

Original Research Article

Evaluation of Dental Students' Self-Efficacy Regarding Root Canal Treatment Performance: A Survey Study

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ABSTRACT

Aim: Assessing undergraduate dental students' self-efficacy can help educators better understand what works well in the curriculum and where further support is needed. This study aimed to explore differences in undergraduate dental students' self-efficacy in performing root canal treatments according to academic year and gender.

Materials and Methods: A survey was conducted among fourth- and fifth-year students from eight dental faculties in Ankara, Türkiye, all of whom had completed their endodontic clinical practice. The questionnaire consisted of demographic questions and items assessing students' self-efficacy in performing different steps of root canal treatment. Responses were rated on a 5-point Likert scale (1 = not sufficient, 5 = very sufficient). The internal consistency of the questionnaire was assessed using Cronbach's alpha, and a linear-by-linear Chi-squared test was applied to evaluate trends across ordered Likert-scale responses between academic year and gender. Statistical significance was set at $p < 0.05$.

Results: A total of 135 students participated in the study, including 44 (32.6%) males and 91 (67.4%) females. Among them, 48 (35.6%) were fourth-year and 87 (64.4%) were fifth-year students. Descriptive analysis showed that students' self-efficacy levels were generally in the neutral to high range across most endodontic procedures. Fifth-year students reported higher self-efficacy than fourth-year students for indication, single versus

multiple visits, infiltrative anesthesia, access cavity, localization of canal orifices in anterior and premolar teeth, irrigation, and working length maintenance ($p < 0.05$), while no such trend was observed for the remaining procedures ($p > 0.05$). No linear trend was observed between gender and self-efficacy levels, except for access cavity, preparation, and periapical radiography ($p < 0.05$).

Conclusion: Overall, students generally had a moderate to high perception of self-efficacy, with differences across academic years and gender confined to a limited number of endodontic procedures.

Keywords: Dental students; Endodontics; Self-efficacy; Survey study

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INTRODUCTION

Undergraduate dental students are required to gain clinical experience during their training.¹ With increasing clinical exposure, students' performance tends to improve², and hands-on experience not only reinforces their learning but also contributes to patient care.³ In addition, students' performance is strongly influenced by their self-efficacy.⁴⁻⁶ Moreover, self-efficacy substantially contributes to students' academic achievement, as it has been shown to influence the effectiveness with which individuals perform tasks.⁶

In undergraduate dental education, the quality of endodontic procedures performed by students is widely recognized as a reliable indicator of clinical competence and serves as an essential measure for evaluating their overall proficiency.⁷ Among the various

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dental specialties, endodontic procedures are often perceived by students as a challenging task and associated with higher stress levels compared to periodontology and restorative dentistry.⁸ Multiple factors contribute to this perception, such as the need for effective patient communication, emergency management, pain control, the use of various techniques and materials, anatomical variations, and the overall complexity of endodontic procedures.⁵ These challenges can increase students' stress and this may undermine students' self-efficacy in performing root canal treatments.⁹

After graduation, dental professionals should be able to accurately diagnose endodontic conditions and develop effective treatment strategies to provide high-quality patient care.³ To achieve this, it is essential that the curriculum be regularly reviewed. Understanding dental students' views on their educational experiences plays a critical role in the curriculum planning processes of dental schools and can inform improvements that promote more effective learning. Thus, achieving both solid theoretical knowledge and sufficient clinical experience enables students to perform endodontic procedures independently and confidently.⁸⁻¹¹

Self-efficacy describes a person's belief in their own competence and confidence in carrying out specific tasks successfully. It positively influences clinical endodontic performance⁴ and is linked to the effective use of academic skills.¹² Furthermore, individuals with high self-efficacy tend to show greater persistence and are better able to perform effectively in stressful situations compared with those who have low self-efficacy.¹³ Dental curricula are designed around specific competencies that students must achieve to practice independently after graduation.¹⁴ However, not all graduates feel confident in their abilities.^{15,16}

Until now, many studies have examined students' self-confidence regarding various stages of endodontic treatment^{8, 17-20}, few have explored this issue from the perspective of self-efficacy.^{4, 6} To better understand self-efficacy and its link to undergraduate education, it would be valuable to examine students' self-efficacy in various endodontic programs as well.²¹ Therefore, this study aims to evaluate the self-efficacy levels of fourth- and fifth-year under-

graduate dental students at faculties of dentistry in Ankara for various stages of root canal treatment. The null hypothesis was that there would be no statistically significant differences in self-efficacy levels according to academic year or gender.

MATERIALS AND METHODS

Ethical approval was obtained from the Ethics Committee of Ankara University (Decision No: 06/54, dated 03.04.2024). An a priori power analysis was performed using G*Power (version 3.1.9.7; Universität Düsseldorf, Germany). In the absence of prior studies using the same measurement instrument, study design, and target population, a medium effect size ($d_z = 0.50$) was assumed based on Cohen's conventional benchmark for a standardized mean-difference effect.²² This value represents a deliberately conservative assumption and is considered appropriate when no directly comparable prior estimate is available. With a significance level of $\alpha = 0.05$ and a desired power of $1 - \beta = 0.90$, the required minimum sample size was calculated as 130 participants.

The survey included demographic items and was designed to evaluate students' self-efficacy levels across various stages of endodontic procedures. The survey instrument was developed by adapting from the Endodontic General Self-Efficacy Scale.²¹ The original scale comprises 10 items assessing students' generalized sense of self-efficacy in endodontic practice on a 4-point response scale. As the aim of the present study was to assess self-efficacy at the level of specific procedural steps rather than as a global construct, the items were substantially adapted to reflect discrete clinical stages of root canal treatment: indication, anesthesia, isolation, access cavity, working length, irrigation, obturation, management and prediction of complications, post-endodontic restoration, and periapical radiography. The response format was modified to a 5-point Likert scale (1 = not sufficient, 2 = slightly sufficient, 3 = neutral, 4 = sufficient, 5 = very sufficient). The adapted instrument comprised 19 items in total, and the English translation of all statements is presented in Table 1. The adapted items were examined by experienced endodontic specialists for clinical accuracy, scope, and contextual appropriateness within the Turkish dental education system; necessary revisions were made based on their feedback.

Table 1. Statements used to assess students' self-efficacy in performing various endodontic procedures. Responses were rated on a 5-point Likert scale (1 = not sufficient, 5 = very sufficient)

Endodontic Procedure	Statement
Indication	I am confident that I can decide on the indication for endodontic treatment.
Single vs multiple visits	I am confident that I can determine whether endodontic treatment should be completed in a single visit or over multiple visits.
Infiltrative anesthesia	I am confident that I can administer infiltration anesthesia.
Block anesthesia	I am confident that I can perform inferior alveolar nerve block anesthesia.
Intrapulpal anesthesia	I am confident that I can apply intrapulpal anesthesia.
Isolation	I am confident that I can achieve proper isolation.
Access cavity	I am confident that I can establish appropriate access cavity during endodontic treatment.
Localization of orifices (anterior teeth)	I am confident that I can locate root canal orifices in anterior teeth.
Localization of orifices (premolar teeth)	I am confident that I can locate root canal orifices in premolar teeth.
Localization of canal orifices (posterior teeth)	I am confident that I can locate root canal orifices in molar teeth.
Preparation	I am confident that I can perform the mechanical preparation of root canals effectively.
Periapical radiograph	I am confident that I can take accurate periapical radiographs.
Working length determination	I am confident that I can determine the working length correctly.
Maintaining the working length	I am confident that I can maintain the working length throughout instrumentation.
Irrigation	I am confident that I can apply irrigation solutions effectively.
Predicting complications	I am confident that I can anticipate possible endodontic complications.
Management of complications	I am confident that I can manage potential endodontic complications.
Obturation	I am confident that I can perform the obturation of root canals successfully.
Post-endodontic restoration	I am confident that I can decide on appropriate post-endodontic restorations.

The adapted scale was originally developed in Turkish. To ensure linguistic equivalence, a forward–backward translation procedure was applied to produce the English version: two bilingual academics independently translated the instrument into English, and a third independent translator produced the back-translation; discrepancies were resolved by expert consensus.

A pilot study was conducted with 10 dental students (5 in the fourth year and 5 in the fifth year) from the Faculty of Dentistry, Ankara University, who were not included in the main sample. Item clarity and comprehensibility were evaluated, and minor wording revisions were made based on participant feedback.

The survey was distributed online via Google Forms (Google LLC, Mountain View, CA, USA) during the second semester of the 2023-2024 academic year (April-May 2024) to fourth- and fifth-year dental students who had completed their endodontic clinical practice. Data were collected from eight dental faculties in Ankara using a single-group survey design. Faculty affiliation was recorded for descriptive purposes only and was not employed as an analytical variable.

Statistical Analysis

The data were collected electronically and subsequently transferred to Microsoft Excel (Microsoft Corp., Redmond, WA, USA) and IBM SPSS Statistics (version 21; IBM Corp., Armonk, NY, USA) for analysis. The level of statistical significance (α) was set at 0.05. The internal consistency of the questionnaire was assessed using Cronbach's alpha coefficient. Descriptive statistics were presented as frequencies and percentages. Given the ordinal structure of the Likert-scale data, differences between fourth- and fifth-year students were analyzed using the linear-by-linear Chi-squared test in 5 x 2 contingency tables.

RESULTS

A total of 135 dental students participated in the survey; of these, 91 (67.4%) were female and 44 (32.6%) were male. Among the participants, 48 (35.6%) were fourth-year students, and 87 (64.4%) were in their fifth year. The participants were enrolled at the following dental faculties: Ankara University (29.6%, n = 40), Gazi University (26.7%, n = 36), Hacettepe University (23.7%, n = 32), Başkent

University (6.7%, n = 9), Ankara Yıldırım Beyazıt University (5.2%, n = 7), Lokman Hekim University (3.7%, n = 5), Ankara Medipol University (2.2%, n = 3), and the University of Health Sciences (2.2%, n = 3). The self-efficacy of students in relation to end-

odontic procedures is presented by gender and academic year in Figures 1 and 2, respectively. The questionnaire demonstrated good internal consistency, with a Cronbach's alpha value of 0.874.

According to the results of the linear-by-linear

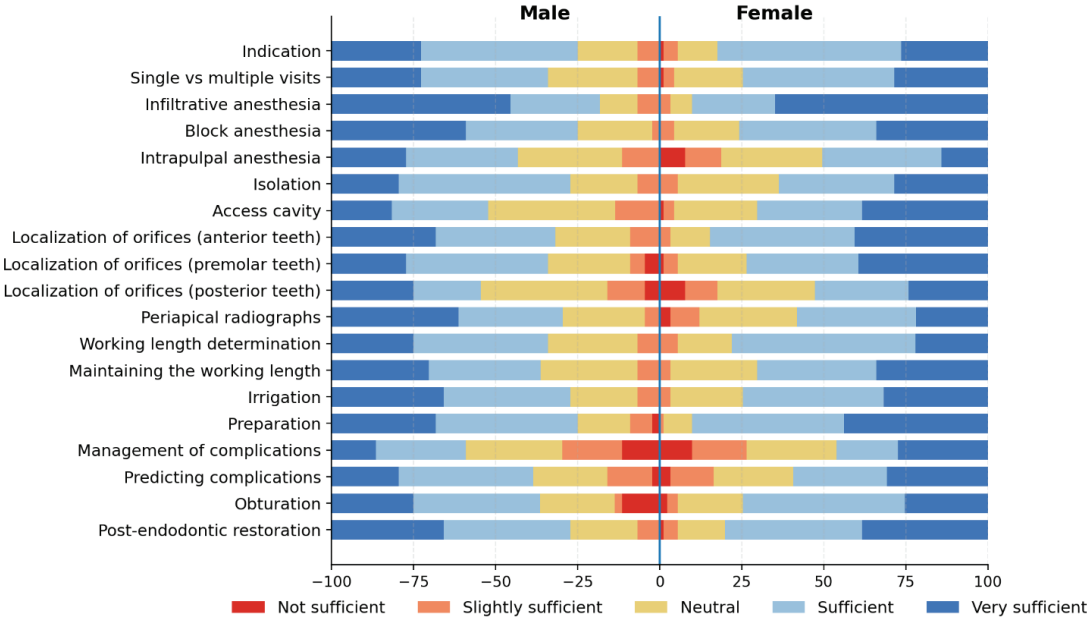


Figure 1. Diverging stacked bar chart showing the percentage (%) distribution of students' self-efficacy levels in endodontic treatment procedures according to gender. Self-efficacy responses are shown according to a five-point Likert scale ranging from “Not sufficient” to “Very sufficient”.

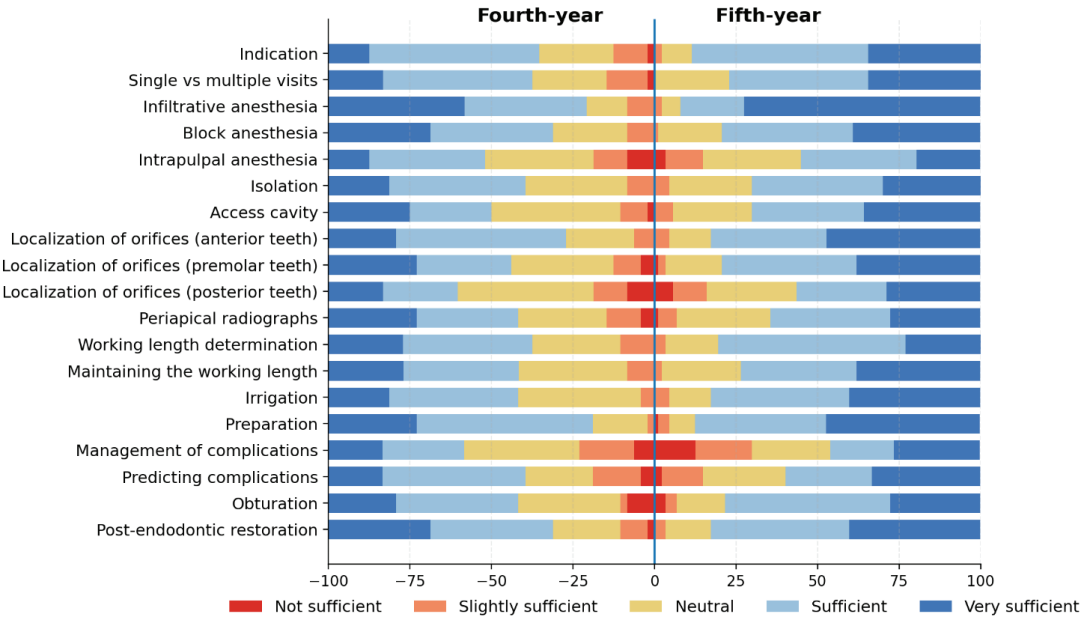


Figure 2. Diverging stacked bar chart showing the percentage distribution (%) of students' self- efficacy levels in endodontic treatment procedures according to academic year. Self-efficacy responses are shown according to a five-point Likert scale ranging from “Not sufficient” to “Very sufficient”.

Table 2. The percentage (%) distribution of students' self-efficacy levels in endodontic treatment procedures according to academic year

Endodontic Procedures		Academic Year						p
		Fourth year n = 48		Fifth year n = 87		Total n = 135		
		n	%	n	%	n	%	
Indication	Not sufficient	1	2.1	0	0.0	1	0.7	0.0001*
	Slightly sufficient	5	10.4	2	2.3	7	5.2	
	Neutral	11	22.9	8	9.2	19	14.1	
	Sufficient	25	52.1	47	54.0	72	53.3	
	Very sufficient	6	12.5	30	34.5	36	26.7	
Single vs multiple visits	Not sufficient	1	2.1	0	0.0	1	0.7	0.002*
	Slightly sufficient	6	12.5	0	0.0	6	4.4	
	Neutral	11	22.9	20	23.0	31	23.0	
	Sufficient	22	45.8	37	42.5	59	43.7	
	Very sufficient	8	16.7	30	34.5	38	28.1	
Infiltrative anesthesia	Not sufficient	0	0.0	0	0.0	0	0.0	0.001*
	Slightly sufficient	4	8.3	2	2.3	6	4.4	
	Neutral	6	12.5	5	5.7	11	8.1	
	Sufficient	18	37.5	17	19.5	35	25.9	
	Very sufficient	20	41.7	63	72.4	83	61.5	
Block anesthesia	Not sufficient	0	0.0	0	0.0	0	0.0	0.113
	Slightly sufficient	4	8.3	1	1.1	5	3.7	
	Neutral	11	22.9	17	19.5	28	20.7	
	Sufficient	18	37.5	35	40.2	53	39.3	
	Very sufficient	15	31.3	34	39.1	49	36.3	
Intrapulpal anesthesia	Not sufficient	4	8.3	3	3.4	7	5.2	0.229
	Slightly sufficient	5	10.4	10	11.5	15	11.1	
	Neutral	16	33.3	26	29.9	42	31.1	
	Sufficient	17	35.4	31	35.6	48	35.6	
	Very sufficient	6	12.5	17	19.5	23	17.0	
Isolation	Not sufficient	0	0.0	0	0.0	0	0.0	0.117
	Slightly sufficient	4	8.3	4	4.6	8	5.9	
	Neutral	15	31.3	22	25.3	37	27.4	
	Sufficient	20	41.7	35	40.2	55	40.7	
	Very sufficient	9	18.8	26	29.9	35	25.9	
Access cavity	Not sufficient	1	2.1	0	0.0	1	0.7	0.033*
	Slightly sufficient	4	8.3	5	5.7	9	6.7	
	Neutral	19	39.6	21	24.1	40	29.6	
	Sufficient	12	25.0	30	34.5	42	31.1	
	Very sufficient	12	25.0	31	35.6	43	31.9	
Localization of orifices (anterior teeth)	Not sufficient	0	0.0	0	0.0	0	0.0	0.017*
	Slightly sufficient	3	6.3	4	4.6	7	5.2	
	Neutral	10	20.8	11	12.6	21	15.6	
	Sufficient	25	52.1	31	35.6	56	41.5	
	Very sufficient	10	20.8	41	47.1	51	37.8	
Localization of orifices (premolar teeth)	Not sufficient	2	4.2	1	1.1	3	2.2	0.011*
	Slightly sufficient	4	8.3	2	2.3	6	4.4	
	Neutral	15	31.3	15	17.2	30	22.2	
	Sufficient	14	29.2	36	41.4	50	37.0	
	Very sufficient	13	27.1	33	37.9	46	34.1	
Localization of orifices (posterior teeth)	Not sufficient	4	8.3	5	5.7	9	6.7	0.106
	Slightly sufficient	5	10.4	9	10.3	14	10.4	
	Neutral	20	41.7	24	27.6	44	32.6	
	Sufficient	11	22.9	24	27.6	35	25.9	
	Very sufficient	8	16.7	25	28.7	33	24.4	

Periapical radiographs	Not sufficient	2	4.2	1	1.1	3	2.2	0.376
	Slightly sufficient	5	10.4	5	5.7	10	7.4	
	Neutral	13	27.1	25	28.7	38	28.1	
	Sufficient	15	31.3	32	36.8	47	34.8	
	Very sufficient	13	27.1	24	27.6	37	27.4	
Working length determination	Not sufficient	0	0.0	0	0.0	0	0.0	0.088
	Slightly sufficient	5	10.4	3	3.4	8	5.9	
	Neutral	13	27.1	14	16.1	27	20.0	
	Sufficient	19	39.6	50	57.5	69	51.1	
	Very sufficient	11	22.9	20	23.0	31	23.0	
Maintaining the working length	Not sufficient	0	0.0	0	0.0	0	0.0	0.025*
	Slightly sufficient	4	8.3	2	2.3	6	4.4	
	Neutral	16	33.3	21	24.1	37	27.4	
	Sufficient	17	35.4	31	35.6	48	35.6	
	Very sufficient	11	22.9	33	37.9	44	32.6	
Irrigation	Not sufficient	0	0.0	0	0.0	0	0.0	0.002*
	Slightly sufficient	2	4.2	4	4.6	6	4.4	
	Neutral	18	37.5	11	12.6	29	21.5	
	Sufficient	19	39.6	37	42.5	56	41.5	
	Very sufficient	9	18.8	35	40.2	44	32.6	
Preparation	Not sufficient	0	0.0	1	1.1	1	0.7	0.146
	Slightly sufficient	1	2.1	3	3.4	4	3.0	
	Neutral	8	16.7	7	8.0	15	11.1	
	Sufficient	26	54.2	35	40.2	61	45.2	
	Very sufficient	13	27.1	41	47.1	54	40.0	
Management of complications	Not sufficient	3	6.3	11	12.6	14	10.4	0.975
	Slightly sufficient	8	16.7	15	17.2	23	17.0	
	Neutral	17	35.4	21	24.1	38	28.1	
	Sufficient	12	25.0	17	19.5	29	21.5	
	Very sufficient	8	16.7	23	26.4	31	23.0	
Predicting complications	Not sufficient	2	4.2	2	2.3	4	3.0	0.274
	Slightly sufficient	7	14.6	11	12.6	18	13.3	
	Neutral	10	20.8	22	25.3	32	23.7	
	Sufficient	21	43.8	23	26.4	44	32.6	
	Very sufficient	8	16.7	29	33.3	37	27.4	
Obturation	Not sufficient	4	8.3	3	3.4	7	5.2	0.065
	Slightly sufficient	1	2.1	3	3.4	4	3.0	
	Neutral	15	31.3	13	14.9	28	20.7	
	Sufficient	18	37.5	44	50.6	62	45.9	
	Very sufficient	10	20.8	24	27.6	34	25.2	
Post-endodontic restoration	Not sufficient	1	2.1	0	0.0	1	0.7	0.057
	Slightly sufficient	4	8.3	3	3.4	7	5.2	
	Neutral	10	20.8	12	13.8	22	16.3	
	Sufficient	18	37.5	37	42.5	55	40.7	
	Very sufficient	15	31.3	35	40.2	50	37.0	

Data were analyzed with linear-by-linear Chi-squared test in 5 x 2 tables. *p < 0.05 was considered statistically significant.

Chi-squared association test, a statistically significant and positive linear trend was identified in self-efficacy levels as the academic year increased from the fourth to the fifth year for certain endodontic procedures. For indication, single visit versus multiple visits, infiltrative anesthesia, access cavity, localization of canal orifices in anterior and premolar teeth, irrigation, and working length maintenance,

higher self-efficacy levels (4–5) were more frequently reported as the academic year increased, while lower levels became less frequent (p < 0.05; Table 2). For these procedures, responses demonstrated a systematic shift from low and moderate levels towards higher levels.

In contrast, no statistically significant linear trend

Table 3. The percentage distribution (%) of students' self- efficacy levels in endodontic treatment procedures according to gender

Endodontic Procedures		Gender						p
		Female n = 91		Male n = 44		Total n = 135		
		n	%	n	%	n	%	
Indication	Not sufficient	1	1.1	0	0.0	1	0.7	0.741
	Slightly sufficient	4	4.4	3	6.8	7	5.2	
	Neutral	11	12.1	8	18.2	19	14.1	
	Sufficient	51	56.0	21	47.7	72	53.3	
	Very sufficient	24	26.4	12	27.3	36	26.7	
Single vs multiple visits	Not sufficient	1	1.1	0	0.0	1	0.7	0.525
	Slightly sufficient	3	3.3	3	6.8	6	4.4	
	Neutral	19	20.9	12	27.3	31	23.0	
	Sufficient	42	46.2	17	38.6	59	43.7	
	Very sufficient	26	28.6	12	27.3	38	28.1	
Infiltrative anesthesia	Not sufficient	0	0.0	0	0.0	0	0.0	0.153
	Slightly sufficient	3	3.3	3	6.8	6	4.4	
	Neutral	6	6.6	5	11.4	11	8.1	
	Sufficient	23	25.3	12	27.3	35	25.9	
	Very sufficient	59	64.8	24	54.5	83	61.5	
Block anesthesia	Not sufficient	0	0.0	0	0.0	0	0.0	0.669
	Slightly sufficient	4	4.4	1	2.3	5	3.7	
	Neutral	18	19.8	10	22.7	28	20.7	
	Sufficient	38	41.8	15	34.1	53	39.3	
	Very sufficient	31	34.1	18	40.9	49	36.3	
Intrapulpal anesthesia	Not sufficient	7	7.7	0	0.0	7	5.2	0.143
	Slightly sufficient	10	11.0	5	11.4	15	11.1	
	Neutral	28	30.8	14	31.8	42	31.1	
	Sufficient	33	36.3	15	34.1	48	35.6	
	Very sufficient	13	14.3	10	22.7	23	17.0	
Isolation	Not sufficient	0	0.0	0	0.0	0	0.0	0.248
	Slightly sufficient	5	5.5	3	6.8	8	5.9	
	Neutral	28	30.8	9	20.5	37	27.4	
	Sufficient	32	35.2	23	52.3	55	40.7	
	Very sufficient	26	28.6	9	20.5	35	25.9	
Access cavity	Not sufficient	1	1.1	0	0.0	1	0.7	0.004*
	Slightly sufficient	3	3.3	6	13.6	9	6.7	
	Neutral	23	25.3	17	38.6	40	29.6	
	Sufficient	29	31.9	13	29.5	42	31.1	
	Very sufficient	35	38.5	8	18.2	43	31.9	
Localization of orifices (anterior teeth)	Not sufficient	0	0.0	0	0.0	0	0.0	0.052
	Slightly sufficient	3	3.3	4	9.1	7	5.2	
	Neutral	11	12.1	10	22.7	21	15.6	
	Sufficient	40	44.0	16	36.4	56	41.5	
	Very sufficient	37	40.7	14	31.8	51	37.8	
Localization of orifices (premolar teeth)	Not sufficient	1	1.1	2	4.5	3	2.2	0.099
	Slightly sufficient	4	4.4	2	4.5	6	4.4	
	Neutral	19	20.9	11	25.0	30	22.2	
	Sufficient	31	34.1	19	43.2	50	37.0	
	Very sufficient	36	39.6	10	22.7	46	34.1	
Localization of orifices (posterior teeth)	Not sufficient	7	7.7	2	4.5	9	6.7	0.939
	Slightly sufficient	9	9.9	5	11.4	14	10.4	
	Neutral	27	29.7	17	38.6	44	32.6	
	Sufficient	26	28.6	9	20.5	35	25.9	
	Very sufficient	22	24.2	11	25.0	33	24.4	

Periapical radiographs	Not sufficient	3	3.3	0	0.0	3	2.2	0.036*
	Slightly sufficient	8	8.8	2	4.5	10	7.4	
	Neutral	27	29.7	11	25.0	38	28.1	
	Sufficient	33	36.3	14	31.8	47	34.8	
	Very sufficient	20	22.0	17	38.6	37	27.4	
Working length determination	Not sufficient	0	0.0	0	0.0	0	0.0	0.353
	Slightly sufficient	5	5.5	3	6.8	8	5.9	
	Neutral	15	16.5	12	27.3	27	20.0	
	Sufficient	51	56.0	18	40.9	69	51.1	
	Very sufficient	20	22.0	11	25.0	31	23.0	
Maintaining the working length	Not sufficient	0	0.0	0	0.0	0	0.0	0.399
	Slightly sufficient	3	3.3	3	6.8	6	4.4	
	Neutral	24	26.4	13	29.5	37	27.4	
	Sufficient	33	36.3	15	34.1	48	35.6	
	Very sufficient	31	34.1	13	29.5	44	32.6	
Irrigation	Not sufficient	0	0.0	0	0.0	0	0.0	0.914
	Slightly sufficient	3	3.3	3	6.8	6	4.4	
	Neutral	20	22.0	9	20.5	29	21.5	
	Sufficient	39	42.9	17	38.6	56	41.5	
	Very sufficient	29	31.9	15	34.1	44	32.6	
Preparation	Not sufficient	0	0.0	1	2.3	1	0.7	0.013*
	Slightly sufficient	1	1.1	3	6.8	4	3.0	
	Neutral	8	8.8	7	15.9	15	11.1	
	Sufficient	42	46.2	19	43.2	61	45.2	
	Very sufficient	40	44.0	14	31.8	54	40.0	
Management of complications	Not sufficient	9	9.9	5	11.4	14	10.4	0.456
	Slightly sufficient	15	16.5	8	18.2	23	17.0	
	Neutral	25	27.5	13	29.5	38	28.1	
	Sufficient	17	18.7	12	27.3	29	21.5	
	Very sufficient	25	27.5	6	13.6	31	23.0	
Predicting complications	Not sufficient	3	3.3	1	2.3	4	3.0	0.741
	Slightly sufficient	12	13.2	6	13.6	18	13.3	
	Neutral	22	24.2	10	22.7	32	23.7	
	Sufficient	26	28.6	18	40.9	44	32.6	
	Very sufficient	28	30.8	9	20.5	37	27.4	
Obturation	Not sufficient	2	2.2	5	11.4	7	5.2	0.128
	Slightly sufficient	3	3.3	1	2.3	4	3.0	
	Neutral	18	19.8	10	22.7	28	20.7	
	Sufficient	45	49.5	17	38.6	62	45.9	
	Very sufficient	23	25.3	11	25.0	34	25.2	
Post-endodontic restoration	Not sufficient	1	1.1	0	0.0	1	0.7	0.476
	Slightly sufficient	4	4.4	3	6.8	7	5.2	
	Neutral	13	14.3	9	20.5	22	16.3	
	Sufficient	38	41.8	17	38.6	55	40.7	
	Very sufficient	35	38.5	15	34.1	50	37.0	

Data were analyzed with linear-by-linear Chi-squared test in 5 x 2 tables. *p < 0.05 was considered statistically significant.

was identified between academic year and self-efficacy levels for block and intrapulpal anesthesia, isolation, working length determination, preparation, management of complications, predicting complication, obturation, post-endodontic restoration, periapical radiography steps ($p > 0.05$; Table 2). Although a tendency towards higher levels was observed among fifth-year students in these areas, this

change did not reach statistical significance according to the linear trend test. A significant linear trend was observed between gender and self-efficacy levels, with higher self-efficacy reported by female students for access cavity and preparation and by male students for periapical radiography procedures ($p < 0.05$; Table 3).

DISCUSSION

Undergraduate dental education is expected to prepare graduates who can deliver safe and high-quality patient care, demonstrate awareness of their professional boundaries, and refer cases beyond their competence according to the 2024 European Society of Endodontology (ESE) Undergraduate Curriculum Guidelines.¹⁴ Dental schools should address the challenges students face early in their education to help them manage the complex aspects of endodontic treatment more effectively. Ongoing curriculum review, supported by student feedback, facilitates the recognition of weaknesses and the adoption of appropriate revisions to improve the overall standard of teaching.⁵ Globally, dental schools are reforming their curricula by incorporating evidence-based, patient-focused comprehensive care models while encouraging the use of integrated learning approaches.²³

Students' competencies should be assessed regularly through structured evaluations to ensure readiness for independent clinical practice.¹⁴ Recently, contrary to the traditional approach, student performance in endodontics has been evaluated not only on theoretical knowledge and technical skills but also on clinical decision-making and self-perceived competence.² These outcomes are best supported by learning environments that foster critical thinking and the integration of knowledge, thereby enhancing students' clinical problem-solving abilities.³ Nonetheless, limited infrastructure, demanding curricula, and insufficiently qualified staff may impede the development of students' clinical competence and procedural readiness in dental practice.²⁴

Developing self-efficacy is a central aspect of dental education. The quality and scope of undergraduate training directly influence students' belief in their ability to perform endodontic procedures independently.¹⁶ Students with higher self-efficacy transfer their knowledge and skills to endodontic practice with greater effectiveness and clinical competence, demonstrating enhanced procedural performance.²⁵ Self-assessment of competence provides a valuable means of evaluating how well the curriculum meets students' learning needs and of identifying the impact of specific educational components.¹⁹

Surveys are one of the main methods used to collect data on the challenges faced by students.^{8,9} The present survey was conducted to assess students' perceived self-efficacy across various endodontic procedures, showing good internal consistency and supporting its use for evaluating self-efficacy in undergraduate dental students.

In Türkiye, dental education follows the Turkish Higher Education Qualifications Framework, which guides all faculties in designing their curricula and defining learning outcomes in line with national standards. Accordingly, the endodontic clinical training across the eight participating faculties was comparable in terms of its basic structure and progression. In Turkish dental schools, the first three to four years focus on theoretical and preclinical training. This is followed by supervised clinical practice, where knowledge is applied to patient care, integrating theory with hands-on experience. Each student completes a set number of procedures specified in the curriculum for their academic year. While fourth-year students carry out basic endodontic treatments, fifth-year students treat a greater number of patients, thereby advancing their clinical experience. Consequently, the institutional distribution of participants reflected the level of clinical exposure defined by academic year and structured in a comparable manner across faculties. Such reflective practices not only provide valuable feedback for educators but also help students develop a greater awareness of their own learning progress, further reinforcing the link between self-efficacy and clinical competence.

In the present study, students' self-assessments mostly fell within the sufficient range. According to Bandura,¹³ a sufficient level of competence is essential for developing self-efficacy. This may indirectly indicate that students have reached a certain level of clinical competence. However, as these findings rely on self-reported data, they should be interpreted cautiously, given that they may not accurately reflect students' actual clinical performance.

In the present study, a statistically significant difference was found in self-efficacy levels during various stages of root canal treatment according to academic year and gender; therefore, the null hypothesis was rejected. Female students reported higher self-efficacy than males in access cavity and preparation.

In contrast, male students reported higher self-efficacy in periapical radiography. Some previous studies claimed that female students often show higher academic responsibility and achievement, which may increase their confidence in certain clinical skills.^{26, 27} Soto-Araya *et al.*¹ found that female students demonstrated higher abilities in organization, planning, and decision-making compared to their male colleagues. However, the absence of gender-related differences across the majority of the assessed procedures indicates that such differences were limited to a small number of specific skills rather than representing a generalized pattern within endodontic clinical practice.

In this study, fifth-year students reported significantly higher self-efficacy than fourth-year students in some endodontic procedures, whereas self-efficacy levels remained similar for a substantial proportion of them. This finding indicates that self-efficacy during clinical training does not increase at the same rate or in a linear manner across all stages of endodontic treatment. In other words, although increased clinical experience strengthens students' confidence in certain procedures, this effect cannot be assumed to extend equally or consistently to every procedural step. Some endodontic procedures may allow learning, and consequently self-efficacy, to reach a certain level over a shorter period of time, whereas others may require higher levels of cognitive and technical competence. This suggests that more prolonged and targeted clinical experience may be needed for learning to be consolidated. Overall, self-efficacy perceptions related to the various steps of endodontic treatment are shaped not only by academic level, but also by multidimensional factors such as the frequency of endodontic clinical exposure, technical complexity, and learning requirements of the procedure. Nevertheless, the shift towards higher self-efficacy levels in favor of fifth year students observed in a limited number of procedures suggests that greater final year clinical exposure may contribute to increased confidence, in line with previous evidence on the role of hands-on clinical experience in enhancing self-efficacy and clinical competence.¹⁶ These findings carry direct implications for endodontic curriculum design. Procedural areas in which self-efficacy did not significantly increase between the fourth and fifth year, notably complication management, obtura-

tion, and block anesthesia, may represent domains where current training provisions are insufficient to consolidate students' competence beliefs. Targeted educational interventions such as simulation-based training, case-based learning, and structured clinical feedback may be particularly warranted in these areas. Moreover, the procedure-specific nature of self-efficacy gains supports a competency-based approach to curriculum mapping, whereby instructional resources and clinical case requirements are allocated in proportion to the complexity and learning demands of individual procedural steps. The 2024 ESE Undergraduate Curriculum Guidelines¹⁴ provide a valuable framework against which endodontic training standards can be benchmarked and revised in light of such evidence.

Several limitations of the present study should be acknowledged. First, all data are self-reported; students' perceptions of their own procedural competence may not accurately reflect their objective clinical performance. Self-efficacy judgments are subjective appraisals of capability that do not always correspond to demonstrated skill.¹³ Social desirability bias whereby students may overestimate their competence in a survey context cannot be excluded. Future studies should examine the correspondence between self-efficacy perceptions and objective competency indicators such as faculty assessments, structured clinical evaluations, or objective structured clinical examinations (OSCEs).

Second, the cross-sectional design precludes causal inference. Although fifth-year students reported higher self-efficacy than fourth-year students across certain procedures, this difference cannot be attributed to within-individual development over time, as the two groups were not followed longitudinally. The observed pattern may reflect cohort effects, differences in prior clinical exposure, or other unmeasured curricular variables. Longitudinal studies tracking the same cohort across academic years are needed to establish genuine developmental trajectories of endodontic self-efficacy.

Third, although data were gathered from eight dental faculties in Ankara, the study followed a single-group survey design and faculty was not employed as an analytical variable. Given the unequal and in some cases limited sample sizes per institution, inter-fac-

ulty statistical comparisons were not conducted, as such analyses would have been insufficiently powered to yield reliable conclusions. The multi-center sampling approach was intended to increase the representativeness of the findings across the Ankara dental education context rather than to enable institutional comparisons. Nonetheless, institutional differences in curriculum structure, clinical case volume requirements, simulation training resources, and instructional approaches may have introduced heterogeneity in students' self-efficacy levels that the present design cannot fully disaggregate. Future studies employing faculty-stratified sampling with adequate statistical power per institution would enable a more refined examination of how institutional factors moderate the development of endodontic self-efficacy throughout undergraduate training.

Fourth, the study was conducted exclusively among dental students at faculties located in Ankara, which limits the generalizability of the findings to other regions of Türkiye and to dental education systems in other countries. Replication across diverse institutional and national contexts is encouraged. Future studies should compare students' self-efficacy levels with their actual clinical performance based on standardized assessment criteria to better understand the relationship between perceived and demonstrated competence in endodontic procedures.

CONCLUSION

Within the limitations of this study, advancing academic level was associated with higher self-efficacy perceptions for specific endodontic procedures, such as indication, infiltrative anesthesia, access cavity preparation, canal orifice localization, and irrigation. While this finding suggests a gradual development of professional confidence throughout the educational process, it also demonstrates that such progression does not occur uniformly across all endodontic procedures. Moreover, gender-related differences in self-efficacy are limited to a very small number of endodontic procedures. Overall, the majority of students reported moderate to high levels of self-efficacy in relation to endodontic practice.

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CONFLICT OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

DATA AVAILABILITY STATEMENT

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Institutional Ethics Committee of Ankara University. All procedures were conducted in accordance with the ethical standards outlined in the Declaration of Helsinki by the World Medical Association (WMA). Every participant provided their informed consent prior to participation in the study.

CONSENT FOR PUBLICATION

Not applicable.

REFERENCES

1. Soto-Araya M, Baños JE, Pérez J, Moyano E. Generic Competencies in Dentistry: Students' and Teachers' Perceptions of Their Professional Relevance and Their Development in Undergraduate Studies at Universidad Diego Portales of Chile. *Eur J Dent Educ* 2025;29:304-14.
2. Longridge NN, Dutta A, Fox K. Endodontic education - present status and future directions. *Br Dent J* 2025;238:567-72.
3. Friedlander L, Hunt G, Chandler N, Daniel B. Students' experience and perceptions of undergraduate endodontic education in New Zealand. *Aust Endod J* 2023;49:492-502.
4. Baaij A, Özok AR. Influence of Method of Teaching Endodontics on the Self-Efficacy and Self-Perceived Competence of Undergraduate Dental Students. *Eur Endod J* 2018;3:31-7.
5. Altoris A, Ahmad MZ. Assessing confidence levels in endodontic procedures among senior undergraduate dental students at Qassim university, Saudi Arabia: A Cross-Sectional observational study. *Cureus* 2023;15:e43649.

6. Nafea ET. Does Self-Efficacy Affect Clinical Reasoning in Dental Students? *Int Dent J* 2022;72:872-8.
7. Ilgüy D, Ilgüy M, Fisekçioğlu E, Ersan N, Tanalp J, Dölekoglu S. Assessment of root canal treatment outcomes performed by Turkish dental students: results after two years. *J Dent Educ* 2013;77:502-9.
8. Almutairi M, Alattas MH, Alamoudi A, Bahammam SA, Zidane B, Almutairi N, et al. Challenges Assessment in Endodontics Among Undergraduate Students. *Cureus* 2023;15:e43215.
9. Martins RC, Seijo MO, Ferreira EF, Paiva SM, Ribeiro Sobrinho AP. Dental students' perceptions about the endodontic treatments performed using NiTi rotary instruments and hand stainless steel files. *Braz Dent J* 2012;23:729-36.
10. Deeb JG, Carrico CK, Laskin DM, Koertge TE. Influence of Self-Assessment on Dental Students' Performance on Technical Assessments in Periodontics. *J Dent Educ* 2019;83:457-63.
11. Fong W, Heidarifar O, Killough S, Lappin MJ, El Karim IA. An audit on technical quality of root fillings performed by undergraduate students. *Int Endod J* 2018;51:e197-e203.
12. Zimmerman BJ. Self-Efficacy: An Essential Motive to Learn. *Contemp Educ Psychol* 2000;25:82-91.
13. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev* 1977;84:191-215.
14. Baaij A, Kruse C, Whitworth J, Jarad F. European Society of Endodontology Undergraduate Curriculum Guidelines for Endodontology. *Int Endod J* 2024;57:982-95.
15. Murray CM, Chandler NP. Undergraduate endodontic teaching in New Zealand: students' experience, perceptions and self-confidence levels. *Aust Endod J* 2014;40:116-22.
16. Davey J, Bryant ST, Dummer PM. The confidence of undergraduate dental students when performing root canal treatment and their perception of the quality of endodontic education. *Eur J Dent Educ* 2015;19:229-34.
17. Ali Al-Kadhim AH, Nor Azan A, Muhammad Salim M, Yousif Al-Ani ST, Jaafar A. Evaluation on the perception of final year dental students on their confidence level regarding endodontic treatments: a cross sectional analysis. *IJUM Journal of Orofacial and Health Sciences* 2022;3:102-10.
18. Javed MQ, Bhatti UA. Students' performance in clinics and self-perceived Confidence in performing Endodontic procedures: A correlation study. *Pak J Med Sci* 2023;39:203-8.
19. Tanalp J, Güven EP, Oktay I. Evaluation of dental students' perception and self-confidence levels regarding endodontic treatment. *Eur J Dent* 2013;7:218-24.
20. Tavares LG, Lima SMF, Lima MG, Arruda MP, Menegazzi TC, Rezende TMB. Undergraduate dentistry students' perception of difficulties regarding endodontic treatment. *Aust Endod J* 2019;45:98-105.
21. Baaij A, Özok AR, Væth M, Musaeus P, Kirkevang LL. Self-efficacy of undergraduate dental students in Endodontics within

Aarhus and Amsterdam. *Int Endod J* 2020;53:276-84.

22. Cohen J. Statistical power analysis for the behavioral sciences. 2nd ed. Hillsdale (NJ): Lawrence Erlbaum Associates; 1988.
23. Praveen G, Pujitha D, Lakshmi Durga IS, Uddaraju SR, Narisetty SGP, Sayana RG, et al. Comparing traditional and comprehensive clinical training methods in dental education: a study of students' self-confidence and clinical performance. *Br Dent J* 2023;234:682-6.
24. Lynch CD, Ash PJ, Chadwick BL. Student perspectives and opinions on their experience at an undergraduate outreach dental teaching centre at Cardiff: a 5-year study. *Eur J Dent Educ* 2010;14:12-6.
25. Baaij A, Özok AR. Method of teaching undergraduate students to perform root canal treatment: It's influence on the quality of root fillings. *Eur J Dent Educ* 2018;22:e221-e7.
26. Kærsgaard JLB, Christensen MK, Søndergaard PY, Naukkarinen J. Gender differences in dentistry: A qualitative study on students' intrinsic and extrinsic motivations for entering dentistry at higher education. *Eur J Dent Educ* 2021;25:495-505.
27. Kukulu K, Korukcu O, Ozdemir Y, Bezci A, Calik C. Self-confidence, gender and academic achievement of undergraduate nursing students. *J Psychiatr Ment Health Nurs* 2013;20:330-5.

Diş Hekimliği Öğrencilerinin Kök Kanal Tedavisi Performansına İlişkin Öz Yeterliliklerinin Değerlendirilmesi: Bir Anket Çalışması

ÖZET

Amaç: Diş hekimliği öğrencilerinin öz yeterlilik düzeylerinin değerlendirilmesi, eğitimcilerin müfredatta hangi alanların etkili olduğunu ve hangi alanlarda ek desteğe ihtiyaç duyulduğunu daha iyi anlamalarına yardımcı olabilir. Bu çalışma, lisans düzeyindeki diş hekimliği öğrencilerinin kök kanal tedavisi uygulama konusundaki öz yeterliliklerindeki farklılıkları akademik yıl ve cinsiyete göre araştırmayı amaçlamıştır.

Gereç ve Yöntemler: Çalışma Ankara, Türkiye'deki sekiz diş hekimliği fakültesinin, endodonti klinik uygulamalarını tamamlamış olan dördüncü ve beşinci sınıf öğrencileri arasında yürütüldü. Anket, demografik sorulardan ve öğrencilerin kök kanal tedavisinin farklı aşamalarını uygulamadaki öz yeterliliklerini değerlendiren maddelerden oluşmaktaydı. Yanıtlar, 5'li Likert ölçeğinde derecelendirildi (1 = yetersiz, 5 = çok yeterli). Anketin iç tutarlılığı Cronbach alfa katsayısıyla değerlendirildi; akademik yıl ile cinsiyet arasında sıralı Likert ölçekli yanıtlardaki eğilimleri değerlendirmek amacıyla doğrusal eğilim ki-kare testi uygulandı. İstatistiksel anlamlılık düzeyi $p < 0.05$ olarak belirlendi.

Bulgular: Çalışmaya 44'ü (%32.6) erkek, 91'i (%67.4) kadın toplam 135 öğrenci katıldı. Katılımcıların 48'i (%35.6) dördüncü

sınıf, 87'si (%64.4) beşinci sınıf öğrencisiydi. Tanımlayıcı analiz, öğrencilerin öz yeterlik düzeylerinin çoğu endodontik işlemde nötr ile yüksek aralıkta olduğunu gösterdi. Beşinci sınıf öğrencileri; endikasyon, tek seans/çok seans tedavi, infiltratif anestezi, giriş kavitesi, anterior ve premolar dişlerde kanal ağzlarının lokalizasyonu, irrigasyon ve çalışma boyunun korunmasında dördüncü sınıf öğrencilerine kıyasla daha yüksek öz yeterlik bildirdi $p < 0.05$; buna karşılık, kalan işlemler için böyle bir eğilim gözlenmedi ($p > 0.05$). Cinsiyet ile öz yeterlik düzeyleri arasında,

giriş kavitesi, preparasyon ve periapikal radyografi dışında ($p < 0.05$) anlamlı bir doğrusal eğilim saptanmadı.

Sonuç: Öğrenciler, endodontik işlemlere ilişkin öz yeterlik algılarını genel olarak orta ile yüksek düzeyde bildirdi; akademik yıl ve cinsiyete bağlı farklılıklar sınırlı sayıdaki endodontik işlemle kısıtlı kaldı.

Anahtar Kelimeler: Anket; Diş hekimliği öğrencileri; Endodonti; Öz yeterlik