Preventing lack of compliance in children: use of behaviour techniques in paediatric dentistry among Italian practictioners

S. Arcari[1], M. Severino[2], A. Mattei[1], D. Tripodi[3], G. Gallusi[4], M. Moscati[5]

[1] Department of Life, Health and Environmental Sciences, University of L'Aquila, Italy
[2] Department of Medicine and Surgery, University of Perugia, Italy
[3] Department of Medical, Oral and Biotechnological Sciences, University G. D'Annunzio of Chieti-Pescara, Italy
[4] Italian Society of Pediatric Dentistry - Societa Italiana di Odontoiatria Infantile (SIOI)
[5] Private practice, Rome, Italy

DOI 10.23804/ejpd.2025.S05

email: sara.arcari@libero.it

Abstract

Aim The purpose of this study was to survey Italian dental practitioners on behaviour guidance techniques (BGTs). Use of tell-show-do (TSD), sedation with nitrous oxide and oxygen according to the Langa technique, audio-visual distraction (AVD) and referral to general anaesthesia (GA) were enquired, particularly focusing on nitrous oxide usage in paediatric dental patients.
Methods The research was conducted between September 2022 and December 2023. Data from 153 surveys were eligible to be processed using the STATA/BE software program, version18.0. The sample was stratified based on time in practice (≤10 and >10 years in practice), gender, practicing area (northern, central or southern Italy). Descriptive and inferential analysis were conducted comparing groups using X2 test or Fisher's exact test as appropriate. The level of statistical significance was set at P value <0.05.
Results One hundred fifty-three complete surveys were analysed. Of the respondents, 79.8% (121) were female and 20.92% (32) were male. Regarding years in practice, 53.59% (82) were in practice for less than or equal to 10 years and 46.41% (71) were in practice for more than 10 years. As for location of the practice, 45.10% (69) worked in northern Italy, 23.53% (36) practiced in central Italy and 31.37% (48) were from southern Italy, Sicily and Sardegna included. Significant difference was found between genders, with 55.37% (67) female practitioners who assessed to have more than 50% of their patients in paediatric age, compared to 28.12% (9) male participants. Statistical significance was also found between years in practice and referral to general anaesthesia: 29.27% (24) respondents in practice for equal or less than 10 years stated to refer no patients to general anaesthesia compared to 9.86% (7) providers in practice for more than 10 years. In the sample stratified by geographical area, statistical significance was noticed among practitioners who do not refer any paediatric patient to GA: 37.50% (18) Southern Italian practitioners versus 27.78% (10) central Italian practitioners and 4.35% (3) northern Italian practitioners. Northern Italy was found to be the territory with the highest referral to GA: the answer category <10% paediatric patients indicated for GA was selected by 71.01% (49) northern practitioners versus 66.67% (24) central respondents and 45.83% (22) southern participants in the survey.
Conclusions Behaviour guidance technique selection and utilisation among Italian practicing paediatric dentists is influenced by multiple factors, including gender, time in practice and geographic location of practice. The results showed Tell-Show-Do as the preferred behaviour guidance technique among Italian practitioners. GA referral was assessed to be significantly higher among northern practitioners. Responders in practice for more than 10 years referred to GA a statistically higher percentage of paediatric patients, who were more prevalent in female providers' practices. Sedation with nitrous oxide and oxygen according to the Langa technique was noticed to be the least prevalent among the enquired BGTs; there is a need to implement the use and knowledge of nitrous oxide/oxygen analgesia among Italian practitioners.

KEYWORDS Behaviour guidance techniques, dental anxiety, Italian practitioners, paediatric patients.

Introduction

Paediatric dentistry has progressed significantly, with a modern approach focused on creating a pleasant dental experience and fostering a positive attitude in young patients, all while providing necessary care. However, dental fear and anxiety continue to pose challenges to achieving this goal [Shanmugaavel et al., 2016]. Fear of dental procedures, anxiety, and pain sensitivity are well-known obstacles that hinder successful treatment in children, affecting the quality of dental care [Galeotti et al., 2016]. Dental anxiety disorders—such as fear, anxiety, and phobia—are common issues in dentistry, often leading to the avoidance of treatment and posing significant barriers to maintaining oral health [Gozin et al., 2022]. Despite advancements in dental techniques, anxiety and fear remain persistent in the dental field [Tieri et al., 2023]. These fears can lead to non-cooperative behaviour, especially in younger children [d'Alessandro et al., 2016; Mourad et al., 2022]. Consequently, dental fear not only stresses the patient but also impacts the dental team. Given the strong correlation between dental anxiety and poor oral health, it is crucial for dental professionals to actively work to reduce fear from the outset [Cosi et al., 2022; Paglia, 2016].

The dental treatment process itself can sometimes be a source of anxiety for children [Klingberg et al., 2007]. Research shows that children with high dental fear are more than twice as likely to have untreated cavities compared to those with lower fear levels [Murthy et al., 2014]. In cases of dental caries, clinical judgment is necessary not only to decide whether to restore cavities but also to ensure that the treatment preserves a positive dental attitude in paediatric patients [Dhar & Jayaraman et al., 2023]. The prevalence of dental anxiety in the Italian paediatric population ranges from 5% to 40% [Paglia et al., 2017; Cianetti et al., 2017]. Treating anxious children increases stress for clinicians and leads to longer, more costly treatments, creating further challenges [Cianetti et al., 2017]. Therefore, dentists must be well-versed in managing anxiety, using both pharmacological and basic behavioural techniques, to provide optimal care based on the patient's age and needs [Tieri et al., 2023; Cianetti et al., 2017]. To gain the cooperation of children during dental treatments, behaviour management techniques have been developed to facilitate communication and eliminate inappropriate behaviours [Veloso et al., 2023]. Behaviour guidance is a continuum of skills and a spectrum of strategies used by dentists to encourage cooperation in anxious or young children [Wells et al., 2018]. Managing anxiety and fear in paediatric patients is one of the most challenging aspects of

paediatric dentistry, making behaviour guidance techniques essential for ensuring effective treatment while fostering a positive attitude toward dental care [Abushanan et al., 2022]. Dentists are expected to recognise and manage childhood dental diseases within their training, using appropriate behaviour guidance techniques [AAPD, 2022].

Initially, non-pharmacological approaches are used to manage children in a dental setting. When these methods fail to address the child's emotional or cognitive responses, pharmacological interventions may be considered for diagnostic and therapeutic procedures [Wilson et al., 2016]. Paediatric dentists use various behaviour guidance techniques that emphasise communication and building rapport, including "tell-show-do," non-verbal communication, positive reinforcement, voice control, the presence or absence of parents, distraction, and nitrous oxide/oxygen inhalation according to the Langa technique. More advanced techniques include protective stabilisation, sedation, and general anaesthesia. Dentists often combine these techniques, adjusting them according to the child's temperament, the nature of the appointment, and the child's previous experiences [Juntgen et al., 2013].

Behaviour guidance can vary depending on the practitioner's training, experience, and personality [AAPD, 2022]. However, the "tell-show-do" (TSD) method remains the most widely used technique in paediatric dentistry. TSD aims to eliminate fear and anxiety by making the dental process more familiar [Wright et al., 2014, Gozin et al. 2022].

Sedation with nitrous oxide and oxygen according to the Langa technique has proven effective in reducing dental anxiety in the long term, offering advantages over behavioural management techniques alone and general anaesthesia [Arch et al., 2001]. The "Relative Analgesia" technique developed by Harry Langa uses low concentrations of N2O (30-40%) mixed with high concentrations of O2 to produce mild sedation and analgesia. The patient remains conscious and cooperative, with all protective reflexes intact, while experiencing a pleasant sensation [Arcari et al., 2018]. Nitrous oxide is widely accepted as a safe and effective option for alleviating dental anxiety, offering benefits such as anxiolysis, mild analgesia, and amnesia. It raises the pain threshold and provides rapid analgesia, thus enhancing the effects of local anaesthesia [Khinda et al., 2023].

Nitrous oxide/oxygen sedation according to the Langa technique, also known as N2O/O2 analgesia/anxiolysis, is a safe and effective technique for managing pain and anxiety [AAPD, 2023]. It is recommended as an alternative to general anaesthesia [Hallonsten et al., 2003] and it can help to obtain cooperation from younger patients, reducing the need for hospital-based general anaesthesia [Galeotti et al., 2016]. General anaesthesia is typically reserved for cases where dental care cannot be provided through standard methods due to multiple failed treatment attempts [Rajavaara et al., 2017].

Behaviour and anxiety are interrelated, and younger children often exhibit more anxiety, necessitating advanced behaviour guidance techniques [Shanmugaavel et al., 2016]. General anaesthesia is usually recommended for uncooperative children, those with special needs, or those requiring extensive restorations. It offers advantages over local anaesthesia for managing early childhood caries [Alwadani et al., 2023]. Studies have shown that clinicians agree sedation should be available for all children undergoing dental treatment [Hosey, 2002; Madouh et al., 2016].

Dentists need a diverse set of behaviour guidance techniques to accommodate the varying developmental, emotional, and social needs of children. Most dental visits require basic behaviour guidance strategies to provide quality oral care for paediatric patients [Dhar & Randall et al., 2023]. The American Academy of Pediatric Dentistry, along with other international paediatric dentistry organisations, acknowledges the importance of behaviour guidance techniques in delivering safe, high-quality restorative and surgical care. Over time, these techniques have evolved in response to societal changes, practice new patterns and recent studies in healthcare settings [Dhar & Jayaraman et al., 2023]. In the digital age, innovative behaviour management techniques, including electronic devices, have become valuable tools that are more likely to be accepted by younger patients. Behaviour management techniques vary across Italy. Inhalation sedation has proven to be a safe and effective way to perform emergency dental treatment for uncooperative paediatric patients, particularly during the COVID-19 outbreak [Ferrazzano et al., 2020].

SURVEY

Dear Colleague,
we would appreciate your anonymous participation in the following survey, in which we want to investigate Italian dentists in the use of the following behaviour management techniques: nitrous oxide/oxygen inhalation sedation, tell-show-do, electronic distraction and referral to GA. Thank you in advance for your time.

1. Years in practice: **a.** 1-10 **b.** >10
2. Gender: **a.** Male **b.** Female
3. Geographic region of practice:
a. Northern Italy (Liguria, Piemonte, Valle d'Aosta, Lombardia, Trentino-Alto Adige, Friuli-Venezia Giulia, Veneto, Emilia Romagna) **b.** Central Italy (Toscana, Umbria, Lazio, Marche) **c.** Southern Italy (Abruzzo, Molise, Campania, Basilicata, Puglia, Calabria, Sicilia, Sardegna)
4. Dental field which classifies your practice:
a. general dentistry **b.** paediatric dentistry **c.** orthodontics **d.** oral surgery **e.** oral hygiene
5. Percentage of paediatric patients (0-14 years):
a. <10% **b.** 10-20% **c.** 21-50% **d.** >50% **e.** no paediatric patients
6. Regarding the use of sedation with nitrous oxide and oxygen according to the Langa technique in paediatric patients, in what percentage of pediatric patients is the technique used:
a. <10% **b.** 10-20% **c.** 21-50% **d.** >50% **e.** no use
7. In case of use of the technique, what percentage of paediatric patients is considered successful with the use of nitrous oxide and oxygen sedation according to the Langa technique?
a. <10% **b.** 10-20% **c.** 21-50% **d.** >50% **e.** no patient
8. Regarding the use of the "tell-show-do" behaviour management technique, in what percentage of paediatric patients is the "tell-show-do" technique used?
a. <10% **b.** 10-20% **c.** 21-50% **d.** >50% **e.** no use
9. Regarding the use of general anaesthesia, what percentage of paediatric patients are annually referred for general anaesthesia?
a. <10% **b.** 10-20% **c.** 21-50% **d.** > 50% **e.** no patient
10. Regarding the use of audio-visual electronic distraction technique, in what percentage of paediatric patients is the audio-visual electronic distraction technique used:
a. <10% **b.** 10-20% **c.** 21-50% **d.** >50% **e.** no use

TAB. 1 Survey.

To our knowledge, this is the first study to examine behaviour guidance techniques (BGTs) among Italian practitioners, considering factors such as years of experience, gender, and region of practice. The aim of this study was to survey Italian dentists about their preferences for BGTs, focusing on:

1. determining the current use and understanding of nitrous oxide/oxygen anxiolysis according to the Langa technique among Italian practitioners who treat children.
2. assessing the use of basic behaviour guidance techniques such as "tell-show-do" (TSD) and audio-visual distraction (AVD).

3. evaluating the frequency of referrals for general anaesthesia (GA).
4. investigating any associations between gender, time in practice, and Italian geographic region in relation to BGT usage.

Methods

This study collected data through anonymous surveys completed by Italian practitioners. The survey consisted of 10 multiple-choice questions (Table 1) and was approved by the Italian Society of Pediatric Dentistry (SIOI). The survey was distributed at various SIOI conventions, meetings, and educational courses, and participation was voluntary.

The survey, developed by the authors, was conducted between September 2022 and December 2023. Respondents filled out the 10-item questionnaire during the meetings and returned it to the front desk. Participation was anonymous, and respondents were not compensated.

The survey asked about participants' time in practice (≤10 years and >10 years), gender, geographic location (Northern, Central, and Southern Italy), and primary field of practice (general dentistry, paediatric dentistry, orthodontics, oral surgery, hygiene). The remaining questions covered the percentage of paediatric patients in daily practice, the use of sedation with nitrous oxide and oxygen according to the Langa technique, tell-show-do techniques, referrals to general anaesthesia, and the use of audio-visual distraction as a behaviour management technique. A percentage scale selection of 5-point Likert Scale numerical categories (less than 10%, 10 to 20%, 21 to 50%, more than 50%, none) was provided for each question. Specifically:

- The first question inquired about the amount of time in practice.
- The second question asked to express the gender.
- The third question asked to identify the Italian region of practice.
- The fourth question requested information about the main field of practice.
- The fifth question inquired about the percentage of paediatric patients in daily practice.
- The sixth question investigated the percentage of paediatric patients who undergo sedation with nitrous oxide and oxygen according to the Langa technique during dental treatment.
- The seventh question explored the percentage of paediatric patients who successfully benefit from the use of analgesia/anxiolysis technique.
- The eighth question searched for the percentage of tell-show do usage in the management of paediatric patients.
- The ninth question interrogated about the percentage of paediatric patients who are annually referred to GA.
- The tenth and last question sought information about the use of AVD as a behavioural management technique.

Data were analysed using the STATA/BE software, version 18.0, with percentages calculated for each survey item. Statistical significance was determined using chi-square or Fisher's exact tests, with a P-value of <0.05 considered significant (Table 2 – 6).

TABLE 2		Time in practice		
	TOTAL N=153	Group A n (%) 82 (53.59)	Group B n (%) 71 (46.41)	p-value
Gender, n (%)				0.098*
Female	121(79.08)	69 (84.15)	52 (73.24)	
Male	32 (20.92)	13 (15.85)	19 (26.76)	
Geographic region of practice n (%)				0.001*
North	69 (45.10)	27 (32.93)	42 (59.15)	
Center	36 (23.53)	20 (24.39)	16 (22.54)	
South + Islands	48 (31.37)	35 (42.68)	13 (18.31)	
*χ2 test				
** Fisher's exact test				

TABLE 2 Descriptive - inferential analysis of the sample features, stratified by years in practice (Group A: ≤10 years, Group B: > 10 years).

Results

A total of 200 questionnaires were distributed, and 171 were returned during continuing education courses and meetings over a 16-month period from September 2022 to December 2023. Eighteen (10.53%) of the surveys were excluded due to incomplete data. Of the 171 surveys returned, 153 (89.47%) were accepted for statistical analysis as they contained no missing data.

Participant Characteristics

Among the 153 participants, 121 (79.08%) were female, and 32 (20.92%) were male. The sample was stratified by gender and time in practice:

- Gender: Of the 121 female respondents, 69 (57.02%) had been in practice for 10 years or less, while 52 (42.98%) had been practicing for more than 10 years. Among the 32 male participants, 13 (40.62%) had 10 years or less of practice experience, and 19 (59.38%) had more than 10 years.
- Time in Practice: Of the 153 total participants, 82 (53.59%) had been in practice for 10 years or less, with 69 (84.15%) being female and 13 (15.85%) male. The remaining 71 (46.41%) had been practicing for more than 10 years, with 52 (73.24%) being female and 19 (26.76%) male.

Geographic Distribution

Participants were also grouped by the region where they practiced:

- Of the 153 total respondents, 69 (45.10%) were from northern Italy, 36 (23.53%) from central Italy, and 48 (31.37%) from southern Italy.
- Among the 121 female participants, 51 (41.15%) were from the north, 30 (24.79%) from the center, and 40 (33.06%) from the south. Among the 32 male participants, 18 (56.25%) were from the north, 6 (18.75%) from the center, and 8 (25%) from the south.

Regarding time in practice by geographic area:

- Of the 82 respondents with 10 years or less of practice, 27 (32.93%) were from northern Italy, 20 (24.39%) from central Italy, and 35 (42.68%) from southern Italy.
- Of the 71 respondents with more than 10 years of practice, 42 (59.15%) were from northern Italy, 16 (22.54%) from central Italy, and 13 (18.31%) from southern Italy.

A significant difference was observed between northern and southern respondents based on years in practice. In the north, practitioners with more than 10 years of experience were significantly more represented (59.15% vs. 32.93%), while in the south, most respondents had 10 years or less of practice

TABLE 3 Descriptive - inferential analysis of the sample professional features, stratifies by years in practice (Group A: ≤10 years, Group B: > 10 years).

TABLE 3		Years of Clinical Experience		
	TOTAL N=153	Group A n (%) 82 (53.59)	Group B n (%) 71 (46.41)	p-value
Dental field which classifies your practice, n (%)				0.186*
General dentistry	40 (26.14)	21 (25.61)	19 (26.76)	
Paediatric dentistry	90 (58.82)	49 (59.76)	41 (57.75)	
Orthodontics	15 (9.80)	6 (7.32)	9 (12.68)	
Oral Surgery	3 (1.96)	1 (1.22)	2 (2.82)	
Oral Hygiene	5 (3.27)	5 (6.10)	0 (0.00)	
Percentage of paediatric patients (0-14 years), n (%)				0.843*
< 10	7 (4.58)	4 (4.88)	3 (4.23)	
10 – 20	26 (16.99)	13 (15.85)	13 (18.31)	
21 – 50	44 (28.76)	26 (31.71)	18 (25.35)	
> 50	76 (49.67)	39 (47.56)	37 (52.11)	
no paediatric patients	0 (0.00)	0 (0.00)	0 (0.00)	
In what percentage of paediatric patients is sedation with nitrous oxide and oxygen according to the Langa technique used, n (%)				0.179*
< 10	27 (17.65)	17 (20.73)	10 (14.08)	
10 – 20	17 (11.11)	9 (10.98)	8 (11.27)	
21- 50	18 (11.76)	5 (6.10)	13 (18.31)	
> 50	29 (18.95)	15 (18.29)	14 (19.72)	
no use	62 (40.52)	36 (43.90)	26 (36.62)	
In case of use of the technique, what percentage of paediatric patients is considered successful with the use of nitrous oxide/ oxygen sedation according to the Langa technique, n (%)				0.349*
< 10	15 (9.80)	9 (10.98)	6 (8.45)	
10 – 20	4 (2.61)	3 (3.66)	1 (1.41)	
21- 50	29 (18.95)	16 (19.51)	13 (18.31)	
> 50	46 (30.07)	19 (23.17)	27 (38.03)	
no patient	59 (38.56)	35 (42.68)	24 (33.80)	
Regarding the use of the "tell-show-do" behaviour management technique, in what percentage of paediatric patients is the "tell-show-do" technique used? n (%)				0.560*
< 10	2 (1.31)	1 (1.22)	1 (1.41)	
10 – 20	0 (0.00)	0 (0.00)	0 (0.00)	
21- 50	4 (2.61)	1 (1.22)	3 (4.23)	
> 50	147 (96.08)	80 (97.56)	67 (94.37)	
no use	0 (0.00)	0 (0.00)	0 (0.00)	
What percentage of paediatric patients are annually referred for general anaesthesia n (%)				0.003*
< 10	95 (62.09)	47 (57.32)	48 (67.61)	
10 – 20	13 (8.50)	4 (4.88)	9 (12.68)	
21- 50	8 (5.23)	2 (2.44)	6 (8.45)	
> 50	6 (3.92)	5 (6.10)	1 (1.41)	
no patient	31 (20.26)	24 (29.27)	7 (9.86)	
Regarding the use of electronic distraction technique, in what percentage of paediatric patients is the electronic distraction technique used n (%)				0.940**
< 10	45 (29.41)	26 (31.71)	19 (26.76)	
10 – 20	27 (17.65)	15 (18.29)	12 (16.90)	
21- 50	20 (13.07)	10 (12.20)	10 (14.08)	
> 50	25 (16.34)	12 (14.63)	13 (18.31)	
no use	36 (23.53)	19 (23.17)	17 (23.94)	
* Fisher's exact test				
** χ^2 test				

TABLE 5 Descriptive - inferential analysis of the sample professional features stratified by gender.

TABLE 4		Gender		
	TOTAL N=153	Female n (%) 121 (79.08)	Male n (%) 32 (20.92)	p-value
Time in practice, n (%)				0.098*
≤ 10 years	82 (53.59)	69 (57.02)	13 (40.62)	
> 10 years	71 (46.41)	52 (42.98)	19 (59.38)	
Italian geographic location, n (%)				0.362**
North	69 (45.10)	51 (42.15)	18 (56.25)	
Center	36 (23.53)	30 (24.79)	6 (18.75)	
South	48 (31.37	40 (33.06)	8 (25.00)	
* χ^2 test - ** Fisher's exact test				

TABLE 4 Descriptive - inferential analysis of the sample features, stratified by gender.

TABLE 5		Gender		
	TOTAL N=153	Female n (%) 121 (79.08)	Male n (%) 32 (20.92)	p-value
Dental field which classifies your practice, n (%)				0.001*
General dentistry	40 (26.14)	24 (19.83)	16 (50.00)	
Paediatric dentistry	90 (58.82)	79 (65.29)	11 (34.38)	
Orthodontics	15 (9.80)	12 (9.92)	3 (9.38)	
Oral surgery	3 (1.96)	1 (0.83)	2 (6.25)	
Oral Hygiene	5 (3.27)	5 (4.13)	0 (0.00)	
Percentage of paediatric patients (0-14 years), n (%)				0.002*
< 10	7 (4.58)	2 (1.65)	5 (15.62)	
10 – 20	26 (16.99)	19 (15.70)	7 (21.88)	
21 – 50	44 (28.76)	33 (27.27)	11 (34.38)	
> 50	76 (49.67)	67 (55.37)	9 (28.12)	
no pediatric patients	0 (0.00)	0 (0.00)	0 (0.00)	
In what percentage of paediatric patients is sedation with nitrous oxide and oxygen according to the Langa technique used, n (%)				0.133*
< 10	27 (17.65)	23 (19.01)	4 (12.50)	
10 – 20	17 (11.11)	10 (8.26)	7 (21.88)	
21- 50	18 (11.76)	13 (10.74)	5 (15.62)	
> 50	29 (18.95)	22 (18.18)	7 (21.88)	
no use	62 (40.52)	53 (43.80)	9 (28.12)	
In case of use of the technique, what percentage of paediatric patients is considered successful with the use of nitrous oxide/oxygen sedation according to the Langa technique, n (%)				0.377*
< 10	15 (9.80)	12 (9.92)	3 (9.38)	
10 – 20	4 (2.61)	3 (2.48)	1 (3.12)	
21- 50	29 (18.95)	21 (17.36)	8 (25.00)	
> 50	46 (30.07)	34 (28.10)	12 (37.50)	
no patient	59 (38.56)	51 (42.15)	8 (25.00)	
Regarding the use of the "tell-show-do" behaviour management technique, in what percentage of paediatric patients is the "tell-show-do" technique used, n (%)				0.203*
< 10	2 (1.31)	1 (0.83)	1 (3.12)	
10 – 20	0 (0.00)	0 (0.00)	0 (0.00)	
21- 50	4 (2.61)	2 (1.65)	2 (6.25)	
> 50	147 (96.08)	118 (97.52)	29 (90.62)	
no use	0 (0.00)	0 (0.00)	0 (0.00)	
What percentage of paediatric patients are annually referred for general anaesthesia n (%)				0.442*
< 10	95 (62.09)	75 (61.98)	20 (62.50)	
10 – 20	13 (8.50)	10 (8.26)	3 (9.38)	
21- 50	8 (5.23)	5 (4.13)	3 (9.38)	
> 50	6 (3.93)	4 (3.31)	2 (6.25)	
no patient	31 (20.26)	27 (22.31)	4 (12.50)	
Regarding the use of electronic distraction technique, in what percentage of paediatric patients is the electronic distraction technique used, n (%)				0.144*
< 10	45 (29.41)	33 (27.27)	12 (37.50)	
10 – 20	27 (17.65)	22 (18.18)	5 (15.62)	
21- 50	20 (13.07)	18 (14.88)	2 (6.25)	
> 50	25 (16.34)	23 (19.01)	2 (6.25)	
no use	36 (23.53)	25 (20.66)	11 (34.38)	
* Fisher's exact test				

TABLE 6		Geographical Area of Origin, n (%)			
	TOTAL N=153	North n (%) 69 (45.10)	Center n (%) 36 (23.53)	South n (%) 48 (31.37)	p-value
Dental field which classifies your practice, n (%)					0.250*
Generale dentistry	40 (26.14)	17 (24.64)	8 (22.22)	15 (31.25)	
Pediatric dentistry	90 (58.82)	42 (60.07)	20 (55.56)	28 (58.33)	
Orthodontics	15 (9.80)	8 (11.59)	5 (13.89)	2 (4.17)	
Oral surgery	3 (1.96)	2 (2.90)	0 (0.00)	1 (2.08)	
Oral hygiene	5 (3.27)	0 (0.00)	3 (8.33)	2 (4.17)	
Percentage of paediatric patients (0-14 years), n (%)					0.911*
< 10	7 (4.58)	2 (2.90)	2 (5.56)	3 (6.25)	
10 – 20	26 (16.99)	12 (17.39)	5 (13.89)	9 (18.75)	
21 – 50	44 (28.76)	18 (26.09)	11 (30.56)	15 (31.25)	
> 50	76 (49.67)	37 (53.62)	18 (50.00)	21 (43.75)	
no pediatric patients	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	
in what percentage of paediatric patients is sedation with nitrous oxide and oxygen according to the Langa technique used, n (%)					0.140*
< 10	27 (17.65)	12 (17.39)	5 (13.89)	10 (20.83)	
10 – 20	17 (11.11)	12 (17.39)	1 (2.78)	4 (8.33)	
21 - 50	18 (11.76)	8 (11.59)	6 (16.67)	4 (8.33)	
> 50	29 (18.95)	16 (23.19)	4 (11.11)	9 (18.75)	
no use	62 (40.52)	21 (30.43)	20 (55.56)	21 (43.75)	
In case of use of the technique, what percentage of paediatric patients is considered successful with the use of nitrous oxide/ oxygen sedation according to the Langa technique, n (%)					
< 10	15 (9.80)	8 (11.59)	2 (5.56)	5 (10.42)	0.126*
10 – 20	4 (2.61)	2 (2.90)	1 (2.78)	1 (2.08)	
21 - 50	29 (18.95)	14 (20.29)	4 (11.11)	11 (22.92)	
> 50	46 (30.07)	27 (39.13)	8 (22.22)	11 (22.92)	
no patient	59 (38.56)	18 (26.09)	21 (50.33)	20 (41.67)	
Regarding the use of the "tell-show-do" behaviour management technique, in what percentage of paediatric patients is the "tell-show-do" technique used, n (%)					0.835*
< 10	2 (1.31)	1 (1.45)	0 (0.00)	1 (2.08)	
10 – 20	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	
21- 50	4 (2.61)	2 (2.90)	0 (0.00)	2 (4.17)	
> 50	147 (96.08)	66 (95.65)	36 (100.00)	45 (43.75)	
no use	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	
What percentage of paediatric patients are annually referred for general anaesthesia, n (%)					<0.001*
< 10	95 (62.09)	49 (71.01)	24 (66.67)	22 (45.83)	
10 – 20	13 (8.50)	8 (11.59)	1 (2.78)	4 (8.33)	
21- 50	8 (5.23)	7 (10.14)	0 (0.00)	1 (2.08)	
> 50	6 (3.93)	2 (2.90)	1 (2.78)	3 (6.25)	
no patient	31 (20.26)	3 (4.35)	10 (27.78)	18 (37.50)	
Regarding the use of electronic distraction technique, in what percentage of paediatric patients is the electronic distraction technique used, n (%)					0.208*
< 10	45 (29.41)	16 (23.19)	14 (38.89)	15 (31.25)	
10 – 20	27 (17.65)	15 (21.74)	4 (11.11)	8 (16.67)	
21- 50	20 (13.07)	12 (17.39)	5 (13.09)	3 (6.25)	
> 50	25 (16.34)	11 (15.94)	8 (22.22)	6 (12.50)	
no use	36 (23.53)	15 (21.74)	5 (13.89)	16 (33.33)	
* Fisher's exact test					

TABLE 6 Descriptive - inferential analysis of the sample professional features, stratified by geographic location of practice.

(42.68% vs. 18.31%).

Gender and Practice Focus

A positive correlation was found between gender and the main field of dental practice. Most male participants were general practitioners (50%), with no male hygienists reported. In contrast, 79 (65.29%) of the 121 female participants were paediatric dentists, compared to 11 (34.38%) male paediatric dentists (P-value = 0.001).

Another statistically significant difference was observed in the treatment of paediatric patients. Among the 121 female participants, 67 (55.37%) reported that more than 50% of their patients were paediatric, while only 9 (28.12%) male participants reported the same (P-value = 0.002).

Referral to General Anaesthesia (GA)

A chi-square analysis revealed a significant relationship between time in practice and the frequency of referrals for general anaesthesia (GA). Of the practitioners with 10 years or less of experience, 29.27% reported no GA referrals, compared to only 9.86% of those with more than 10 years of experience. Additionally, practitioners with more than 10 years of experience were more likely to refer 10-20% of their patients to GA (12.68% vs. 4.88%, P-value = 0.003).

When considering geographic location and GA referrals, northern practitioners were more likely to refer fewer than 10 patients annually for GA (49 respondents, 71.01%), compared to those from central (24 respondents, 66.67%) and southern Italy (22 respondents, 45.83%). No referral was reported by 3 northern respondents (4.35%), 10 from central Italy (27.78%), and 18 from southern Italy (37.50%) (P-value < 0.001).

Tell-Show-Do

The Tell-Show-Do technique was used by 147 (96.08%) of participants for more than 50% of their paediatric patients, with no significant differences based on gender, time in practice, or geographic area.

Audio Visual Distraction (AVD)

Regarding the use of AVD for paediatric patients, 36 (23.53%) participants did not use any AVD, 45 (29.41%) used AVD with fewer than 10% of their paediatric patients and only 25 (16.34%) reported using AVD with more than 50% of their paediatric patients.

Nitrous Oxide/Oxygen Anxiolysis

Survey results on the use of nitrous oxide/oxygen anxiolysis according to the Langa technique indicated no significant differences based on gender, time in practice, or geographic area. Overall, 40.52% of respondents reported no use of the technique, and only 30.07% reported its success in more than 50% of paediatric patients.

Discussion

Patient compliance is crucial for successful dental treatment, but achieving it in children can be challenging due to anxiety and fear, which hinder therapeutic procedures [Tieri et al., 2023]. Therefore, managing dental anxiety is a key aspect of paediatric dentistry [Walley et al., 2015]. This study aimed to explore the use of behaviour guidance techniques (BGTs), including Tell-Show-Do (TSD), audiovisual distraction (AVD), nitrous oxide/ oxygen anxiolysis according to the Langa technique, and referrals for general anaesthesia (GA), to alleviate children's anxiety during

dental treatment.

Nonpharmacologic BGTs have evolved over time, influenced by social changes, parenting styles, and outcomes-based research [Dhar, Randall et al., 2023]. However, evidence on the effectiveness of different nonpharmacologic techniques remains limited, making it difficult for clinicians to make informed decisions [Dhar, Jayaraman et al., 2023]. This issue is further complicated by varying demographic and cultural contexts [Dhar, Randall et al., 2023]. Most dental treatments in the USA are conducted using nonpharmacologic techniques, a finding consistent with this study, where the majority of respondents reported using methods like TSD and AVD [Wells et al., 2018].

Numerous studies have examined dentists' use of BGTs and found that factors such as age, gender, and region of practice influence their utilisation [McKnight-Hanes et al., 1993; Adair et al., 2007; Wells et al., 2014; Wells et al., 2018]. Positive techniques, such as distraction and TSD, are widely employed by paediatric dentists worldwide [Adair et al., 2004; Wells et al., 2018]. The effectiveness of TSD in reducing dental anxiety has been well documented [Gozin et al., 2022]. It is particularly useful for young children lacking dental preconditioning, children with previous painful dental experiences, or those influenced by negative information from parents or peers [Wright et al., 2014]. This study also found that TSD is the most commonly used technique among Italian practitioners, with no significant differences related to gender, years of practice, or geographic location, aligning with previous research. TSD is widely accepted as a fundamental communication tool in paediatric dentistry and has high parental approval [Boka et al., 2014]. Its routine use by all dental team members working with children has been recommended [Stigers, 2016]. In this study, over 91% of both male and female practitioners reported using TSD, consistent with similar findings in earlier studies [Adair et al., 2004; Wells et al., 2018].

It is important to regularly reassess behaviour management techniques, as stagnant methods can complicate treatment and communication with the patient [Veloso et al., 2023]. Given that today's children are widely exposed to electronic devices, integrating technology with traditional behaviour modeling techniques has shown promising results in reducing dental anxiety [Abbasi et al., 2021]. Various forms of distraction, including audio and audiovisual methods, have been shown to help manage children's pain and anxiety during dental treatment [Gizani et al., 2022; Gurav et al., 2022]. Techniques such as magic tricks and positive imagery also offer effective distraction, comforting children and diverting their attention away from negative emotions [Dhar, Randall et al., 2023]. Audiovisual distraction using electronic tools [television, virtual reality, mobile games], has been particularly effective in reducing anxiety in children undergoing local anaesthesia [Zhang et al., 2019].

Despite the effectiveness of these tools, technology-based distraction techniques are not yet widely adopted in Italian paediatric dentistry. In this study, 23.53% of participants reported not using AVD at all, while 29.41% used it in fewer than 10% of cases, and only 16.34% used AVD in over half of their paediatric patients. No significant differences were found regarding years of practice. Interestingly, female practitioners were more likely to use AVD, with 19.01% employing it in over 50% of cases, compared to only 6.25% of male practitioners. Additionally, 20.66% of female respondents reported no use of AVD, compared to 34.38% of male respondents. These differences may stem from both training experience and the larger proportion of female respondents (79.08% vs. 20.92%). Female practitioners may also be more inclined to please young patients and their parents.

Regional differences were also observed, with central Italian practitioners reporting higher AVD use in over 50% of patients (22.22%) compared to those in the North (15.94%) and South (12.50%). Central practitioners also reported lower rates of no AVD use (13.89%), whereas Northern and Southern practitioners reported no use in 21.74% and 33.33% of cases, respectively. This disparity may be due to the investment required for AVD tools. Nonetheless, expanding the range of behaviour management techniques is essential to adapting to societal changes [Dhar, Jayaraman et al., 2023].

In the past, practitioners have been reluctant to adopt new behaviour management techniques, citing cost, acceptance, and reimbursement concerns [Allen et al., 1990]. Other factors, such as legal concerns, parental acceptance, and accessibility, have also influenced change over time [Juntgen et al., 2013]. In the future, mobile healthcare applications may prove beneficial in helping children navigate dental treatment [Dhar, Randall et al., 2023].

While non-pharmacological behavioural management techniques, combined with effective local anaesthesia, are sufficient for many paediatric patients, some children will still require additional support through conscious sedation or general anaesthesia (GA). Among these methods, sedation with nitrous oxide and oxygen according to the Langa technique has long been recognised as a safe and effective alternative to GA in paediatric dental treatments [Walley et al., 2015].

This study is the first to survey Italian dentists about their use of nitrous oxide/oxygen anxiolysis in paediatric dentistry. The findings revealed that 18.95% of respondents used this technique with over 50% of their paediatric patients, while 40.52% reported no use. One explanation could be the predominantly private nature of Italian dental practices, where paediatric dentistry represents a smaller portion of income compared to other countries. This may discourage investment in sedation equipment in favor of higher-profit tools.

The most frequently reported response in this study was "no use" of nitrous oxide/oxygen anxiolysis, which contrasts sharply with a 25-year follow-up survey of AAPD paediatric dentists, where usage rates for nitrous oxide were increasing over time, with 26% reporting use for over 50% of their patients [Wilson et al., 2016]. Moreover, Wells et al. [2018] noted that most paediatric dentists used nitrous oxide with 53% of their patients, showing a clear rise in its application.

This survey also showed that less experienced practitioners were more likely to report no use of nitrous oxide (43.90%) compared to those with over 10 years in practice (36.62%). Female dentists were more likely to report no use (42.80%) compared to males (28.12%), though this is likely influenced by the higher proportion of female respondents (79.08%). This is in contrast to Wells et al. [2018], which found younger and female practitioners more frequently used nitrous oxide, possibly because that survey focused exclusively on paediatric dentists, who are more likely to use this technique.

Interestingly, younger Italian practitioners may lack confidence in using nitrous oxide, with 43.90% reporting no use, 20.73% using it in fewer than 10% of cases, and only 23.17% finding it successful in more than 50% of cases. This could stem from a lack of knowledge, training, or reluctance to invest in equipment. However, studies consistently show the safety and efficacy of sedation with nitrous oxide and oxygen according to the Langa technique for reducing anxiety during dental treatment. The rapid onset and reversal of nitrous oxide effects make it an integral tool in dental practices, particularly in the

United States [Houpt et al., 2004].

Regionally, nitrous oxide use was higher in Northern Italy (23.19%) than in Central (11.11%) and Southern Italy (18.75%). Central practitioners reported the lowest frequency of use, with 55.56% indicating no use, compared to 30.43% in the North and 43.75% in the South. This variation may be due to differences in training programs, resource availability, and patient experiences. The study did not account for the role of education or practitioner comfort in selecting behaviour guidance techniques (BGTs).

The overall success rate of nitrous oxide/oxygen anxiolysis was relatively low, with only 30.07% reporting success in more than 50% of patients. Practitioners using the technique with more patients reported higher success rates, suggesting that wider adoption could lead to better outcomes.

Parental acceptance of nitrous oxide is high, as shown in multiple studies [Boka et al., 2014; Patel et al., 2016; Wells et al., 2018]. Its ability to reduce pain and anxiety, combined with rapid recovery, makes it highly effective in suitable cases [Tieri et al., 2023]. Moreover, most children are enthusiastic about the administration of N2O/O2 for anxiolysis [Arcari et al., 2008], thus helping children tolerate challenging procedures, reducing discomfort and speeding up treatments [Sharma et al., 2020]. Providing oral care for children, knowledge and skills specifically in the management of pain and providing sedation are indispensable [Huang et al., 2016].

Despite these advantages, the current study revealed a higher rate of GA referral compared to the use of nitrous oxide, with no use of nitrous oxide reported at double the rate of no GA referral (40.52% vs. 20.26%). This suggests a need to increase the use of nitrous oxide in Italian paediatric dentistry. Other studies have called for more training in sedation with nitrous oxide and oxygen according to the Langa technique in undergraduate dental education, reflecting a growing desire among students to gain practical experience with this technique [Walley et al., 2014; Walley et al., 2015].The survey also highlights a tendency among Italian dentists to refer more paediatric patients to GA rather than using nitrous oxide. This may indicate a need for greater knowledge of both nitrous oxide sedation and GA to improve decision-making and ensure the best outcomes for patients [Walley et al., 2015]. Previous research by Rajavaara et al. [2017] showed that dental caries and dental fear were the primary reasons for GA use, with a rise in its occurrence in recent years. Pharmacological methods should only be used when all other BGTs have failed [Tieri et al., 2023]. Although GA is the least accepted technique among parents [Boka et al., 2014], rising demand has been reported, especially for early childhood caries treatment [Hicks et al., 2012; Alwadani et al., 2023].

The study also found a significant difference in GA referral rates based on the practitioner's experience. Those with over 10 years in practice reported no referral less often (9.86%) and referred fewer than 10% of patients more frequently than less experienced practitioners (67.61% vs. 57.32%). This may reflect younger dentists' reluctance to use advanced BGTs like GA, or their preference for simpler behaviour techniques. This finding contrasts with studies showing that practitioners with more experience are less likely to use GA [Adair et al., 2007; Wells et al., 2018]. However, Veloso et al. have recently reported a current increase of parents requesting general anaesthesia, possibly linked to the search for avoidance of negative dental experiences while researching techniques that reduce anxiety generated by dental treatment [Veloso et al., 2023].

In terms of gender, there was no significant difference in GA usage, although female dentists tended to refer more patients to GA than males. Female respondents reported "no referral" more frequently (22.31%) than their male counterparts (12.50%), contrary to findings that female practitioners tend to use GA more often (Wells et al., 2018). This may be because female dentists are more skilled at managing children's behaviour using basic BGTs.

Geographic differences were also notable, with the highest GA referral rates in Northern Italy. The majority of Northern practitioners (71.01%) reported using GA for fewer than 10% of patients, compared to 66.67% in Central Italy and 45.83% in the South. Southern Italy had the lowest GA referral rate, possibly due to logistical challenges and limited access to GA services. Socioeconomic factors may also influence the use of advanced BGTs, as low-income children often present with higher caries rates, making complex procedures like GA more necessary [Wells et al., 2018].

This study had some limitations, including a small sample size and an oversampling of female respondents. Additionally, only half of the participants were paediatric dentists, and the survey did not explore all behaviour management strategies or factors influencing BGT choice, such as practice characteristics or patient demographics.

Overall, this study provides valuable insight into the use of BGTs among Italian paediatric dentists. However, further research with larger sample sizes is needed to better understand trends in BGT usage. Expanding the use of nitrous oxide/oxygen anxiolysis according to the Langa technique could improve paediatric dental care in Italy.

Conclusions

Based on this study's results the following conclusions can be made:

- Usage of nitrous oxide-oxygen anxiolysis by Italian paediatric dentists is not widespread. The low level of confidence in the use of sedation with nitrous oxide and oxygen according to the Langa technique among Italian practitioners is confirmed by more than 40% surveyed Italian providers reporting no use of the technique.
- Tell-Show-Do was found to be the most widely used technique for behaviour management in children by Italian practitioners. As for AVD usage, no statistical difference was noticed between genders, years in practice or geographic location.
- A significantly different percentage of patients were referred to GA among the different geographic regions: GA had a significantly higher rate of report by respondents who were located in Northern Italy, and a significant lower rate of referral by Southern practitioners.
- Referral to GA was significantly more frequent among respondents who were in practice for more than 10 years.
- Paediatric dentistry was significantly more prevalent among female participants who were found to have a significant higher percentage of paediatric patients.
- Further studies are needed to evaluate Italian usage of BGTs and efforts should be made to implement practitioners' use of nitrous oxide/oxygen anxiolysis according to the Langa technique.

Disclosure

This research had no conflict of interest and no financial funds.

References

- American Academy of Pediatric Dentistry. Behaviour Guidance for the Pediatric Dental Patient. The Reference Manual of Pediatric Dentistry. Chicago Ill; 2022; 321-339.
- American Academy of Pediatric Dentistry. Use of Nitrous oxide for pediatric dental patients. The Reference Manual of Pediatric Dentistry, Chicago Ill; 2023: 393-400
- Abbasi H, Saqib M, Jouhar R, Lal A, Ahmed N, Ahmed MA, Alam MK. The Efficacy of Little Lovely Dentist, Dental Song, and Tell-Show-Do Techniques in Alleviating Dental Anxiety in Paediatric Patients: A Clinical Trial. Biomed Res Int. 2021; 23;2021: 1119710.
- Abushanan A, Alyahyawi A. The effect of parenthood on the clinician's empathy and behaviour guidance technique preferences among pediatric dentists. Eur Arch Pediatr Dent 2022; 23: 641-646.
- Adair SM, Waller JL, Schafer TE, Rockman RA. A survey of members of the American Academy of Pediatric Den- tistry on their use of behaviour management techniques. Pediatr Dent 2004; 26(2):159-66.
- Adair SM, Schafer TE, Waller JL, Rockman RA. Age and gender differences in the use of behaviour management techniques by pediatric dentists. Pediatr Dent 2007; 29: 403-408.
- Allen KD, Stanley RT, McPherson K. Evaluation of behaviour management technology dissemination in pediatric dentistry. Ped Dent 1990; 12: 79-82.
- Alwadani MA, Alsulaiman DA, Kakti A, Alamoudi S, Tadakamadla SK, Quadri MFA. Comparison of oral health-related quality of life scores in children treated for early childhood caries under general and local anaesthesia: a quasi-experimental study. Eur Arch Paediatr Dent 2023; 24: 719-728.
- Arcari S, Ferro R. Preschool children and relative analgesia: satisfaction grading through a verbal questionnaire. Eur J Paediatr Dent 2008; 9(1): 18-22.
- Arcari S, Moscati M. Nitrous oxide analgesic effect on children receiving restorative treatment on primary molars. Eur J Paediatr Dent 2018; 19(3): 205-212.
- Arch LM, Humphris GM, Lee GT. Children choosing between general anaesthesia or inhalation sedation for dental extractions: the effect on the dental anxiety. Int J Paediatr Dent 2001; 11: 41-48.
- Boka V, Arapostathis K, Vretos N, Kotsanos N. Parental acceptance of behaviour-management techniques used in Pediatric Dentistry and its relation to parental anxiety and experience. Eur Arch Ped Dent 2014; 15(5): 333-339.
- Casamassimo PS, Wilson S, Gross L. Effects of changing U.S. parenting styles on dental practice: perceptions of diplomates of the American Board of Pediatric Dentistry presented to the College of Diplomates of the American Board of Pediatric Dentistry 16th Annual Session, Atlanta, GA, 2001. Pediatr Dent 2002;24(1): 18-22.
- Cianetti S, Lombardo G, Lupatelli E, Pagano S, Abraha I, Montadori A, Caruso S, Gatto R, De Giorgio S, Salvato R. Dental fear/anxiety among children and adolescents. A systematic review. Eur J Paediatr Dent 2017; 18(2): 121-130.
- Cosi A, Tieri M, Lombardi L, Ciaravino C, D'Ercole S, Tripodi D. Clowntherapy in paediatric dentistry: the psychological approach to the paediatric patient. Eur J Paediatr Dent 2022; 23(3): 242-248.
- D'Alessandro G, Alkhamis N, Mattarozzi K, Mazzetti M, Piana G. Fear of dental pain in Italian children: child personality traits and parental dental fear. J Public Health Dent. 2016; 76(3):179-83.
- Dhar V, Randall CL, Marghalani AA, Jayaraman J, Chen YC, Wells M, Law C, Gosnell E, Majstorovic M, Townsend J, Wedeward R. Nonpharmacological Behaviour Guidance for children during preventive visits: a systematic review – Part 1. Pediatr Dent 2023; 45(3): 181-188.
- Dhar V, Jayaraman J, Marghalani AA, Wells M, Randall CL Law C, Majstorovic M, Gosnell E, Townsend J, Chen YC, Wedeward R. Nonpharmacological Behaviour Guidance for children during dental treatment visits: a systematic review and meta-analysis – Part 2. Pediatr Dent 2023; 45(3): 197-220.
- Ferrazzano GF, Quaraniello M, Sangianantoni G, Ingenito G, Cantile T. Clinical effectiveness of inhalation conscious sedation with nitrous oxide and oxygen for dental treatment in uncooperative paediatric patients during COVID-19 outbreak. Eur J Paediatr Dent 2020; 21(4): 277-282.
- Galeotti A, Garret Bernardin A, D'Antò V, Ferrazzano GF, Gentile T, Viarani V, Cassabgi G, Cantile T. Inhalation Conscious Sedation with Nitrous Oxide and Oxygen as Alternative to General Anaesthesia in Precooperative, Fearful and Disabled Pediatric Dental Patients: a Large Survey on 688 Working Sessions. BioMed Res Int 2016; 2016: 7289310.
- Gizani S, Seremidi K, Katsouli K, Markouli A, Kloukos D. Basic behavioural management techniques in pediatric dentistry: a systematic review and meta-analysis. J Dent 2022; 126: 104303.
- Goodwin M, Coulthard P, Pretty I. Estimating the need for dental sedation using IONS as a referral tool. Br Dent J 2012; 212(5): E9.
- Gozin F, Tabe Bordbar F, Esmaeili M. Audio-visual storytelling for reducing dental anxiety in Iranian children: a randomized controlled trial. Eur Arch Paediatr Dent 2022; 23: 953-960.
- Gurav KM, Kulkarni N, Shetty V, Vinay V, Borade P, Ghadge S, Bhor K. Effectiveness of Audio and Audio-Visual Distraction Aids for Management of Pain and Anxiety in Children and Adults Undergoing Dental Treatment- A Systematic Review and Meta-Analysis. J Clin Pediatr Dent 2022; 46(2): 86-106.
- Hallonsten AL, Jensen B, Raadal M, Veerkamp J, Hosey MT, Poulsen S. EAPD Guidelines on Sedation in Paediatric Dentistry. 11 April 2003, University of Aarhus, Denmark.
- Hicks CG, Jones JE, Saxen MA, Maupome G, Sanders BJ, Walker LA, Weddell JA, Tomlin A. Demand in pediatric dentistry for sedation and general anaesthesia by dentist anesthesiologists: a survey of directors of dentist anesthesiologist and pediatric dentistry residents. Anesth Prog 2012; 59(1): 3-11.
- Hosey M. Managing anxious children: the use of conscious sedation in paediatric dentistry. Int J Dent 2002; 12(5): 359-372.
- Houpt MI, Limb R, Livingston RL. Clinical effect of nitrous oxide conscious sedation in children. Pediatr Dent 2004; 26(1): 29-36
- Huang C, Johnson N. Nitrous oxide, from the operating room to the emergency department. Curr Emerg Hosp Med Rep 2016; 4: 11-18.
- ISTAT. Rapporto Annuale 2023. La situazione del Paese. Palazzo Montecitorio, 7 luglio 2023. Istituto nazionale di Statistica, ISBN 978-88-458-2106-6. Marchesi Grafiche Editoriali 2023; Roma, Italy.
- Juntgen LM, Sanders BJ, Walker LA, Jones JE, Weddell JA, Tomlin AM, Eckert G, Maupome G. Factors influencing behaviour guidance: a survey of practicing pediatric dentists. Pediatr Dent 2013; 35: 539-545.
- 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: 391-406.
- Khinda V, Rao D, Singh Sodhi SP. Nitrous Oxide Inhalation Sedation Rapid Analgesia in Dentistry: An Overview of Technique, Objectives, Indications, Advantages, Monitoring, and Safety Profile. Int J Clin Pediatr Dent 2023;16(1):131-138.
- Madouh M, Tahmassebi JF. Utilising a paediatric version of the indicator of sedation need for children's dental care: a pilot study, Eur Arch Paediatr Dent 2016; 17: 265-270.
- McKnight-Hanes C, Myers DR, Dushku JC, Davis HC. The use of behaviour management techniques by dentists across practitioner type, age, and geographic region. Pediatr Dent 1993;15(4):267-71.
- Mourad MS, Santamaria RM, Splieth CH, Schwahn C, Midani R, Schmoeckel J. Impact of operators' experience and patients' age on the success of nitrous oxide sedation for dental treatment in children. Eur J Paediatr Dent 2022; 23(3): 183 -188.
- Murthy AK, Pramila M, Ranganath S. Prevalence of clinical consequences of untreated dental caries and its relation to dental fear among 12–15-year-old school children in Bangalore city, India. Eur Arch Paediatr Dent 2014; 15(1): 45-49.
- Paglia L. Dental fear in Italy: what is going on. Eur J Paediatr Dent 2016; 17(4): 257.
- Paglia L, Gallus S, Giorgio S, Cianetti S, Lupatelli E, Lombardo G, Montedori A, Eusebi P, Gatto R, Caruso S. Reliability and validity of the Italian version of the Children's Fear Survey Schedule – Dental Subscale and the Modified Child Dental -Anxiety Scale. Eur J Paediatr Dent 2017; 18(4): 305-312.
- Patel M, McTigue DJ, Thikkurissy S, Fields HW. Parental Attitudes Toward Advanced Behaviour Guidance Techniques Used in Pediatric Dentistry. Pediatr Dent. 2016; 38(1):30-36.
- Rajavaara P, Rankinen S, Laitala ML, Vähänikkilä H, Yli-Upro H, Koskinen S, Anttonen V. The influence of general health on the need for dental general anaesthesia in children. Eur Arch Paediatr Dent 2017; 18:179-185.
- Shanmugaavel AK, Asokan S, John BJ, Priya PRG, Raaja MT. Comparison of drug acceptance and anxiety between intranasal and sublingual midazolam sedation. Pediatr Dent 2016; 38(2): 106-111.
- Sharma S, Chopra R, Mathur S, Sachdev, Gupta K. Variations in Physiological, psychomotor and analgesic parameters during titration of nitrous oxide in 3–12-year-old children managed with inhalation sedation. Int J Clin Pediatr Dent 2020; 13(6): 650-655.
- Stigers JI. Nonpharmacologic management of children's behaviours. Mc Donald and Avery's Dentistry for the child and adolescent. Elsevier 2016.
- Tieri M, Cosi A, Lombardi L. De Icco V, D'Ercole S, Ferdeghini R, Tripodi D. Nitrous Oxide and hypnotherapy in pediatric dentistry. Eur J Paediatr Dent 2023; 24(3): 229-237.
- Veloso A, Fernández D, Munné C, Muñoz L, Guinot F. Comparison of basic and advanced behaviour management techniques between Colombian and Spanish parents during regular treatment and in emergency situations. Eur J Pediatr Dent 2023; 24(4): 322-328.
- Walley S, Bailey J, Albadri S. Undergraduates' self-reported clinical experience, confidence and perspectives of hospital and outreach paediatric dentistry: a three-year multi-centre evaluation. Br Dent J 2014; 216(5): 250-255.
- Walley S, Albadri S. Undergraduates' perception of value of practical inhalation sedation experience in a UK dental school. Eur Arch Paediatr Dent 2015; 16: 371-376.
- Wells M, McTigue DJ, Casamassimo PS, Adair S. Gen der shifts and effects on behaviour guidance. Pediatr Dent 2014; 36(2):138-44.
- Wells MH, McCarthy BA, Tseng CH, Law CS. Usage of Behaviour Guidance Techniques differs by providers and practice characteristics. Pediatr Dent 2018; 40(3): 201-208.
- Wilson S. A survey of the American Academy of Pediatric Dentistry membership: nitrous oxide and sedation. Pediatr Dent 1996; 18: 287-293.
- Wilson S, Houpt M. Project USAP 2010: Use of Sedative Agents in Pediatric Dentistry – a 25-year Follow-up Survey. Pediatr Dent 2016; 38(2): 127-133.
- Wright GZ, Kupietzky A. Non-pharmacologic approaches in behaviour management. Behav Manag Dent Children 2014 https://api.semanticscholar.org/CorpusID:58992585.
- Zhang CA-O, Quin D, Shen L, Ji P, Wang J. Does audio-visual distraction reduce dental anxiety in children under local anaesthesia? A systematic review and meta-analysis. Oral Dis 2019; 25(2): 14-21.