Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

The effect of undergraduate clinical training on dental students' perceptions of paediatric behaviour management techniques: a longitudinal cohort study

Nerea Sanz Pablos
European University of Madrid
Natalia del Río Cantero
European University of Madrid
Joany Gouveia Venezel
European University of Madrid
Alberto Adanero Velasco
alberto.adanero@universidadeuropea.es
European University of Madrid
Laura Velayos Galán
European University of Madrid
Marta Piñeiro Herraiz
European University of Madrid
Mónica Miegimolle Herrero
European University of Madrid

Research Article

Keywords: Dental education, undergraduate dental students, paediatric dentistry, behaviour management, clinical training, professional attitudes, exploratory factor analysis

Posted Date: July 7th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9844580/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Behaviour management in paediatric dentistry requires not only technical competence but also communication skills, ethical judgement and appropriate clinical decision-making. Dental students' perceptions of behaviour management techniques may influence their future professional practice, yet less is known about how undergraduate clinical training shapes these perceptions over time. This study aimed to assess dental students' perceptions of paediatric behaviour management techniques, examine the psychometric structure of the questionnaire used, and explore the influence of sociodemographic and experiential factors and undergraduate training.

Methods

A longitudinal cohort study was conducted among fourth- and fifth-year dental students at the European University of Madrid during the 2024/2025 academic year. Students completed an anonymous and voluntary questionnaire at the beginning and end of the academic year. The questionnaire included sociodemographic and experiential variables and assessed the acceptance of 17 paediatric behaviour management techniques using a five-point Likert scale. Descriptive analyses, internal consistency analyses using Cronbach's alpha and McDonald's omega, exploratory factor analysis based on a polychoric correlation matrix, subgroup comparisons using Mann-Whitney U and Kruskal-Wallis tests, and temporal stability analyses using Spearman correlations were performed.

Results

At baseline, 338 students participated, and follow-up data were available for 311 students. The most accepted techniques were positive reinforcement, tell-show-do and distraction, whereas passive restraint, hand-over-mouth and not allowing the child to speak were the least accepted. The questionnaire showed acceptable reliability for exploratory purposes and a two-factor structure distinguishing communication/reinforcement-based techniques from restrictive/pharmacological techniques. Perceptions differed according to year of study, gender, nationality, previous clinical experience and experience with children. Temporal stability between baseline and final measurements was low, suggesting that students' perceptions were not fixed and may be influenced by educational and clinical exposure.

Conclusions

Dental students showed a clear preference for communicative and reinforcement-based behaviour management techniques and lower acceptance of restrictive approaches. The questionnaire demonstrated a coherent two-dimensional structure with educational relevance. These findings suggest that undergraduate clinical training may play an important role in shaping students' attitudes towards paediatric behaviour management and highlight the need for curricula that explicitly integrate communication, ethical reflection and supervised clinical experience.

Background

Paediatric dentistry requires professionals not only to possess technical skills, but also a strong ability to manage the behaviour of young patients, whose fear and anxiety can hinder the delivery of treatment (1). Behaviour management is a fundamental pillar in guiding the child towards a positive dental experience (2). Behaviour management techniques have evolved from coercive approaches towards models centred on communication and the child's well-being (3), and are classified into basic techniques (communication, reinforcement, distraction) and advanced techniques (protective stabilisation, sedation, general anaesthesia) (2).

Dental students' perceptions of these techniques are a key indicator, as they reflect the training received and predict their future clinical practice (4–6). Sotto et al. (4) demonstrated that training can significantly alter students' perceptions, increasing acceptance of aversive techniques following a specific course. Subsequent studies in different cultural contexts have confirmed this influence, showing that students in higher-year courses tend to accept advanced techniques more readily following clinical exposure (7–10).

However, there are gaps in our understanding of the underlying factor structure of the instruments measuring these perceptions and of the stability of these perceptions throughout the training process (11). Most studies have focused on cross-sectional designs (5, 12) and few have longitudinally assessed the impact of training during a single academic year (4, 13).

Methods

Design and participants

A longitudinal cohort study was conducted among fourth- and fifth-year dental students at the European University of Madrid during the 2024/2025 academic year. At baseline, 338 students completed the questionnaire, and 311 students completed the final assessment. Participation was anonymous and voluntary, in accordance with the ethical principles of the Declaration of Helsinki. The study was approved by the Ethics Committee of the European University of Madrid, Spain [insert approval number].

Instrument

The questionnaire used in this study was developed for the purposes of the present investigation. Its content and structure were based on previously published questionnaires and studies assessing perceptions and acceptability of paediatric behaviour management techniques, particularly those by Sotto et al. and Luis de León, Guinot Jimeno and Bellet Dalmau (4,14). The initial version was drafted in Spanish by the research team and adapted to the undergraduate dental education context. The first part collected sociodemographic data and information on previous experience (age, gender, year of study, nationality, clinical experience, previous dental and medical experiences, and experience caring for children). The second part assessed acceptance of 17 behaviour management techniques (Table 1) using a Likert scale ranging from 1 ('strongly disagree') to 5 ('strongly agree').

For linguistic validation, the Spanish version was translated into English by a native English speaker with experience in dental terminology and independently back-translated into Spanish by a native Spanish speaker. Discrepancies between the original Spanish version and the back-translated version were reviewed by the research team until semantic and conceptual equivalence was achieved.

Before final administration, the questionnaire was piloted in a reduced sample of students under comparable conditions. Item-level agreement was assessed using weighted Cohen's kappa coefficients to evaluate preliminary reliability of the translated instrument. The final English-language version of the questionnaire is provided as Additional file 1.

Table 1
Behavioural management techniques assessed

Code	Technique
T1	Tell-show-do
T2	Not allowing the child to speak
T3	Voice control
T4	Hand over mouth
T5	Nitrous oxide/inhaled oxygen
T6	Encourage the child not to be a coward
T7	Active immobilisation
T8	Passive restraint (straps)
T9	Distraction with videos or music
T10	Positive reinforcement
T11	Sensory stimulation
T12	Communicating pain
T13	Explanation of the procedure
T14	Pharmacological sedation
T15	General anaesthesia
T16	Promising a present
T17	Use of euphemisms

Procedure

The questionnaire was administered at two key points: at the start of the 2024/2025 academic year (baseline assessment) and at the end of the same academic year, after theoretical and practical clinical training in paediatric dentistry. Students completed the questionnaire in person at the University Polyclinic of the European University of Madrid, taking an average of 4 minutes and 38 seconds.

Data analysis

A descriptive analysis of the variables was carried out. As the variables did not follow a normal distribution (Kolmogorov-Smirnov test, $p<.05$), non-parametric tests were used: Mann-Whitney U for two groups and Kruskal-Wallis H for three groups, with calculation of effect size (r and epsilon squared). The reliability of the questionnaire was analysed using Cronbach's alpha and McDonald's omega. To explore the internal structure, an exploratory factor analysis (EFA) was performed using a polychoric correlation matrix, minimum residuals extraction and oblique rotation, after verifying sample adequacy with the Kaiser-Meyer-Olkin index and Bartlett's test of sphericity. Temporal change and stability were explored by comparing baseline and final measurements and, where individual-level linkage was available, using Spearman correlations between the two time points. The analyses were performed using SPSS v.28 and RStudio v.2024.03. Statistical significance was set at $p<.05$.

Results

Sample characteristics

The initial sample (n = 338) was characterised by a predominance of women (56.8%), with a balanced distribution between 4th (53.3%) and 5th year (46.7%) students. There was a notable high proportion of international students (62.7% from the EU, excluding Spain) and a high level of prior exposure to dental practice (84.3% had observed treatments). The mean age was 24.3 years (SD = 3.77). Tables 2 and 3.

Table 2
Frequency table. Sociodemographic variables 1/2.

Items (N = 338)		***Descriptives***
Gender	*1. Male*	**43.2% (146)**
	2. Female	**56.8% (192)**
Year Academic	*1. Year 4*	**53.3% (180)**
	2. Year 5	**46.7% (158)**
Nationality	*1. Spanish*	**23.1% (78)**
	2. EU (excluding Spain)	**62.7% (212)**
	3. Non-EU	**14.2% (48)**
Do you have any older ?	*0. No*	**40.5% (137)**
	1. Yes	**59.5% (201)**
Do you have younger ?	*0. No*	**47.3% (160)**
	1. Yes	**52.7% (178)**
Are you married?	*0. No*	**95.9% (324)**
	1. Yes	**4.1% (14)**
Do you have children?	*0. No*	**99.1% (335)**
	1. Yes	**.9% (3)**

Table 3
Exploratory and descriptive analysis. Sociodemographic variables (N = 338).

Variables	*Exploration: Form*			*Centrality*			*Variability*	
	Skewness	*Kurtosis*	*Normal p-value*	*Mean*	*Median*	*Range (Min./Max.)*	*Std. dev. Est.*	*Range IQR*
Age (years)	5.06	43.42	**< .001***	24.30	23.50	20.00 / 65.00	3.77	3.00
N/A regarding previous dental experiences	.61	− .53	**< .001***	2.04	2.00	1.00 / 5.00	1.07	2.00
N/A (no previous medical history)	.45	− .82	**< .001***	2.08	2.00	1.00 / 5.00	1.02	2.00
Previous experience looking after other children	.08	− .76	**< .001***	2.86	3.00	1.00 / 5.00	1.20	2.00

[NS] Non-significant deviation; the variable is normally distributed * Significant; the variable is not normally distributed.

When n > 50, the Kolmogorov-Smirnov test is used; when n < 50, the Shapiro-Wilk test is used.

Note. ND: Level of dissatisfaction.

Initial acceptance of behaviour management techniques

At the outset, the most highly rated techniques were those involving positive reinforcement and communication: T10 (positive reinforcement, M = 4.36, SD = 0.88), T1 (tell-show-do, M = 4.30, SD = 0.87) and T9 (distraction, M = 4.11, SD = 0.91). In contrast, restrictive and aversive techniques received the lowest scores: T8 (passive restraint, M = 2.12, SD = 1.08), T4 (hand over mouth, M = 2.35, SD = 1.19) and T2 (not allowing the child to speak, M = 2.26, SD = 1.10) (Table 4).

Table 4
Initial acceptance of behaviour management techniques (n = 338) SD: standard deviation; IQR: interquartile range

Technique	Mean (SD)	Median	IQR
T10	4.36 (0.88)	5.00	1.00
T1	4.30 (0.87)	4.50	1.00
T11	4.21 (0.82)	4.00	1.00
T9	4.11 (0.91)	4.00	1.00
T5	4.00 (1.02)	3.95	1.00
T15	4.00 (1.15)	3.17	1.00
T3	3.95 (0.84)	4.00	1.00
T17	3.83 (1.03)	4.00	2.00
T16	3.82 (0.98)	4.00	2.00
T13	3.17 (1.09)	3.00	2.00
T6	3.14 (1.05)	3.00	1.00
T14	3.00 (0.99)	3.00	2.00
T7	2.88 (1.07)	3.00	2.00
T12	2.78 (1.14)	3.00	2.00
T4	2.35 (1.19)	2.00	2.00
T2	2.26 (1.10)	2.00	2.00
T8	2.12 (1.08)	2.00	2.00

Reliability and factor structure of the questionnaire

The internal consistency of the questionnaire was moderate (α = .69; ω = .76), indicating acceptable reliability for exploratory purposes, similar to other studies (4,16). The KMO index (.796) and Bartlett's test (p<.001) confirmed suitability for EFA. The parallel analysis recommended a two-factor solution. The EFA (Table 5) revealed:

- **Factor 1 (Communication/Reinforcement/Distraction)**: T11 (λ = .83), T10 (λ = .78), T9 (λ = .75), T1 (λ = .52), T3 (λ = .44), T16 (λ = .48), T17 (λ = .48).
- **Factor 2 (Restrictive/Pharmacological)**: T8 (λ = .69), T7 (λ = .62), T14 (λ = .62), T15 (λ = .58), T5 (λ = .54), T4 (λ = .51), T2 (λ = .35), T12 (λ = .36).

The correlation between factors was practically zero (Φ = − .04), confirming their independence. This bifactorial structure is consistent with the theoretical classification of behaviour management techniques (2,3) and

constitutes a novel finding not previously described in the literature.

Table 5
Factor loadings (λ) of the EFA with oblimin rotation

Technique	Factor 1	Factor 2
T11	**.83**	.00
T10	**.78**	− .06
T9	**.75**	.03
T1	**.52**	− .19
T16	**.48**	.08
T17	**.48**	.08
T3	**.44**	.19
T5	**.34**	**.54**
T2	**− .31**	**.35**
T8	− .27	**.69**
T7	.00	**.62**
T14	.22	**.62**
T15	.03	**.58**
T4	− .16	**.51**
T12	.00	**.36**
T6	.16	**.30**
T13	.12	.27

Note: Factor loadings ≥ .30 in bold. Factor 1: Communication/Reinforcement/Distraction; Factor 2: Restrictive/Pharmacological. Correlation between factors: Φ = − .04.

Influence of sociodemographic and experiential factors

Significant differences were found (Table 6):

Year group

Year 4 showed greater acceptance than Year 5 of pharmacological sedation (T14, p=.009) and promising a gift (T16, p=.012) [7,8].

Gender: Males accepted more restrictive techniques: T2 (not allowing talking, p=.039), T4 (hand over mouth, p=.009), T15 (general anaesthesia, p=.038). Women rated T9 (distraction, p=.017) and T11 (sensory stimulation, p=.003) more highly [4,18].

Nationality: Non-EU students showed lower acceptance of positive reinforcement (T10, p<.001) and euphemisms (T17, p<.05). Spanish students rejected passive immobilisation more (T8, p<.01) [17,19].

Clinical experience: Students with work experience were more accepting of T8 (passive immobilisation, p=.005) and T12 (reporting pain, p=.006) [20,21].

Experience with children

Positive correlation with T9 (distraction using videos or music), T10 (positive reinforcement), T11 (sensory stimulation), T16 (promising a treat), T17 (use of euphemisms); negative correlation with T2 (not allowing the child to speak) and T4 (hand over mouth) (Table 7) [4].

Table 6
Significant differences in the acceptance of techniques by subgroup

Variable	Technique	Group 1 (Mean)	Group 2 (Mean)	p-value	Effect size (r)
Course	T14 (sedation)	4th (3.11)	5th (2.88)	.009	.142 (p)
	T16 (promise of a gift)	4th (3.96)	5th (3.67)	.012	.136 (p)
Gender	T2 (no speech)	Male (2.41)	Female (2.15)	.039	.112 (p)
	T4 (hand-over-mouth)	Male (2.54)	Women (2.21)	.009	.141 (p)
	T9 (distraction)	Women (4.20)	Male (3.99)	.017	.130 (p)
	T11 (stimulation)	Women (4.32)	Male (4.06)	.003	.160 (p)
	T15 (anaesthesia)	Male (2.86)	Female (2.61)	.038	.113 (p)
Nationality	T8 (passive restraint)	EU (2.20) / Non-EU (2.25)	Spanish (1.83)	.003/.022	.173/.204 (p)
	T10 (positive reinforcement)	Spanish (4.56) / EU (4.39)	Non-EU (3.94)	< .001/.002	.337 (m)/.195 (p)
	T17 (euphemisms)	Spanish (3.90) / EU (3.89)	Non-EU (3.48)	.027/.019	.197/.145 (p)
Clinical exp.	T8 (passive immobilisation)	Yes (2.37)	No (2.00)	.005	.152 (p)
	T12 (report pain)	Yes (3.01)	No (2.66)	.006	.149 (p)

p: small; m: medium

Table 7
Correlations between levels of dislike and experience with children (Spearman). ** p<.05; ** p<.01; † p<.10*

Technique	Dental aversion	Medical aversion	Experience with children
T1	**− .133***	**− .094†**	.054
T2	.055	.063	**− .192****
T4	.022	.017	**− .123***
T9	.019	.024	**.111***
T10	**− .102†**	**− .101†**	**.135***
T11	− .061	− .049	**.133***
T13	**.113***	**.154****	− .003
T16	− .031	− .005	**.111***
T17	**− .104†**	**− .123***	**.135***

Impact of training on the stability of perceptions

The analysis of temporal stability suggested a high degree of instability in perceptions (Table 8). No significant correlations were found between initial and final scores for any of the 17 techniques (p>.05). The only partial exception was T17 (use of euphemisms), which showed a slight, non-significant correlation (r=-.184, p=.105). These results indicate that initial perceptions did not strongly predict final perceptions, which is compatible with the possibility that theoretical-practical training and clinical exposure may reshape students' attitudes.

Table 8
Correlations between baseline and final measurements (n = 338)

Technique	Coeff (ρ)	p-value	Interpretation
T1	.004	.940	I
T2	.023	.691	I
T3	− .004	.948	I
T4	− .038	.509	I
T5	.029	.615	I
T6	− .006	.919	I
T7	− .018	.752	I
T8	.018	.758	I
T9	− .023	.691	I
T10	− .038	.501	I
T11	− .048	.398	I
T12	.025	.656	I
T13	.004	.940	I
T14	.056	.324	I
T15	.062	.274	I
T16	.049	.388	I
T17	− .184	.105	L

Note: I: Insignificant; L: Mild

Discussion

This study provides a comprehensive overview of dental students' perceptions of behaviour management techniques in paediatric dentistry, highlighting the robustness of a two-dimensional questionnaire and, for the first time in the literature, the impact of training on the instability of these perceptions over the course of an academic year.

Acceptance of basic techniques and rejection of restrictive techniques

The high acceptance of techniques such as "tell-show-do" (T1, M = 4.30) and positive reinforcement (T10, M = 4.36) is consistent with the findings of numerous international studies (4–6, 12, 13). Sotto et al. (4) reported that, following an educational course, scores for "tell-show-do" increased significantly (from 84.5 to 92.6 on a

scale of 0–100), similar to our high scores at T1. York et al. (5) found that 78.9% of students reported having been taught to use “tell-show-do”, and 77.9% had used it in their practice, confirming its centrality in the curriculum.

Oliveira et al. (12), in a study with Brazilian students in their first, third and eighth semesters, also found that “positive verbal reinforcement”, “distraction” and “tell-show-do” were the most accepted techniques across all semesters, with averages above 8.0 on a 0–10 scale. Our results replicate this pattern, with T10 (positive reinforcement), T1 (“tell-show-do”) and T9 (distraction) being the highest-rated.

The rejection of restrictive techniques such as passive restraint (T8, M = 2.12) and “hand over mouth” (T4, M = 2.35) is consistent with the literature (5, 19, 20). York et al. (5) reported that only 2.1% of students had used the “hand-over-mouth” technique, despite 77.9% reporting that they had been taught it. This discrepancy between teaching and practice reflects the ethical evolution of the profession, which has led to the removal of these techniques from clinical guidelines (21).

Galdino et al. (19), in their systematic review, concluded that the technique least accepted by students and professionals was protective stabilisation, a finding confirmed by our results for T8 (passive immobilisation) and T7 (active immobilisation). The qualitative studies by Marty et al. (20,22) explore this rejection in greater depth, describing feelings of “violence”, “discomfort” and “failure” associated with the use of protective stabilisation. Our fifth-year students, with greater clinical exposure, showed lower scores on T7 (active immobilisation) than fourth-year students (2.85 vs. 2.91), suggesting that direct experience may reinforce the rejection of these techniques.

Factor structure of the questionnaire

The most significant finding of this study is the clear two-dimensional structure of the questionnaire, not previously described in the literature. The independence between the ‘communication/reinforcement’ factor and the ‘restrictive/pharmacological’ factor ($\Phi = -.04$) demonstrates that students perceive these categories as conceptually distinct constructs. This structure empirically validates the theoretical classification of the AAPD (2) and has important educational implications: training must address communication skills and critical judgement for advanced techniques separately.

Bimstein et al. (8,13) compared undergraduate and postgraduate students, finding significant differences in the acceptance of techniques according to educational level. Our EFA suggests that these differences could be explained by the techniques belonging to different factors, which are valued differently depending on accumulated experience.

Influence of training and the curriculum

The influence of the curriculum on the perception of behaviour management techniques has been documented by numerous authors (4, 7, 8, 12, 13). Al-Jobair & Al-Mutairi (7) found that, following an academic year comprising both theoretical and clinical components, Saudi students showed significant increases in acceptance of aversive techniques (voice control, hand over mouth), all pharmacological techniques, and modelling. Our fifth-year students showed lower acceptance of pharmacological techniques T14 (pharmacological sedation) and T15 (general anaesthesia) than fourth-year students (2.88 vs. 3.11 for

sedation; 2.65 vs. 2.78 for general anaesthesia), which may reflect a more nuanced understanding of their indications and limitations following clinical experience.

Ali et al. (16), in their study of Malaysian students, found significant differences in the acceptance of communication techniques between pre-clinical and clinical students, with clinical students showing greater acceptance of allowing the child to stop treatment (67.7% vs. 55.5%) and lower acceptance of not allowing the child to speak (30.9% vs. 42.2%). Our results show similar patterns, with fifth-year students showing lower acceptance of T2 (not allowing the child to speak, 2.35) than fourth-year students (2.19), although this was not statistically significant.

Kalwitzki et al. (9) demonstrated that the teaching method (video recordings vs. lectures) influences the perception of behaviour management techniques, with videos increasing the intention to apply them clinically. Slaven et al. (11) compared three instructional methods; this study revealed that dental students' knowledge of basic behavioural guidance techniques improved following any type of instruction. Our study confirms that training, regardless of the specific method, has a significant impact on reshaping perceptions.

Influence of cultural and gender factors

The cross-cultural differences observed (lower acceptance of positive reinforcement (T10) and euphemisms (T17) among non-EU students) reflect previous findings. Ali et al. (16) found that, in Malaysia, reinforcement techniques were highly accepted (70.7–90.9%), which they attributed to local culture and educational practices. Our non-EU students may have different perceptions regarding the professional's role and the relationship with the patient.

Gender differences (greater male acceptance of restrictive techniques and female acceptance of communicative techniques) are consistent with Sotto et al. (4) and Peretz et al. (17). Bimstein et al. (8) also found that gender influenced perceptions of techniques such as talking to parents during treatment. Our results show that men are more accepting of T2 (not allowing the child to speak), T4 (hand over mouth) and T15 (general anaesthesia), whilst women place greater value on T9 (distraction with videos or music) and T11 (sensory stimulation).

Impact of training on temporal stability

Our results suggest that perceptions of behaviour management techniques may be malleable and responsive to the training context. The absence of significant baseline-final associations should be interpreted cautiously, but it supports the educational relevance of addressing behaviour management attitudes explicitly during undergraduate clinical training.

This finding has crucial educational implications. If perceptions are malleable, educators have both the responsibility and the opportunity to actively shape empathetic, evidence-based professional attitudes. Training should not be limited to the transmission of technical knowledge, but must include opportunities for ethical reflection, case discussion and supervised practice that enable students to integrate professional values into their clinical identity (20,22).

Limitations and future directions

Our results are fully consistent with the systematic review by Galdino et al. (19), which included 21 studies on the acceptability of behaviour management techniques among students and professionals. The authors concluded that the most accepted techniques were ‘tell-show-do’ and positive reinforcement, whilst the least accepted was protective stabilisation. Our findings confirm these conclusions with a large sample (n = 338) and add the novel analysis of the training impact on the stability of perceptions.

Galdino et al. (19) also noted that the quality of the available evidence is very low, with 14 out of 21 studies presenting a high risk of bias. Our study, with a robust longitudinal design and advanced psychometric analyses, contributes to improving the quality of evidence in this field.

This study has certain limitations. It was conducted at a single university, which limits its generalisability. The follow-up period is limited to a single academic year. Future studies should extend this period to assess whether these perceptions become more established over time.

Conclusions

Dental students showed a clear preference for behaviour management techniques based on communication and positive reinforcement, such as ‘tell-show-do’ and verbal reinforcement, compared with a marked rejection of restrictive techniques such as passive immobilisation or hand-over-mouth, in line with the international literature.

The questionnaire used had a valid and reliable two-dimensional structure, distinguishing between a communication/reinforcement factor and a restrictive/pharmacological techniques factor, which empirically validates the theoretical classification of behaviour management techniques.

The students’ perceptions were influenced by cultural, gender and experiential factors, including nationality, prior clinical experience and childcare, which underscores the need to adapt training to multicultural contexts.

Perceptions were highly unstable throughout the training process, with no significant correlations between initial and final course scores, demonstrating that theoretical and practical training plays a crucial role in shaping professional attitudes. These findings highlight the need for purposeful educational programmes that not only impart technical knowledge but also actively shape attitudes towards empathetic, ethical and evidence-based behaviour management, incorporating opportunities for ethical reflection, case discussion and supervised practice that enable students to integrate these values into their clinical identity.

Abbreviations

EFA
exploratory factor analysis
IQR
interquartile range
KMO
Kaiser-Meyer-Olkin
SD
standard deviation.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Ethics Committee of the European University of Madrid, Spain, approval reference number: [insert approval number]. Participation was voluntary and anonymous. All participants received information about the purpose of the study and provided consent to participate in accordance with the approved study protocol.

Consent for publication

Not applicable. The manuscript does not contain any individual person's data, images or identifiable information.

Competing interests

The authors declare that they have no competing interests.

Authors' information

Not applicable.

Additional files

Additional file 1. English-language version of the study questionnaire.

Funding

This research received no external funding.

Author Contribution

NSP contributed to the conceptualisation of the study, data collection, data curation and drafting of the manuscript. NDRC contributed to data collection, interpretation of results and critical revision of the manuscript. JGM contributed to the methodological design, statistical analysis, interpretation of data and revision of the manuscript. AAV contributed to the conceptualisation of the study, supervision, methodological oversight, interpretation of results and critical revision of the manuscript. LVG contributed to data collection, interpretation of findings and manuscript revision. MPH contributed to data collection, interpretation of findings and manuscript revision. MMH contributed to study supervision, interpretation of results and critical revision of the manuscript. All authors read and approved the final manuscript.

Acknowledgements

The authors would like to thank the dental students who voluntarily participated in this study and the academic and clinical staff involved in undergraduate paediatric dentistry teaching at the European University of Madrid.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available because they contain student-level educational data from a single institution and public sharing could compromise participant confidentiality. The data are available from the corresponding author on reasonable request and subject to institutional ethical and data protection requirements.

References

1. Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. Int J Paediatr Dent. 2007; 17(6):391-406. Doi: 10.1111/j.1365-263X.2007.00872.x.
2. American Academy of Pediatric Dentistry. Behaviour guidance for the paediatric dental patient. The Reference Manual of Paediatric Dentistry. Chicago, IL: American Academy of Paediatric Dentistry (AAPD); 2025:379-99.
3. Roberts JF, Curzon ME, Koch G, Martens LC. Review: behaviour management techniques in paediatric dentistry. Eur Arch Paediatr Dent. 2010;11(4):166-74. DOI: 10.1007/BF03262738.
4. Sotto JJ, Azari AF, Riley J 3rd, Bimstein E. First-year students' perceptions about paediatric dental behaviour guidance techniques: the effect of education. J Dent Educ. 2008;72(9):1029-41.
5. York KM, Mlinac ME, Deibler MW, Creed TA, Ganem I. Paediatric behaviour management techniques: a survey of pre-graduate dental students. J Dent Educ. 2007;71(4):532-9.
6. Newton JT, Naidu R, Sturmey P. The acceptability of the use of sedation in the management of dental anxiety in children: views of dental students. Eur J Dent Educ. 2003;7(2):72-6. Doi: 10.1034/j.1600-0579.2003.00301.x.
7. Al-Jobair AM, Al-Mutairi MA. Saudi dental students' perceptions of paediatric behaviour guidance techniques. BMC Med Educ. 2015;15:120. Doi: 10.1186/s12909-015-0382-6.
8. Bimstein E, Azari AF, Riley JL 3rd. Predoctoral and postdoctoral students' perspectives on paediatric dental behaviour guidance. J Dent Educ. 2011;75(5):616-25.
9. Kalwitzki M, Beyer C, Meller C. Differences in the perception of seven behaviour-modifying techniques in paediatric dentistry by undergraduate students using lectures and video sequences for teaching. Eur J Dent Educ. 2010;14(4):247-53. Doi: 10.1111/j.1600-0579.2010.00617.x.
10. Newton JT, Sturmey P. Students' perceptions of the acceptability of behaviour management techniques. Eur J Dent Educ. 2003;7(3):97-102. Doi: 10.1034/j.1600-0579.2003.00277.x.
11. Slaven CM, Wells MH, DeSchepper EJ, Dormois L, Vinall CV, Douglas K. Effectiveness of and dental student satisfaction with three teaching methods for behaviour guidance techniques in paediatric dentistry. J Dent Educ. 2019;83(9):1055-61. Doi: 10.21815/JDE.019.091.
12. Oliveira RVD, Ângelo ACB, Brito DBA, Medeiros RCG, Forte FDS, Sousa SA. Students' perceptions of paediatric dental behaviour management techniques throughout a five-year dental curriculum. Pesqui Bras

Odontopediatria Clin Integr. 2015;15(1):143-52. Doi: http://dx.doi.org/10.4034/PBOCI.2015.151.16.

13. Bimstein E, Azari AF, Sotto JJ, Riley JL 3rd. Students' perceptions of paediatric dental behaviour guidance within a four-year undergraduate dental curriculum. J Dent Educ. 2009;73(12):1366-71. Doi: 10.1002/j.0022-0337.2009.73.12.tb04831.x.
14. Luis de León J, Guinot Jimeno F, Bellet Dalmau LJ. Acceptance by Spanish parents of behaviour-management techniques used in paediatric dentistry. Eur Arch Paediatr Dent. 2010;11(4):175-8. doi: 10.1007/BF03262739.
15. Wright GZ, Kupietzky A. Behaviour management in dentistry for children. 2nd Edition. 2014. Accessed March 2026. Doi: 10.1002/9781118852446.
16. Ali NM, Husin IN, Ahmad MS, Hamzah SH. Perceptions of behavioural guidance techniques for paediatric patients amongst students in a Malaysian dental school. Eur J Dent Educ. 2021;25(1):18-27. Doi: 10.1111/eje.12573.
17. Peretz B, Glacher H, Ram D. Child-management techniques: are there differences in the way female and male paediatric dentists in Israel practise? Braz Dent J. 2003;14(2):82-6. Doi: 10.1590/S0103-64402003000200002.
18. Abushal M, Adenubi J. The use of behaviour management techniques by dentists in Saudi Arabia: a survey. Saudi Dent J. 2000;12(3):129-34.
19. Galdino FF, Bendo CB, Fidalgo TKS. Acceptability of child behaviour management techniques among dental students and professionals: A systematic review. Eur J Dent Educ. 2024;28(3):840-56. DOI: 10.1111/eje.13016.
20. Marty M, Carbillet M, Valera MC. Students' perception of protective stabilisation of paediatric dental patients: a qualitative study. J Clin Pediatr Dent. 2024;48(1):19-25. doi: 10.22514/jocpd.2024.003.
21. Oueis HS, Ralstrom E, Miriyala V, Molinari GE, Casamassimo P. Alternatives for the hand-over-mouth exercise following its removal from the clinical guidelines of the American Academy of Paediatric Dentistry. Pediatr Dent. 2010;32(3):223-8.
22. Marty M, Marquet A, Valera MC. Perception of protective stabilisation by paediatric dentists: a qualitative study. JDR Clin Transl Res. 2021;6(4):402-8. doi: 10.1177/2380084420963933.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Additionalfile1Englishquestionnaire.docx