treatment planning					
Functional treatment	25 (25)	45 (45)	28 (28)	2 (2)	100 (100)
Maxillary protraction	28 (28)	39 (39)	30 (30)	3 (3)	100 (100)
Serial extraction	57 (57)	34 (34)	7 (7)	2 (2)	100 (100)
Space supervision	44 (44)	36 (36)	17 (17)	3 (3)	100 (100)
Expansion	9 (9)	44 (44)	41 (41)	6 (6)	100 (100)
Space maintenance	7 (7)	37 (37)	52 (52)	4 (4)	100 (100)
Diagnosis of necessity of referral to specialist	10 (10)	31 (31)	51 (51)	8 (8)	100 (100)
Procedural					
Construction of acrylic removable appliances	30 (30)	36 (36)	31 (31)	3 (3)	100 (100)
Adjustment of appliance retention	5 (5)	22 (22)	57 (57)	16 (16)	100 (100)
Adjustment of headgear force vector	54 (54)	35 (35)	9 (9)	2 (2)	100 (100)
Prescription of force in headgear and facemask therapy	60 (61.2)	30 (30.6)	7 (7.1)	1 (1)	98 (100)
Preparation of functional construction bite	19 (19.2)	46 (46.5)	29 (29.3)	5 (5.1)	99 (100)

^a Values are presented as No. (%).

Table 2. Correlation of the Self-Reported Confidence with the General Self Efficacy Score^a

Clinical Skills	GSE Scores	P-Value
Diagnosis and examination	0.326	0.001
Treatment planning	0.256	0.010
Procedural	0.282	0.004
Total	0.338	0.001

^a Spearman's correlation coefficient (r_s), significant at 0.05.

struction of acrylic removable appliances, adjustment of headgear force vector and prescription of force in headgear and facemask therapy.

This is in keeping with Fattahi et al. (23) who demonstrated that treatment planning and construction of removable plates were amongst weaknesses of final-year students.

Although the correlation was weak, the number of visited patients also influenced student confidence in managing orthodontic patients. This is in keeping with Arena et al. (25) and Wanigasooriya (26) who stated that stu-

dents were most confident in managing problems that they most frequently encountered in dental school.

The areas in which they were least confident require curricular reform; increased clinical time for complex procedures may help in increasing the confidence of final-year students in these areas.

A major limitation of the current study was its analyses based on a single cohort of 101 final-year dental students. It is not possible to determine the extent to which these findings can be generalized beyond the current sample until further data is available.

5.1. Conclusion

The following conclusions were drawn within the limitations of this study:

The self-perceived confidence of dental students in performing orthodontic clinical tasks is moderately correlated with their GSE. Other factors such as the number of orthodontic cases the students are exposed to and different types of teaching methods seem to exert a greater influence on student confidence.

Supplementary Material

Supplementary material(s) is available [here](#) [To read supplementary materials, please refer to the journal website and open PDF/HTML].

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Footnote

Authors' Contribution: Shahla Momeni Danaei, conception and design of the work; revising it critically for important intellectual content. Niloofar Azadeh, conception and design of the work; interpretation of data; and drafting the work Dana Jafarpur, acquisition and analysis of data; drafting the work.

References

- Holmes DC, Diaz-Arnold AM, Williams VD. Alumni self-perception of competence at time of dental school graduation. *J Dent Educ.* 1997;**61**(6):465-72. [PubMed: [9209255](#)].
- Greenwood LF, Lewis DW, Burgess RC. How competent do our graduates feel? *J Dent Educ.* 1998;**62**(4):307-13. [PubMed: [9603445](#)].
- Kiyak HA, Brudvik J. Dental students' self-assessed competence in geriatric dentistry. *J Dent Educ.* 1992;**56**(11):728-34. [PubMed: [1430528](#)].
- Mavis B. Self-efficacy and OSCE performance among second year medical students. *Adv Health Sci Educ Theory Pract.* 2001;**6**(2):93-102. [PubMed: [11435761](#)].
- Shetty VB, Shirahatti RV, Pawar P. Students' perceptions of their education on graduation from a dental school in India. *J Dent Educ.* 2012;**76**(11):1520-6. [PubMed: [23144488](#)].
- Greenwood LF, Townsend GC, Wetherell JD, Mullins GA. Self-perceived competency at graduation: A comparison of dental graduates from the Adelaide PBL curriculum and the Toronto traditional curriculum. *Eur J Dent Educ.* 1999;**3**(4):153-8. [PubMed: [10865351](#)].
- Akhlaghi N, Mirkazemi H, Jafarzade M. Does learning style preferences influence academic performance among dental students in Isfahan, Iran? *J Educ Eval Health Prof.* 2018;**15**:8. doi: [10.3352/jeehp.2018.15.8](#). [PubMed: [29575848](#)]. [PubMed Central: [PMC5968221](#)].
- Fugill M. Teaching and learning in dental student clinical practice. *Eur J Dent Educ.* 2005;**9**(3):131-6. doi: [10.1111/j.1600-0579.2005.00378.x](#). [PubMed: [15982383](#)].
- Plasschaert AJ, Manogue M, Lindh C, McLoughlin J, Murtomaa H, Nat-testad A, et al. Curriculum content, structure and ECTS for European dental schools. Part II: Methods of learning and teaching, assessment procedures and performance criteria. *Eur J Dent Educ.* 2007;**11**(3):125-36. doi: [10.1111/j.1600-0579.2007.00445.x](#). [PubMed: [17640255](#)].
- Bandura A, Freeman WH, Lightsey R. Self-efficacy: The exercise of control. *J Cognitive Psychotherapy.* 1997;**13**(2). doi: [10.1891/0889-8391.13.2.158](#).
- Luszczynska A, Gutiérrez-Dona B, Schwarzer R. General self-efficacy in various domains of human functioning: Evidence from five countries. *Int J Psychol.* 2005;**40**(2):80-9. doi: [10.1080/00207590444000041](#).
- Saadat S, Ghamarani A. Dark triad personality and wisdom in prediction of students' academic self-efficacy. *Educ Res Med Sci.* 2017;**6**(2):63-8.
- Schwarzer R, Jerusalem M. Generalized self-efficacy scale. In: Weinman J, Wright S, Johnston M, editors. *Measures in health psychology: A user's portfolio. Causal and control beliefs.* Windsor, England: NFER-Nelson; 1995.
- Ahmadian M, Khami MR, Ahamdi AE, Razeghi S, Yazdani R. Effectiveness of two interactive educational methods to teach tobacco cessation counseling for senior dental students. *Eur J Dent.* 2017;**11**(3):287-92. doi: [10.4103/ejd.ejd_352_16](#). [PubMed: [28932135](#)]. [PubMed Central: [PMC5594954](#)].
- von Bergmann H, Walker J, Dalrymple KR, Shuler CF. Dental faculty members' pedagogic beliefs and curriculum aims in problem-based learning: An exploratory study. *J Dent Educ.* 2017;**81**(8):937-47. doi: [10.21815/JDE.017.046](#). [PubMed: [28765438](#)].
- Zimmerman BJ. Self-Efficacy: An essential motive to learn. *Contemp Educ Psychol.* 2000;**25**(1):82-91. doi: [10.1006/ceps.1999.1016](#). [PubMed: [10620383](#)].
- Dehmer JJ, Amos KD, Farrell TM, Meyer AA, Newton WP, Meyers MO. Competence and confidence with basic procedural skills: The experience and opinions of fourth-year medical students at a single institution. *Acad Med.* 2013;**88**(5):682-7. doi: [10.1097/ACM.0b013e31828b0007](#). [PubMed: [23524922](#)].
- Schonwetter DJ, Law D, Mazurat R, Sileikyte R, Nazarko O. Assessing graduating dental students' competencies: The impact of classroom, clinic and externships learning experiences. *Eur J Dent Educ.* 2011;**15**(3):142-52. doi: [10.1111/j.1600-0579.2010.00648.x](#). [PubMed: [21762318](#)].
- Chen W, Liao SC, Tsai CH, Huang CC, Lin CC, Tsai CH. Clinical skills in final-year medical students: The relationship between self-reported confidence and direct observation by faculty or residents. *Ann Acad Med Singapore.* 2008;**37**(1):3-8. [PubMed: [18265890](#)].
- Henzi D, Davis E, Jasinevicius R, Hendricson W, Cintron L, Isaacs M. Appraisal of the dental school learning environment: The students' view. *J Dent Educ.* 2005;**69**(10):1137-47. [PubMed: [16204680](#)].

21. Lynch CD, Ash PJ, Chadwick BL, Hannigan A. Effect of community-based clinical teaching programs on student confidence: A view from the United kingdom. *J Dent Educ.* 2010;**74**(5):510-6. [PubMed: [20442428](#)].
22. Smith M, Lennon MA, Brook AH, Robinson PG. A randomized controlled trial of outreach placement's effect on dental students' clinical confidence. *J Dent Educ.* 2006;**70**(5):566-70. [PubMed: [16687642](#)].
23. Fattahi H, Bazrafkan L, HasanLi E, Rad AB. [The viewpoints of dental students of shiraz toward the amount of their achievement to learning objectives in different courses of orthodontics]. *Iranian J Med Educ.* 2009;**9**(3):249-62. Persian.
24. Rock WP, O'Brien KD, Stephens CD. Orthodontic teaching practice and undergraduate knowledge in British dental schools. *Br Dent J.* 2002;**192**(6):347-51. [PubMed: [15552073](#)].
25. Arena G, Kruger E, Holley D, Millar S, Tennant M. Western Australian dental graduates' perception of preparedness to practice: A five-year follow-up. *J Dent Educ.* 2007;**71**(9):1217-22. [PubMed: [17761629](#)].
26. Wanigasooriya N. Student self-assessment of essential skills in dental surgery. *Br Dent J.* 2004;**Suppl**:11-4. doi: [10.1038/sj.bdj.4811680](#). [PubMed: [15359296](#)].