Delft University of Technology

Amsterdam Self-Efficacy Scale for Tooth Removal (ASES-TR)

Beuling, M.G.; Nak, Jason; Kober, Jens; Ho, Jean Pierre T.F.; de Lange, Jan; Grasman, Raoul P. P. P. ; van Riet, T.C.T.

Important note
To cite this publication, please use the final published version (if applicable).
Please check the document version above.

WILEY

ORIGINAL ARTICLE OPEN ACCESS

Amsterdam Self-Efficacy Scale for Tooth Removal (ASES-TR)

Maaike G. Beuling[1] | Jason Nak[2] | Jens Kober[3] | Jean Pierre T. F. Ho[1] | Jan de Lange[1] | Raoul P. P. P. Grasman[2] | Tom C. T. van Riet[1]

[1]Amsterdam University Medical Centers, Department of Oral and Maxillofacial Surgery, Amsterdam, the Netherlands | [2]University of Amsterdam, Department of Psychological Methods, Amsterdam, the Netherlands | [3]Delft University of Technology, Faculty of 3mE, Delft, the Netherlands

Correspondence: Maaike G. Beuling (m.g.beuling@amsterdamumc.nl)

ABSTRACT

Objectives: To develop and validate a questionnaire on dental students' self-efficacy with tooth removal, suitable for measuring the effectiveness of training methods.

Methods: To prepare and validate this questionnaire, we used the Association of Medical Education in Europe (AMEE) stepwise guide for developing questionnaires for educational research. In the validation process, our study group conducted two pilot studies, the first for an exploratory factor analysis and the second for a confirmatory factor analysis. In addition, the questionnaire was tested for convergence with the neuroticism subscale of the NEO-Personality Inventory.

Results: After an exploratory factor analysis, which used a total of 137 responses on 33 items, 15 items were left for confirmatory factor analysis. A total of 118 responses were available for the confirmatory factor analysis. Model fitness was tested using tests for exact fitness and fit indices such as the goodness of fit index (GFI), root mean square error of approximation (RMSEA) and standardised root mean squared residual (SRMR). An acceptable fit was found for 11 items divided over three factors: 'self-perceived skill', 'tension' and 'dedication'. These 11 items did not converge with the neuroticism scale.

Conclusion: This study showed the development steps and initial validation of a psychometric instrument, the Amsterdam Self-Efficacy Scale for Tooth Removal (ASES-TR), consisting of 11 items for testing dental students' self-efficacy in performing tooth removal procedures.

1 | Introduction

Dental students are trained in a broad range of practical dental procedures. This includes tooth removal, a common dental procedure in which students must develop significant competencies to perform it safely and effectively [1]. Brand et al. [2] found significant variations between European curricula in how they teach tooth removal in dental schools across Europe. They also found that dental students' inadequate training in tooth removal is frequently reported.

Several reasons have been suggested to explain deficient training in tooth-removal procedures for dental students. One reason is that improved oral health and developments in preventive and restorative dentistry have given students less exposure during their training [3]. Another reason could be the absence

of sufficient realistic preclinical practice modalities for this specific procedure [2, 4, 5]. Inadequate training may result in reduced self-efficacy among dental students, potentially leading to suboptimal patient experiences and higher referral rates for nonsurgical tooth removal to more costly oral and maxillofacial surgeons [6].

To enhance tooth-removal training, implementing a validated scale to assess students' training status could be beneficial, and self-efficacy could serve as a valuable metric for this scale. Perceived self-efficacy is defined as 'people's judgments of their capabilities to execute courses of action required to attain designated types of performances' [7]. It provides important insight into their personal development and their learning outcomes [8, 9]. Bandura [7] hypothesised that people who have low self-efficacy for accomplishing a specific task are more likely to avoid it, while those with high self-efficacy are more likely to participate, exert more effort and persist despite challenges [10]. A reliable and valid questionnaire in assessing self-efficacy could help to identify areas in which dental students may need further training and, moreover, to evaluate the effectiveness of different training methods. Currently, no standardised questionnaire is available. In this paper, our aim was to develop and validate a questionnaire to test dental students' self-efficacy in tooth-removal procedures.

2 | Methods

2.1 | Goal

Our goal is to develop a psychometrically validated scale that measures perceived self-efficacy in the ability to perform nonsurgical tooth-removal procedures among dental students. The target population for this scale consists of dental students at all levels of training, from first-year to sixth-year. The dental programme in the Netherlands consists of a 3-year bachelor's programme followed by a 3-year master's programme. The purpose of the scale is to evaluate whether the training in tooth-removal skills contributes to students' self-efficacy.

2.2 | Initial Development of a Topic List and Possible Domains

To prepare and validate the questionnaire, the Association of Medical Education in Europe (AMEE) stepwise guide for developing questionnaires for educational research was used [11]. Methods from Rubio et al. [12] and McKenzie et al. [13] were used to establish content validity. The step-by-step process undertaken to develop and validate the first version of the questionnaire is illustrated in the flowchart (Figure 1). A more detailed description of each step is provided in the following sections.

An exhaustive literature search on questionnaires used for tooth-removal training did not identify any existing surveys that test students' self-efficacy levels. Consequently, we compiled a short list of topics to be discussed in a semi-structured interview, in which sixth-year dental students used phrasing to describe their perceptions of self-efficacy in performing tooth-removal procedures. At the time of the interviews, all students were in their oral and maxillofacial surgery internship and were all affiliated with the Academic Center for Dentistry Amsterdam (ACTA). The topics covered included *current theoretical preparation*, *self-efficacy in tooth removal at present*, *learning goals and expectations* and *new educational materials. The specific questions used during the semi-structured interviews are provided in Appendix* 1. Based on these interviews, possible domains were formulated in consultation with two psychologists highly experienced in questionnaire

FIGURE 1 | Flowchart of the steps undertaken to develop and validate the first versions of the questionnaire that assess self-efficacy in tooth removal among dental students.

TABLE 1 | English version of the final list of 33 items, including four control questions (#8–#10).

#	Items (translated from Dutch to English)
1.	'I probably need assistance from a teacher if I have to perform an extraction of a sound 11 without any additional specifications right now'.
2.	'I probably need assistance from a teacher if I have to perform an extraction of a sound 16 without any additional specifications right now'.
3.	'If I were to perform an extraction of tooth 36 today, I would ask for assistance from a teacher if I cannot get any movement in the tooth'.
4.	'If I were to perform an extraction of tooth 36 today, I would ask for assistance from a teacher if there is a cusp fracture causing the forceps to slip off repeatedly'.
5.	'If I were to perform an extraction of tooth 36 today, I would ask for assistance from a teacher if the entire crown breaks off'.
6.	'If an extraction is necessary, I would most likely treat the patient myself, even if there was postoperative bleeding in the previous extraction'.
7.	'If an extraction is necessary, I would most likely treat the patient myself, even if the patient is anxious about undergoing an extraction'.
8.	'For a healthy patient, I currently feel competent to independently perform supragingival dental cleaning'.
9.	'For a healthy patient, I currently feel competent to independently perform a Class II restoration on tooth 14'.
10.	'For a healthy patient, I currently feel competent to independently perform an extraction of a sound tooth 11'.
11.	'I feel competent to independently perform an extraction of a sound tooth 47 in a healthy patient'.
12.	Indicate your level of agreement with the following statement: 'If I encounter a problem during an extraction, I expect to be able to find a solution myself'.
13.	Indicate your level of agreement with the following statement: 'If an extraction needs to be performed today, I prefer to delegate it to someone else'.
14.	Indicate your level of agreement with the following statement: 'I have sufficient knowledge of anatomy to prevent permanent damage'.
15.	Indicate your level of agreement with the following statement: 'I have sufficient proficiency with extraction instruments to avoid causing permanent damage'.
16.	'I feel anxious when a fellow student assists me during an extraction'.
17.	'I feel anxious when the teacher observes me performing an extraction'.
18.	'I feel anxious when the teacher asks me, in the presence of the patient, to select the appropriate extraction forceps'.
19.	'I feel anxious when the teacher asks me, in the presence of the patient, a question about the anatomy of the extraction area'.
20.	Indicate your level of agreement with the following statement: 'I expect performing an extraction to require less effort than it does for the majority of my fellow students'.
21.	Indicate your level of agreement with the following statement: 'I think I will need more time for an extraction than the majority of my fellow students'.
22.	Indicate your level of agreement with the following statement: 'The thought of independently performing an extraction is frightening to me'.
23.	Indicate your level of agreement with the following statement: 'I think extractions are complicated'.
24.	Indicate your level of agreement with the following statement: 'If I were to perform an extraction today, I would probably think about everything that could go wrong'.
25.	Indicate your level of agreement with the following statement: 'Just the thought of having to perform an extraction independently makes me nervous'.

(Continues)

TABLE 1 | (Continued)

#	Items (translated from Dutch to English)
26.	Indicate your level of agreement with the following statement: 'If I know that I have to perform an extraction this afternoon, I feel tense throughout the morning'.
27.	Indicate your level of agreement with the following statement: 'I will not perform the extractions I have indicated myself as a dentist in the future'.
28.	Indicate your level of agreement with the following statement: 'I will never become really skilled at performing extractions'.
29.	Indicate your level of agreement with the following statement: 'I enjoy being able to independently and skilfully perform an extraction'.
30.	Indicate your level of agreement with the following statement: 'I find independently performing an extraction to be interesting and challenging'.
31.	Indicate your level of agreement with the following statement: 'I have never had an interest in learning to perform extractions'.
32.	Indicate your level of agreement with the following statement: 'It is important to me to be able to perform most of the extractions I indicate myself in the future'.
33.	Indicate your level of agreement with the following statement: 'I do not see performing an extraction as more complicated than most other dental treatments'.

development. The identified domains consisted of *theoretical understanding, technical skill, personality-related factors, patient-related factors* and *situation-related factors*.

2.3 | Development of Questionnaire Items

The possible domains were discussed among three expert focus groups (*n* = 6 members), consisting of one dentist and one oral and maxillofacial surgeon responsible for the oral-surgery-training programme of all three Dutch dentistry faculties: Academic Center for Dentistry Amsterdam (ACTA), University Medical Center Groningen (UMCG) and Radboud University Nijmegen. The discussion with the experts gave us a clear understanding of the construct and the most relevant domains, along with the key factors for boosting self-efficacy in tooth-removal procedures. We then generated a list of items to cover each of the identified domains. The ISO (International Standards Organisation number 3950, Fédération Dentaire International) system was used as the dental notation system for the items. We sent the first draft of questionnaire items to the three focus groups and one independent psychologist highly experienced in questionnaire development. The first feedback round consisted of written qualitative feedback to assess representativeness, clarity, relevance and factor distribution of each item [13]. After adjustments, the second round of feedback consisted of quantitative feedback, in which the intended final items were presented in the desired (online) format and were rated by the experts. The experts scored the items for ambiguity and relevance on a scale of one to four and classified them into their respective domains to see if this corresponded with their intended domains. The feedback of both rounds was collected in an anonymous manner. The Content Validity Index for each item (I-CVI) based on expert ratings of relevance was calculated. As the result was satisfactory (I-CVI > 0.83), no extra iterations of feedback were deemed

necessary [12, 14]. We subsequently conducted a series of cognitive interviews with sixth-year dental students guided by two oral and maxillofacial surgeons and one psychologist. The questionnaire was presented to the students in its final form (digitally) and evaluated in two rounds of interviews using the *think-aloud* technique and concurrent *verbal probing* in order to assess how the target demographic interpreted the questions. After minor refinements, a final list of 33 items was ready to be used for pilot testing. The questionnaire was administered through the Qualtrics online survey platform (Qualtrics, Provo, UT). A translation of the 33 items can be found in Table 1. The original Dutch version of each item can be found in Appendix 2. It included four control questions to filter out potential response bias (Table 1, items 8–11). In addition, neuroticism, one of the Big Five personality traits, was assessed using questions from the NEO-Personality Inventory (NEO-PI) [15]. These items were added to the questionnaire to investigate the construct validity of the subscale 'tension' (Table 1, items 16–18 and 24–26).

2.4 | Pilot Testing: Exploratory and Confirmatory Factor Analysis

2.4.1 | Sample Size

We set a minimum sample size of 100 participants for both pilot studies to ensure sufficient data for analysis. Given the limited number of available students and the expected response rate for questionnaires without incentives, this target was reasonable. For exploratory factor analysis (EFA), we followed Worthington et al.'s recommendations, as sample sizes below 100 and a participant-to-item ratio of less than 3:1 may be inadequate [16]. Similarly, for confirmatory factor analysis (CFA), we aimed for at least 100 participants to ensure robust data analysis, as recommended by Kline [17].

2.4.2 | Pilot One: Exploratory Factor Analysis

In April 2021, all second- and sixth-year dental students from all three Dutch dentistry faculties were invited by e-mail to complete the questionnaire. The invitation was sent twice to each student, with a 2-week interval. The invitation was sent to a sample of approximately 600 enrolled students. An exploratory factor analysis (EFA) was used to analyse the responses. In particular, we assessed the number of factors apparent in the questionnaire as well as their alignment with the intended factors. Items were assessed for factor loading, within-factor reliability (Cronbach's alpha), within-factor item-rest correlation, discriminatory value between second- and sixth-year dental students and content [18]. The reliability of the questionnaire was assessed by means of Cronbach's alpha, aiming for a reliability of at least 0.80 [19]. In addition, an interpretation for each of the factors derived was based on a content analysis of the item text and their variance contribution to each factor.

2.4.3 | Pilot Two: Confirmatory Factor Analysis

In September 2021, a second sample of dental students was invited for data collection for confirming the factors found in the EFA. All students from one of the three faculties (viz. ACTA) were invited by e-mail. The invitation was sent twice to every student, with a 2-week interval, excluding those who had participated in the first pilot. The purpose of the second pilot was to assess whether the extracted factors from the first pilot could be reliably reproduced. The questionnaire was sent to a total of 779 students. The data were analysed using a confirmatory factor analysis (CFA). We used the following indices to assess fit: Goodness of Fit Index (GFI; a GFI < 0.90 is generally considered acceptable), population standardised root mean squared residual (SRMR; SRMR < 0.08 is generally considered acceptable) and the root mean square error of approximation (RMSEA; an RMSEA < 0.10 is generally considered acceptable) [20]. Items showing high cross-loading or a large unexplained item covariance were removed. The covariance was not restricted.

2.5 | Validity

To combine a number of items to represent the construct of 'self-efficacy in tooth removal', it is necessary to provide evidence that these items truly represent the same construct. Validity refers to whether the instrument actually measures what it is designed to measure. There are different types of validity evidence: *test-content, response processes, internal structure, relations to other variables* and *the consequence of testing* [21]. Validity regarding *test content* and *response processes* was ensured through semi-structured and cognitive interviews with sixth-year dental students, as well as discussions and feedback rounds with experts. The internal structure was identified through the EFA and assessed through the CFA. Relations to other variables were assessed by examining the correlations between the construct and the personality trait neuroticism. Lastly, the consequences of testing were evaluated by examining the discriminating scores between second- and sixth-year dental students.

3 | Results

3.1 | Exploratory Factor Analysis Results

A total of 137 full responses (71/137 female, 59/137 sixth-year dental students) were used for factor analysis using oblique rotation. The Kaiser–Meyer–Olkin (KMO) measure defined the data as suitable for factor analysis (KMO = 0.87) [22]. Eigenvalues were obtained for each factor by running a principal component analysis. Although Kaiser's criterion (number of eigenvalues greater than 1) suggested five latent factors, a scree plot and parallel analysis provided evidence for only three factors based on the inflexion points (Figure 2) [18]. Based on item text content analysis we designated three factors: 'self-perceived skill', 'tension' and 'dedication'. All three subscales were analysed as highly reliable with a Cronbach's α of 0.952 for the subscale 'self-perceived skill', 0.895 for 'tension', 0.841 for 'dedication' and resulted in an overall Cronbach's α of 0.951. After the exploratory factor analysis, we iteratively excluded items per factor with low factor loadings, low item-rest correlation and/or low
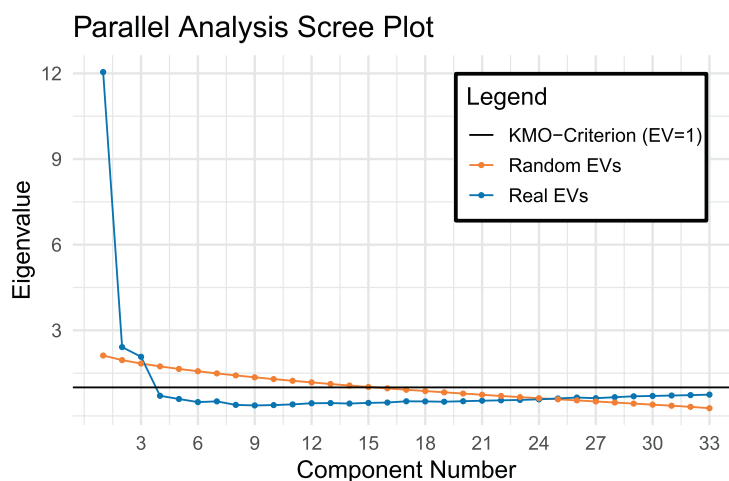
FIGURE 2 | Scree plot indicating three factors based on the inflexion point, Kaiser criterion (Eigenvalue (Ev) > 1.0).

discriminative value between second- and sixth-year dental students. From the items in Table 1, the following items (including the four control questions 8–11) were removed in the selection process: 3, 5–12, 19–23, 27, 28, 32 and 33. An overview of the Cronbach's α if deleted, item-rest correlation, factor loadings and discriminative values of each item can be found in Appendix . The remaining 15 items after EFA and their defined subscale can be found in Table 2. Each item was given an ID-number based on the identified subscale to make it easier to refer to each item in the CFA.

3.2 | Confirmatory Factor Analysis Results

A total of 118 complete responses (70% female, 81% master students; and approximately 15% of the individuals that were invited to participate) were obtained for a multi-step CFA. First, model fitness was assessed using tests of exact fit as well as the fit indices GFI, RMSEA and SRMR. In a strict CFA, the three-factor model obtained in the EFA was rejected. To diagnose and remedy this, we inspected fit modification measures reported by the R-package 'lavaan' [23]. Items identified as detrimental to the fit, along with an inspection of earlier measures of the EFA and content analysis of the item, led to the removal of items and an evaluation of multiple models until an acceptable fit was found as defined by the fit indices GFI, RMSEA and SRMR. Fit indices for each model can be found in Table 3. Model 0 tested all 15 items left after the EFA; in the first model, one item (SKI4) was removed; in the second model, three items (SKI1, SKI3 and SKI4) were removed; and, finally, in the third model, four items (SKI1, SKI3, SKI4 and TEN4) were removed. All the removed items showed cross-loading on multiple factors. This process resulted in a final list of 11 items. The correlation matrix of all 15 items can be found in Table 4.

3.3 | Correlation Between the Subscale Tension and Neuroticism

Analysis of the correlation between the subscale 'tension' (Table 1, items 16–18 and 24–26)and the NEO-PI questions

TABLE 2 | Selected 15 items and identified subscale (Self-perceived skill = SS, Tension = T, Dedication = D) a.

#	Item	Identified subscale	ID
1.	'I probably need assistance from a teacher if I have to perform an extraction of a sound 11 without any additional specifications right now'.	SS	SKI1
2.	'I probably need assistance from a teacher if I have to perform an extraction of a sound 16 without any additional specifications right now'.	SS	SKI2
4.	'If I were to perform an extraction of tooth 36 today, I would ask for assistance from a teacher if there is a cusp fracture causing the forceps to slip off repeatedly'.	SS	SKI3
13.	Indicate your level of agreement with the following statement: 'If an extraction needs to be performed today, I prefer to delegate it to someone else'.	SS	SKI4
14.	Indicate your level of agreement with the following statement: 'I have sufficient knowledge of anatomy to prevent permanent damage'.	SS	SKI5
15.	Indicate your level of agreement with the following statement: 'I have sufficient proficiency with extraction instruments to avoid causing permanent damage'.	SS	SKI6
16.	'I feel anxious when a fellow student assists me during an extraction'.	T	TEN1
17.	'I feel anxious when the teacher observes me performing an extraction'.	T	TEN2
18.	'I feel anxious when the teacher asks me, in the presence of the patient, to select the appropriate extraction forceps'.	T	TEN3
24.	Indicate your level of agreement with the following statement: 'If I were to perform an extraction today, I would probably think about everything that could go wrong'.	T	TEN4
25.	Indicate your level of agreement with the following statement: 'Just the thought of having to perform an extraction independently makes me nervous'.	T	TEN5
26.	Indicate your level of agreement with the following statement: 'If I know that I have to perform an extraction this afternoon, I feel tense throughout the morning'.	T	TEN6
29.	Indicate your level of agreement with the following statement: 'I enjoy being able to independently and skilfully perform an extraction'.	D	DED1
30.	Indicate your level of agreement with the following statement: 'I find independently performing an extraction to be interesting and challenging'.	D	DED2
31.	Indicate your level of agreement with the following statement: 'I have never had an interest in learning to perform extractions'.	D	DED3

TABLE 3 | Fit indices of each tested model (X² = Chi-square, df = degrees of freedom, GFI = goodness of fit index, RMSEA = root mean square error of approximation, SRMR = standardised root mean squared residual).

Model	Items	χ^2	df	p	GFI	RMSEA	SRMR
0	1, 2, 4, 13–18, 24–26, 29–31	216.236	87	< 0.001	0.978	0.113	0.106
1	1, 2, 4, 14–18, 24–26, 29–31	127.898	74	< 0.001	0.986	0.079	0.092
2	2, 14–18, 24–26, 29–31	75.739	51	0.014	0.986	0.064	0.082
3	2, 14–18, 25, 26, 29–31	57.831	41	0.042	0.988	0.059	0.077

(Table 1, items 8–11) for neuroticism did not show a significant correlation ($r = 0.129$, $p = 0.16$). Therefore, the items correlated to tension did not effectively assess neuroticism, further suggesting validity of the construct.

4 | Discussion

This study aimed to follow a systematic and evidence-based approach to developing and validating a questionnaire intended to assess dental students' self-efficacy in performing tooth removal. To achieve this, we used the AMEE guide on developing questionnaires for educational research [11]. The purpose of the questionnaire was to provide dental educators with a psychometric instrument that has the potential to measure the impact of specific training methods in tooth removal. The initial validation process outlined in this paper resulted in a final list of 11 items, divided into three factors: 'tension', 'self-perceived skill' and 'dedication'. The final list of 11 items will further be referred to as the Amsterdam Self-Efficacy Scale for Tooth Removal (ASES-TR).

To the best of the authors' knowledge, no validated questionnaires specifically assess self-efficacy among dental students in tooth removal. Existing studies evaluating surgical training tend to rely on general educational evaluation forms [24, 25], single-item questions addressing satisfaction or confidence in tooth removal [26, 27], or broader assessments of oral surgery training using questionnaires based on the Association of British Academic Oral and Maxillofacial Surgeons Education Committee questionnaire [28–30]. Other studies focus on competence rather than self-efficacy, using scoring systems that are also limited in their validation. For example, some rely on institution-specific criteria to assess competence [31], while others attempt validation but remain confined to pilot studies, lacking comprehensive evaluation [32]. Another study uses the Assessment of Competency in Exodontia Skills (ACES) [33], which is also limited in validation, relying on expert focus groups rather than comprehensive validation processes [34]. As these studies mostly rely on nonvalidated instruments, the reliability of their results might be reduced, and the comparability of their findings is limited. In summary, a fully validated tool to measure self-efficacy in simple tooth-removal procedures is lacking, and existing scoring systems or checklists are insufficiently validated.

Scale development is concerned with measuring phenomena that cannot directly be observed [35]. Therefore, it is important to ensure that the construct aligns with the intended measure.

In pursuit of robust questionnaire development, our goal was to achieve precise adherence to methodological guidelines while prioritising transparency and comprehensiveness in each procedural step. This approach aimed to optimise the initial validation process and ensure that the questionnaire accurately assesses the intended construct. The foundation for the initial list of items was developed in collaboration with all three Dutch dental faculties, with active engagement from both students and educators. In this manner, a clear concept of the construct's intended purpose was formulated [36, 37]. The EFA allowed us to identify the number of factors and to identify patterns within the data without imposing any preconceived assumptions about the factor structure. The CFA redefined our factor structure, providing the opportunity to eliminate some items and enhance the model fit indices. Furthermore, the construct had no correlation with the personality trait of neuroticism, which enhances the validity of self-efficacy as a measured indicator for learning effects. To our knowledge, a comprehensive development and initial validation of a questionnaire, like the process as described in this paper, has not been previously undertaken for self-efficacy in tooth-removal training.

The use of a validated psychometric instrument holds great potential for testing newly developed training methods, as well as for monitoring self-efficacy changes throughout different stages of dental training through longitudinal studies. We anticipate future advancements in tooth-removal training, as it still primarily consists of traditional didactic and clinical training on patients, while simulation-based training and digital technologies are already widely used in other dental training areas [2, 38, 39]. For tooth removal, these technologies are still in development [40]. To evaluate a simulation device, along with other newly developed training methods, a validated instrument that measures whether these methods enhance students' self-efficacy is essential. For example, several studies in nursing training have shown that simulation-based training improves self-efficacy scores [41–43]. A validated instrument measuring self-efficacy ensures the effectiveness of the training methods, further enhancing evidence-based teaching.

It is important to note that the instrument, as an educational tool, cannot directly be used as an objective measure of students' competence. It relies on self-reported self-efficacy and is intended to evaluate training methods. Although studies have shown that self-efficacy is positively correlated with academic performance in dental students [44, 45], this association may not directly translate to individual performance outcomes

TABLE 4 | Correlation matrix of all 15 items.

	SKI1	SKI2	SKI3	TEN1	TEN2	TEN3	SKI4	SKI5	SKI6	TEN4	TEN5	TEN6	DED1	DED2	DED3
SKI1	1														
SKI2	0.80	1													
SKI3	0.61	0.79	1												
TEN1	0.46	0.36	0.23	1											
TEN2	0.40	0.29	0.21	0.49	1										
TEN3	0.43	0.35	0.14	0.52	0.40	1									
SKI4	0.55	0.43	0.23	0.61	0.39	0.51	1								
SKI5	−0.37	−0.38	−0.29	−0.41	−0.11	−0.35	−0.41	1							
SKI6	−0.49	−0.58	−0.43	−0.39	−0.20	−0.35	−0.51	0.51	1						
TEN4	0.33	0.34	0.21	0.43	0.34	0.23	0.45	−0.37	−0.46	1					
TEN5	0.61	0.61	0.47	0.45	0.31	0.45	0.53	−0.24	−0.50	0.43	1				
TEN6	0.51	0.51	0.32	0.57	0.32	0.50	0.58	−0.32	−0.44	0.51	0.73	1			
DED1	−0.34	−0.23	−0.10	−0.26	−0.19	−0.26	−0.39	0.11	0.12	−0.19	−0.44	−0.42	1		
DED2	−0.35	−0.24	−0.09	−0.33	−0.25	−0.30	−0.38	0.00	0.06	−0.13	−0.45	−0.46	0.81	1	
DED3	0.12	0.03	−0.10	0.28	0.28	0.26	0.26	−0.04	−0.01	0.09	0.26	0.25	−0.31	−0.35	1

in tooth-removal skills. The main objective of tooth-removal training is to provide students with a solid foundation to perform tooth removal safely and independently, facilitating their progression to expert practitioners postgraduation. In this perspective, self-efficacy appears to be a valuable metric to evaluate training methods. While our study only explores self-efficacy in tooth removal, the relationship between self-efficacy and actual performance in this procedure remains to be investigated. Further research is needed to determine how self-efficacy translates into clinical competence.

Some limitations of the study sample size should be acknowledged. First, a response rate of 15% may introduce bias, potentially limiting the generalisability of our findings. It is possible that the lack of incentives for participation led to a selection bias, attracting more intrinsically motivated students to partake in this pilot study. Since the requirements for the number of participants needed to conduct a robust factor analysis are considerable, there remains a degree of uncertainty regarding the results due to the risk of sample or selection bias [46]. Despite the possibility of these potential biases, we argue that due to the inclusion of all three Dutch dental faculties and targeting different academic years in both pilot studies, our sample size is heterogeneous; therefore, sufficient to encompass the diversity among dental students, and the response rate seemed to be unrelated to any of the demographic variables available.

Although this initial validation process already demonstrated a reliable and consistent construct, it is necessary for further validation, as validation is an ongoing process, to explore the instrument's discriminative capabilities and reliability. The exploratory factor analysis showed discriminative effects between second- and sixth-year students, but more subtle discriminative effects still have to be explored. Subsequent research should focus on demonstrating its discriminative power by accurately distinguish individual learning effects and the potential to assess the effect of specific training. It is important to recognise the risk of potential ceiling effects, wherein the instrument may be well-suited for students in their earlier academic years, but may be less discriminative for sixth-year students, and vice-versa. Therefore, evaluating educational effects and conducting expert-novice analysis are essential steps towards ensuring the questionnaire's efficacy as a valuable educational tool. Another essential step still missing in the validation process is to assess its stability through test–retest analysis, thereby confirming the questionnaire's reliability.

Furthermore, it is highly recommendable for other 'non-Dutch' researchers to replicate the validation process for any translated version of the questionnaire, as the validation process for this questionnaire was done in Dutch. This step is indispensable to guarantee the reliability, validity and overall quality of translated versions across different languages, curriculum structures and cultural contexts. The Dutch questionnaire can serve as a valuable resource in the development and validation process.

Although steps are necessary for further validation, this study presented a thorough approach and initial validation of an instrument for assessing students' self-efficacy in tooth-removal procedures. Further research has the potential to enhance its

capabilities in terms of its discriminative and predictive capacity. These refinements are crucial to transforming the instrument into a useful educational tool and to accurately evaluating students' learning outcomes. Additionally, it is important to note that validation in other languages is necessary to ensure its applicability across different cultural settings. The initiative to equip dental educators with a tool for assessing self-efficacy in tooth removal is driven by the objective of better preparing dental students for clinical care postgraduation.

Ethics Statement

Conflicts of Interest

Data Availability Statement

References

1. J. Cowpe, A. Plasschaert, W. Harzer, H. Vinkka-Puhakka, and A. D. Walmsley, "Profile and Competences for the Graduating European Dentist – Update 2009," *European Journal of Dental Education* 14, no. 4 (2010): 193–202.

2. H. S. Brand, C. C. J. van der Cammen, S. M. E. Roorda, and J. A. Baart, "Tooth Extraction Education at Dental Schools Across Europe," *BDJ Open* 1 (2015): 15002.

3. J. Durham, C. Balmer, A. Bell, et al., "A Generic Consensus Assessment of Undergraduate Competence in Forceps Exodontia in the United Kingdom," *European Journal of Dental Education* 14, no. 4 (2010): 210–214.

4. A. K. Dantas, A. Shinagawa, and M. C. Deboni, "Assessment of Preclinical Learning on Oral Surgery Using Three Instructional Strategies," *Journal of Dental Education* 74, no. 11 (2010): 1230–1236.

5. F. Stelzle, D. Farhoumand, F. W. Neukam, and E. Nkenke, "Implementation and Validation of an Extraction Course Using Mannequin Models for Undergraduate Dental Students," *Acta Odontologica Scandinavica* 69, no. 2 (2011): 80–87.

6. P. Onclin, B. van Minnen, and B. Stegenga, "Recente Toename Van Reguliere Extracties in Mka-Chirurgie Onderzocht [Recent Increase in Simple Extractions in OMF-Surgeries in The Netherlands Studied]," *Nederlands Tijdschrift voor Tandheelkunde* 123, no. 7–8 (2016): 365–372.

7. A. Bandura, "Self-Efficacy: Toward a Unifying Theory of Behavioral Change," *Psychological Review* 84, no. 2 (1977): 191–215.

8. Y. Zhao, Z. Zheng, C. Pan, and L. Zhou, "Self-Esteem and Academic Engagement Among Adolescents: A Moderated Mediation Model," *Frontiers in Psychology* 12 (2021): 690828.

9. J. Moneva and S. Tribunalo, "Students' Level of Self-Confidence and Performance Tasks," *Asia Pacific Journal of Academic Research in Social Sciences* 5, no. 1 (2020): 42–48.

10. A. R. Artino, Jr., "Academic Self-Efficacy: From Educational Theory to Instructional Practice," *Perspectives on Medical Education* 1, no. 2 (2012): 76–85.

11. A. R. Artino, Jr., J. S. La Rochelle, K. J. Dezee, and H. Gehlbach, "Developing Questionnaires for Educational Research: AMEE Guide No. 87," *Medical Teacher* 36, no. 6 (2014): 463–474.

12. D. M. Rubio, M. Berg-Weger, S. S. Tebb, E. S. Lee, and S. Rauch, "Objectifying Content Validity: Conducting a Content Validity Study in Social Work Research," *Social Work Research* 27, no. 2 (2003): 94–104.

13. J. F. McKenzie, M. L. Wood, J. E. Kotecki, J. K. Clark, and R. A. Brey, "Establishing Content Validity: Using Qualitative and Quantitative Steps," *American Journal of Health Behavior* 23, no. 4 (1999): 311–318.

14. D. F. Polit, C. T. Beck, and S. V. Owen, "Is the CVI an Acceptable Indicator of Content Validity? Appraisal and Recommendations," *Research in Nursing & Health* 30 (2007): 459–467.

15. R. R. McCrae, P. T. Costa, and T. A. Martin, "The NEO–PI–3: A More Readable Revised NEO Personality Inventory," *Journal of Personality Assessment* 84, no. 3 (2005): 261–270.

16. R. L. Worthington and T. A. Whittaker, "Scale Development Research: A Content Analysis and Recommendations for Best Practices," *Counseling Psychologist* 34, no. 6 (2006): 806–838.

17. P. Kline, *An Easy Guide to Factor Analysis*, 1st ed. (Routledge, 1994).

18. A. Field, *Discovering Statistics Using IBM SPSS Statistics*, 3rd ed. (SAGE Publications, 2013).

19. J. M. Cortina, "What Is Coefficient Alpha? An Examination of Theory and Applications," *Journal of Applied Psychology* 78, no. 1 (1993): 98–104.

20. D. Hooper, J. Coughlan, and M. R. Mullen, "Structural Equation Modelling: Guidelines for Determining Model Fit," *Electronic Journal of Business Research Methods* 6 (2008): 53–60.

21. E. Knekta, C. Runyon, and S. Eddy, "One Size Doesn't Fit all: Using Factor Analysis to Gather Validity Evidence When Using Surveys in Your Research," *CBE Life Sciences Education* 18, no. 1 (2019): 0064.

22. G. Hutcheson and N. Sofroniou, *The Multivariate Social Scientist: Introductory Statistics Using Generalized Linear Models* (Sage Publication, 1999).

23. Y. Rosseel, "Lavaan: An R Package for Structural Equation Modeling," *Journal of Statistical Software* 48, no. 2 (2012): 1–36.

24. Y. Choi, M. Lee, J. Kim, and W. Park, "Clinical Observation Using Virtual Reality for Dental Education on Surgical Tooth Extraction: A Comparative Study," *BMC Medical Education* 24, no. 1 (2024): 643.

25. L. Liu, Y. Chen, Y. Cao, et al., "From Anatomy to Surgery: Effectiveness of Virtual Simulation Adjuvant to Traditional Methods in the Preclinical Training of Apicoectomy," *Anatomical Sciences Education* 18, no. 1 (2025): 97–116.

26. K. Gaballah, K. Ali, D. Zahra, E. Abou Neel, and E. Ibrahim, "Perceived Confidence of Dental Students and New Graduates in Performing Tooth Extractions-An Exploratory Study," *European Journal of Dental Education* 28, no. 1 (2024): 191–205.

27. M. Brundin and M. Sjöström, "Student Confidence in Clinical Competence During Dental Education," *BDJ Open* 10, no. 1 (2024): 92.

28. M. Macluskey, J. Durham, A. Bell, et al., "A National Survey of UK Final Year Students' Opinion of Undergraduate Oral Surgery Teaching," *European Journal of Dental Education* 16, no. 1 (2012): e205–e212.

29. M. Kamal and M. Abdulwahab, "Self-Confidence in Oral and Maxillofacial Surgery: A Cross-Sectional Study of Undergraduate Dental Students at Kuwait University," *BMC Medical Education* 21, no. 1 (2021): 198.

30. M. Ç. Burdurlu, F. Cabbar, V. Dağaşan, et al., "A City-Wide Survey of Dental Students' Opinions on Undergraduate Oral Surgery Teaching," *European Journal of Dental Education* 24, no. 2 (2020): 351–360.

31. K. Ali, H. S. Qazi, K. Siddiqi, and R. Glanville, "Assessment of Undergraduate Students in Tooth Extraction Competence- A Cohort Study," *European Journal of Dental Education* 25, no. 3 (2021): 607–613.

32. O. W. Majid, "Assessment of Clinical Ability in the Removal of Teeth Among Undergraduate Dental Students: A Longitudinal Comparative Study," *British Journal of Oral & Maxillofacial Surgery* 56, no. 9 (2018): 870–876.

33. X. Yang, T. Yan, Z. Bao, K. Ouyang, and L. Huang, "Wisdom Tooth Extraction Training for Dental Students: Step-By-Step or all-In-One?," *British Journal of Hospital Medicine* 85, no. 9 (2024): 1–15.

34. O. S. Janjua, A. Ashar, and T. Khalid, "Developing an Assessment-Of-Clinical-Exodontia-Skills (ACES) Rating Scale for Undergraduate Dental Students," *Journal of the College of Physicians and Surgeons–Pakistan* 29, no. 5 (2019): 463–468.

35. V. A. Miller, W. W. Reynolds, R. F. Ittenbach, M. F. Luce, T. L. Beauchamp, and R. M. Nelson, "Challenges in Measuring a New Construct: Perception of Voluntariness for Research and Treatment Decision Making," *Journal of Empirical Research on Human Research Ethics* 4, no. 3 (2009): 21–31.

36. L. J. Cronbach and P. E. Meehl, "Construct Validity in Psychological Tests," *Psychological Bulletin* 52, no. 4 (1955): 281–302.

37. L. W. Schuwirth and C. P. van der Vleuten, "General Overview of the Theories Used in Assessment: AMEE Guide No. 57," *Medical Teacher* 33, no. 10 (2011): 783–797.

38. S. Perry, S. M. Bridges, and M. F. Burrow, "A Review of the Use of Simulation in Dental Education," *Simulation in Healthcare* 10, no. 1 (2015): 31–37.

39. N. U. Zitzmann, L. Matthisson, H. Ohla, and T. Joda, "Digital Undergraduate Education in Dentistry: A Systematic Review," *International Journal of Environmental Research and Public Health* 17, no. 9 (2020): 3269.

40. M. G. Beuling, T. C. Van Riet, J. Van Frankenhuyzen, et al., "Development and Testing of a Prototype of a Dental Extraction Trainer With Real-Time Feedback on Forces, Torques, and Angular Velocity," in *44th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*. (Institute of Electrical and Electronics Engineers (IEEE), 2022), 3285–3290.

41. E. Kim, "Effect of Simulation-Based Emergency Cardiac Arrest Education on Nursing Students' Self-Efficacy and Critical Thinking Skills: Roleplay Versus Lecture," *Nurse Education Today* 61 (2018): 258–263.

42. T. T. H. Oanh, L. T. Thuy, and N. T. T. Huyen, "The Effect of Simulation-Based Training on Problem-Solving Skills, Critical Thinking Skills, and Self-Efficacy Among Nursing Students in Vietnam: A Before-And-After Study," *Journal of Educational Evaluation for Health Professions* 21 (2024): 24.

43. Y. J. Choi and Y. J. Um, "The Effects of a Home-Visit Nursing Simulation for Older People With Dementia on Nursing Students' Communication Skills, Self-Efficacy, and Critical Thinking Propensity: Quantitative Research," *Nurse Education Today* 119 (2022): 105564.

44. E. T. Nafea, "Does Self-Efficacy Affect Clinical Reasoning in Dental Students?," *International Dental Journal* 72, no. 6 (2022): 872–878.

45. S. A. Almalki, "Influence of Motivation on Academic Performance Among Dental College Students," *Open Access Macedonian Journal of Medical Sciences* 7, no. 8 (2019): 1374–1381.

46. T. Kyriazos, "Applied Psychometrics: Sample Size and Sample Power Considerations in Factor Analysis (EFA, CFA) and SEM in General," *Psychology* 9 (2018): 2207–2230.

Appendix

APPENDIX 1

Requesting Consent for the Interview

General Information

- What year of the dental program are you currently in?
- How many extractions have you performed during your studies so far?
- Do you have any experience with extractions outside of the dental program?
- How many extractions do you expect to perform during your training?
- What has been your experience with performing extractions so far?

Confidence in Performing Extractions

Topic A: Current Theoretical Preparation

- Can you describe the education you have received so far related to tooth extractions?
  - When did this education take place?
- Have you taken any additional initiative to prepare for performing extractions?
  - If so, how?
- Do you feel well-prepared to perform extractions?
- Do you feel adequately prepared in terms of anatomy? Complications? Instruments?
- Do you think it is possible to learn how to use a luxator or extraction forceps from a textbook?
- If you could improve the educational program, what would you change?

Topic B: Current Confidence in Performing Extractions

- Would you feel comfortable performing an extraction without supervision at this point? Why or why not?
- Do you have a clear sense of what predicts a 'difficult' versus an 'easy' extraction?
- Do you enjoy performing extractions?
- Have you ever had teeth extracted yourself? If so, what was your experience, and has it influenced your own practice?
- What changes in the curriculum could help increase your confidence before starting your hospital internship?
- Do you find it stressful to perform extractions under supervision? And how about performing them independently?

Topic C: Learning Goals and Expectations

- What would you like to be able to do in terms of tooth extractions by the time you complete your training?
- Do you expect to achieve this learning goal by the end of your two hospital internships? Why or why not?
- What could you change to help achieve your learning goal more easily?
- Do you expect to gain significant knowledge and experience in extractions after completing your training?

Topic D: New Educational Materials

- Would you find new educational materials about the practical aspects of tooth extractions useful?
- What would your ideal educational material look like?

- Suppose additional instructional materials in the form of visual content (e.g., animation) were available—would you find this helpful in preparing for your internship?
- Suppose a limited simulation environment were available where you could observe, study, and imitate the movements of an experienced oral surgeon using extraction forceps. Do you think this would meaningfully contribute to your extraction skills?
- Do you expect that additional practice opportunities (e.g., a simulation environment) would increase your confidence during extractions in your hospital internship? Why or why not?

APPENDIX 2

List of the 33 original Dutch items and translation of the items to English.

#	Question (Dutch)	Translation to English
1.	'Ik heb waarschijnlijk hulp van een docent nodig, als ik op dit moment een extractie moet uitvoeren van een gave 11 zonder andere bijzonderheden'	'I probably need assistance from a teacher if I have to perform an extraction of a sound 11 without any additional specifications right now'.
2.	'Ik heb waarschijnlijk hulp van een docent nodig, als ik op dit moment een extractie moet uitvoeren een gave 16 zonder andere bijzonderheden'	'I probably need assistance from a teacher if I have to perform an extraction of a sound 16 without any additional specifications right now'.
3.	'Als ik vandaag een extractie van een 36 uit zou voeren, zou ik een docent om hulp vragen als ik geen beweging in de kies krijg'	'If I were to perform an extraction of tooth 36 today, I would ask for assistance from a teacher if I cannot get any movement in the tooth'.
4.	'Als ik vandaag een extractie van een 36 uit zou voeren, zou ik een docent om hulp vragen als er een knobbelfractuur optreedt waardoor de tang er steeds afglijdt'	'If I were to perform an extraction of tooth 36 today, I would ask for assistance from a teacher if there is a cusp fracture causing the forceps to slip off repeatedly'.
5.	'Als ik vandaag een extractie van een 36 uit zou voeren, zou ik een docent om hulp vragen als de volledige kroon afbreekt'	'If I were to perform an extraction of tooth 36 today, I would ask for assistance from a teacher if the entire crown breaks off'.
6.	'Als een extractie nodig is, zou ik de patiënt het meest waarschijnlijk zelf behandelen, ook als bij de vorige extractie een nabloeding heeft gehad'	'If an extraction is necessary, I would most likely treat the patient myself, even if there was postoperative bleeding in the previous extraction'.
7.	'Als een extractie nodig is, zou ik de patiënt het meest waarschijnlijk zelf behandelen, ook als de patiënt angstig is om een extractie te ondergaan'	'If an extraction is necessary, I would most likely treat the patient myself, even if the patient is anxious about undergoing an extraction'.
8.	'Bij een gezonde patiënt voel ik mij op dit moment bekwaam om zelfstandig een supragingivale gebitsreiniging te doen'	'For a healthy patient, I currently feel competent to independently perform supragingival dental cleaning'.
9.	'Bij een gezonde patiënt voel ik mij op dit moment bekwaam om zelfstandig een klasse II restauratie in een 14 te verrichten'	'For a healthy patient, I currently feel competent to independently perform a Class II restoration on tooth 14'.
10.	'Bij een gezonde patiënt voel ik mij op dit moment bekwaam om zelfstandig een extractie van een gave 11 uit te voeren'	'For a healthy patient, I currently feel competent to independently perform an extraction of a sound tooth 11'.
11.	'Bij een gezonde patiënt voel ik mij op dit moment bekwaam om zelfstandig een extractie van een gave 47 uit te voeren'	'I feel competent to independently perform an extraction of a sound tooth 47 in a healthy patient'.
12.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Als ik tegen een probleem zou aanlopen bij een extractie dan verwacht ik zelf waarschijnlijk wel een oplossing te vinden'	Indicate your level of agreement with the following statement: 'If I encounter a problem during an extraction, I expect to be able to find a solution myself'.
13.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Als er vandaag een extractie uitgevoerd moet worden laat ik dat liever aan een ander over'	Indicate your level of agreement with the following statement: 'If an extraction needs to be performed today, I prefer to delegate it to someone else'.
14.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Ik heb voldoende kennis van de anatomie om blijvende schade te kunnen voorkomen'	Indicate your level of agreement with the following statement: 'I have sufficient knowledge of anatomy to prevent permanent damage'.
15.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Ik heb voldoende vaardigheid met het extractie instrumentarium om geen blijvende schade aan te richten'	Indicate your level of agreement with the following statement: 'I have sufficient proficiency with extraction instruments to avoid causing permanent damage.'
16.	'Ik vind het spannend als een medestudent mij assisteert bij een extractie'	'I feel anxious when a fellow student assists me during an extraction.'
17.	'Ik vind het spannend als de docent meekijkt als ik een extractie uitvoer'	'I feel anxious when the teacher observes me performing an extraction'
18.	'Ik vind het spannend als de docent mij, waar de patiënt bij is, vraagt om de juiste extractietang te selecteren'	'I feel anxious when the teacher asks me, in the presence of the patient, to select the appropriate extraction forceps.'
19.	'Ik vind het spannend als de docent mij, waar de patiënt bij is, een vraag stelt over de anatomie van het extractiegebied'	'I feel anxious when the teacher asks me, in the presence of the patient, a question about the anatomy of the extraction area'
20.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Ik verwacht dat het uitvoeren van een extractie mij minder moeite kost dan het merendeel van mijn medestudenten'	Indicate your level of agreement with the following statement: 'I expect performing an extraction to require less effort than it does for the majority of my fellow students.'

European Journal of Dental Education, 2025

APPENDIX 2 | (Continued)

#	Question (Dutch)	Translation to English
21.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Ik denk dat ik meer tijd nodig heb voor een extractie dan het merendeel van mijn medestudenten'	Indicate your level of agreement with the following statement: 'I think I will need more time for an extraction than the majority of my fellow students'.
22.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Ik vind de gedachte om zelfstandig een extractie uit te voeren beangstigend'	Indicate your level of agreement with the following statement: 'The thought of independently performing an extraction is frightening to me'.
23.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Ik vind extracties maar ingewikkeld'	Indicate your level of agreement with the following statement: 'I think extractions are complicated'.
24.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Als ik vandaag een extractie zou uitvoeren zou ik daarvoor waarschijnlijk denken aan alles wat fout kan gaan'	Indicate your level of agreement with the following statement: 'If I were to perform an extraction today, I would probably think about everything that could go wrong'.
25.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Alleen al de gedachte om zelfstandig een extractie uit te moeten voeren maakt me zenuwachtig'	Indicate your level of agreement with the following statement: 'Just the thought of having to perform an extraction independently makes me nervous'.
26.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Als ik weet dat ik vanmiddag een extractie moet uitvoeren voel ik me de hele ochtend gespannen'	Indicate your level of agreement with the following statement: 'If I know that I have to perform an extraction this afternoon, I feel tense throughout the morning'.
27.	Geef aan in hoeverre je het eens bent met de volgende stellingen: 'Ik zal later als tandarts niet snel de extractie die ik heb geïndiceerd zelf uitvoeren'	Indicate your level of agreement with the following statement: 'I will not perform the extractions I have indicated myself as a dentist in the future'.
28.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Echt goed in het uitvoeren van een extractie zal ik nooit worden'	Indicate your level of agreement with the following statement: 'I will never become really skilled at performing extractions'.
29.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Ik vind het leuk om een extractie zelfstandig vakkundig uit te kunnen voeren'	Indicate your level of agreement with the following statement: 'I enjoy being able to independently and skilfully perform an extraction'
30.	Geef aan in hoeverre je het eens bent met de volgende stelling: 'Ik vind het zelfstandig uitvoeren van een extractie interessant en uitdagend'	Indicate your level of agreement with the following statement: 'I find independently performing an extraction to be interesting and challenging'.
31.	Geef aan in hoeverre je het eens bent met de volgende stellingen: 'Ik heb nooit interesse gehad voor het leren uitvoeren van extracties'	Indicate your level of agreement with the following statement: 'I have never had an interest in learning to perform extractions'.
32.	Geef aan in hoeverre je het eens bent met de volgende stellingen: 'Ik vind het belangrijk om later de meeste extracties die ik indiceer zelf uit te kunnen voeren'	Indicate your level of agreement with the following statement: 'It is important to me to be able to perform most of the extractions I indicate myself in the future'.
33.	Geef aan in hoeverre je het eens bent met de volgende stellingen: 'Een extractie uitvoeren zie ik niet als ingewikkelder dan de meeste andere tandheelkundige behandelingen'	Indicate your level of agreement with the following statement: 'I do not see performing an extraction as more complicated than most other dental treatments'.

APPENDIX 3

Exploratory factor analysis (F1 = 'self-perceived skill', F2 = 'tension', F3 = 'dedication').

#	Factor	Cronbach's Alpha if deleted		Item-rest score		Factor loading			Descriptives		2nd year students		6th year students		2nd vs. 6th students	Selected for CFA (S) or Removed after EFA (R)
		Factor	Total	Factor	Total	F1	F2	F3	Mean	SD	Mean	SD	Mean	SD	Difference	
1	1	0.94	0.95	0.89	0.81	0.93	−0.01	−0.01	2.40	1.47	3.88	1.18	1.47	0.60	2.41	S
2	1	0.95	0.95	0.85	0.81	0.79	0.14	−0.01	2.76	1.37	3.88	1.18	2.05	0.94	1.83	S
3	1	0.95	0.95	0.59	0.53	0.61	0.10	−0.19	3.39	1.20	4.12	0.97	2.92	1.10	1.20	R
4	1	0.95	0.95	0.73	0.7	0.67	0.28	−0.23	3.36	1.24	4.29	0.84	2.77	1.07	1.52	S
5	1	0.95	0.95	0.56	0.52	0.53	0.23	−0.24	3.82	1.11	4.29	0.87	3.52	1.14	0.77	R
6	1	0.95	0.95	0.58	0.52	0.61	−0.08	0.08	2.70	1.07	3.24	1.13	2.35	0.87	0.89	R
7	1	0.95	0.95	0.64	0.61	0.62	−0.03	0.17	2.43	1.04	3.02	1.09	2.05	0.81	0.97	R
8	1	0.95	0.95	0.68	0.66	0.66	−0.03	0.21	1.83	1.29	2.98	1.42	1.10	0.31	1.88	R
9	1	0.95	0.95	0.81	0.74	0.85	−0.10	0.13	1.94	1.29	3.27	1.13	1.10	0.31	2.16	R
10	1	0.94	0.95	0.89	0.79	0.96	−0.11	0.06	2.29	1.53	3.86	1.27	1.30	0.49	2.56	R
11	1	0.94	0.95	0.87	0.8	0.89	−0.02	0.04	2.57	1.47	3.90	1.26	1.73	0.82	2.17	R
12	1	0.95	0.95	0.53	0.59	0.35	0.24	0.21	2.67	0.85	3.00	0.96	2.45	0.70	0.55	R
13	1	0.95	0.95	0.75	0.83	0.52	0.44	0.10	2.38	1.28	3.43	1.22	1.71	0.78	1.71	S
14	1	0.95	0.95	0.75	0.73	0.69	0.11	0.08	2.56	1.08	3.49	0.96	1.97	0.65	1.52	S
15	1	0.95	0.95	0.82	0.75	0.83	0.09	−0.11	2.90	1.30	4.02	1.09	2.18	0.82	1.84	S
16	2	0.88	0.95	0.64	0.65	0.28	0.50	0.08	2.10	0.94	2.65	0.88	1.74	0.80	0.91	S
17	2	0.89	0.95	0.6	0.45	0.04	0.66	−0.13	2.74	1.07	3.04	0.91	2.55	1.12	0.50	S
18	2	0.88	0.95	0.71	0.54	0.08	0.75	−0.17	2.64	1.09	3.04	0.87	2.39	1.15	0.65	S
19	2	0.89	0.95	0.51	0.36	0.01	0.62	−0.23	2.89	1.07	3.16	0.87	2.71	1.16	0.45	R
20	2	0.89	0.95	0.53	0.61	0.30	0.37	0.16	2.89	0.94	3.24	0.83	2.66	0.94	0.58	R
21	2	0.89	0.95	0.5	0.39	−0.13	0.54	0.26	2.51	0.87	2.59	0.76	2.45	0.94	0.14	R
22	2	0.89	0.95	0.59	0.5	−0.09	0.59	0.36	2.09	0.97	2.35	1.03	1.92	0.90	0.42	R
23	2	0.89	0.95	0.56	0.51	0.03	0.50	0.29	2.29	0.81	2.55	0.68	2.12	0.84	0.43	R
24	2	0.88	0.95	0.7	0.63	0.16	0.64	0.06	2.48	1.04	2.98	1.11	2.16	0.86	0.82	S
25	2	0.88	0.95	0.77	0.62	0.00	0.77	0.15	2.21	0.98	2.51	0.96	2.01	0.95	0.50	S

APPENDIX 3 | (Continued)

#	Factor	Cronbach's Alpha if deleted		Item-rest score		Factor loading			Descriptives		2nd year students		6th year students		2nd vs. 6th students	Selected for CFA (S) or Removed after EFA (R)
		Factor	Total	Factor	Total	F1	F2	F3	Mean	SD	Mean	SD	Mean	SD	Difference	
26	2	0.88	0.95	0.73	0.74	0.34	0.59	0.03	2.21	1.09	2.96	1.02	1.74	0.85	1.22	S
27	3	0.82	0.95	0.58	0.51	0.01	0.41	0.46	1.99	0.73	2.27	0.73	1.82	0.68	0.45	R
28	3	0.82	0.95	0.58	0.52	0.03	0.37	0.53	1.78	0.78	2.10	0.87	1.57	0.64	0.53	R
29	3	0.8	0.95	0.73	0.53	0.23	−0.01	0.75	1.79	0.77	2.18	0.91	1.55	0.55	0.64	S
30	3	0.8	0.95	0.73	0.38	0.06	−0.01	0.78	1.77	0.72	1.98	0.88	1.64	0.56	0.34	S
31	3	0.81	0.95	0.64	0.36	−0.11	0.23	0.68	1.63	0.74	1.92	0.89	1.45	0.57	0.46	S
32	3	0.82	0.95	0.57	0.3	0.18	−0.20	0.64	1.74	0.78	2.02	0.95	1.56	0.60	0.46	R
33	3	0.86	0.95	0.4	0.32	0.04	0.17	0.34	2.44	0.93	2.57	0.82	2.35	0.98	0.22	R