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Reducing Dental Anxiety among Children Under 12: A Review of Non-pharmacological Interventions in Asian Countries

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Abstract

Dental anxiety in children undermines treatment success and long-term oral health. This review of interventions for children under 12 years is conducted to identify effective and feasible strategies for a better experience in dental procedures. The objective of this review is to assess the different interventions used for reducing anxiety during dental procedures among children under 12 years of age. A comprehensive search was conducted across the selected electronic database: PubMed. Keywords related to dental anxiety, pediatric dentistry, non-pharmacological interventions, Asian populations, and under 12 were searched, filtering the randomized controlled trials conducted over the last five years (from 2020-2025). The study examined thirteen (13) journal publications and found non-pharmacologic interventions such as Sensory distraction, Tell -show- do, and positive feedback methods. Based on findings, four major themes are generated: (1) Technology-Enhanced Distraction Interventions attract children's attention, (2) Audio-based sensory distractions are ideal for school-age children, (3) Educational and Behavioural Interventions reduce fear, (4) Matter of Multi-Model Measurement Modalities. Non-pharmacological interventions represent safe, effective, and economically viable alternatives for managing dental anxiety in Asian pediatric populations. It is highly recommended to conduct larger-scale, multi-center studies or a comprehensive review to improve the validity of findings.

***Keywords*:** Non-pharmacological interventions; Dental anxiety; Children under 12

Introduction

Dental anxiety is a significant global public health concern affecting both the oral health of children and the effectiveness of dental procedures. Dental fear and anxiety are the most common problems of children, and because of this, they are usually reluctant to undergo any dental treatment (Singh et al., 2021). Children under 12 years old tend to be more sensitive to anxiety about dental procedures due to developmental issues, limited coping strategies, and past bad dental experiences (Paryab & Hosseinbor, 2013). A variety of approaches have been explored to reduce dental anxiety in children, including pharmacological interventions and non-pharmacological interventions such as cognitive & behavioural strategies, sensory distraction methods using technological tools such as virtual reality mobile applications, relaxation techniques, tell–show–do approaches, positive reinforcement, and parental presence or communication.

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Non-pharmacological interventions are therapeutic strategies that do not involve the use of medications but instead rely on behavioural, psychological, and supportive techniques to prevent and manage anxiety, stress, or pain (World Health Organization [WHO], 2020). A recent systematic review suggests that non-pharmacological behavioural interventions such as distraction, modelling, tell-show-do, and mobile applications are effective in lowering dental fear and anxiety in children under 12. Treatment through voice description, mimicking, and functional training also significantly decreases fear during dental work (Ferreira et al., 2009). Methods of distraction, such as shifting attention by engaging kids with games and fun activities, lessen fear (Klingberg et al., 2007). Moreover, positive feedback methods, such as praising actions with gratitude, presenting small prizes or rewards, are known to have a positive effect on reinforcing cooperative behaviour and reducing dental anxiety in children (American Academy of Paediatric Dentistry, 2024). Watching and copying effective coping strategies helps children gain trust and demonstrate appropriate responses to dental procedures, reducing fear (Eaton et al., 2005).

Cognitive and behavioural approaches have been widely applied in paediatric dentistry to help children manage fear and anxiety during procedures. Techniques such as Tell–Show–Do, positive reinforcement, systematic desensitization, and modelling are among the most established methods, helping children gradually adapt to the dental environment (Klingberg & Broberg, 2007). Cognitive strategies, including guided imagery and cognitive restructuring, enable children to reinterpret dental situations more positively and reduce maladaptive thoughts associated with pain or fear (Cignetti et al., 2017). Behavioural management is further enhanced by distraction techniques, such as audiovisual aids and storytelling, which divert attention away from the stress-inducing stimuli (Al-Namankany et al., 2015). However, various factors can influence the choice of behavioural management techniques, including the child's age, developmental level, attitude, past dental experiences, and the complexity of the dental procedure (van der Mierden et al., 2021). Evidence indicates that consistent application of cognitive and behavioural methods improves children's cooperation during dental procedures (Appukuttan, 2016). Cultural and social conditions significantly influence the acceptance and effectiveness of behavioural control techniques in youth dentistry; therefore, clinicians must consider cultural diversity and financial factors when developing and applying behavioural management strategies to ensure their effectiveness across various patient populations (Vandenbroucke et al., 2007). High prevalence of severe dental anxiety in early years of school is evident, making this age group particularly vulnerable. Research indicates that the prevalence of dental anxiety considerably varies from 6 to 20% in European children to 20 to 50% in Asian children, suggesting that anxiety in dental procedures differs substantially across countries, with lower estimations in European children and higher estimations in Asian children (Luoto et al., 2009).

Early intervention during this developmental window can prevent chronic dental phobia that can often persist in adulthood. Non-pharmacological alternatives are generally seen as safe, but it is crucial to check the safety scores carefully to lower the risk to children, considering the age of the child, growth & developmental stage, and medical background. The techniques that may be helpful to teenagers may not be suitable for younger children or children with specific medical needs.

The lack of comprehensive, region-specific reviews focusing on Asian populations represents a prominent knowledge gap that this study aims to address. By establishing specified research objectives at the outset, this review targets to offer significant insight into the approaches or interventions used in dental procedures to reduce fear or anxiety in children. This review provides the foundation for evidence-based clinical guidelines that can improve oral health outcomes while reducing the psychological burden of dental treatment for children and families across Asian healthcare systems.

The objective of this review is to evaluate interventions for reducing dental fear and anxiety in children under 12 years, aiming to enhance clinical practice, improve patient satisfaction, and inform future research by addressing the existing knowledge gaps. This review will provide a strong foundation for future clinical trials and implementation studies specifically designed for Asian pediatric populations. The findings of this review will explore significant clinical and public health implications to reduce fear in pediatric dental practices, promoting positive long-term oral health outcomes in Asian countries.

Materials and Methods

A review of existing literature, while lowering bias and ensuring transparency in the choice and combination of evidence, is used as the research design. The steps identified by Edoard and Alan (2014): formulating a research question, (2) searching for studies, (3) selection and critical appraisal, (4) data extraction, (5) interpretation of findings and recommendations (Edoard and Alan, 2014) were followed for conducting this review.

Formulating a research question

PICO format (Stern et al., 2014) which evaluates the effectiveness of intervention or therapy and its impact or outcome (Munn et al., 2018), is used as PICO is a well-known approach to formulate the question (Stern et al., 2014) and comprehensive guidance (Higgins and Green, 2011) for this type of review.

Table 1: *PICO Table*

P (Population)	I (Intervention)	C (Comparison)	O (Outcome)
Dental fear and anxiety in children	Pediatric non-pharmacological dental interventions aimed at reducing anxiety.	Standard care, no intervention, or alternative intervention	Reduction in dental anxiety and fear, improved cooperation and treatment acceptance, positive dental experience.

Searching for studies

The search method begins by selecting online journal publications that are associated with groups of relevant studies in the fields of youth dentistry and psychology. Journal papers published in one of the popular databases, PubMed were searched following search terms combined with Boolean operators (AND, OR) to combine them rationally. "dentistry" OR "dental anxiety" OR "dental fear" OR "odontophobia" AND "child" OR "Paediatric" OR "paediatric" OR "Preschool" OR "School age" AND "intervention" OR "behavioural management techniques," OR "distraction" AND "children" OR "under 12 years".

Inclusion and exclusion criteria:

Free access Randomized Control Trials published in English medium on children in the age group of 4 to 12 years who experience dental fear or anxiety are included, excluding interventional studies of pharmacological interventions or non-oral interventions irrelevant to dental anxiety in children. Studies conducted with children with special needs or diseases such as Autistic children, hearing impairment, Injection Phobia, anxiety disorders, and excessive gag reflexes are excluded, since the interventions needed to be focused among the normal children. Studies done to assess parental perception, pre-treatment behaviours, interventions related to tooth brushing, and studies not reporting interventional outcomes relevant to dental fear or anxiety reduction were also excluded from this review.

Study selection

An advanced search of the PubMed database was applied to select full-text journal articles published in the English language from 2021 to 2025. Seventy-one (71) articles were initially shown in the database. Out of 71 free full-text records were filtered (removing 33): abstract only, not freely available, and non-English publications. Using the filters available in the database, further filtering was done to select Randomized Control Trials (RCTs) done with the children, and the article number was reduced to 38. All selected Records were screened. Out of 38, some were removed as there was no significant difference between the interventional group and the control group; the child population did not represent the selected age group of 3-12 years.

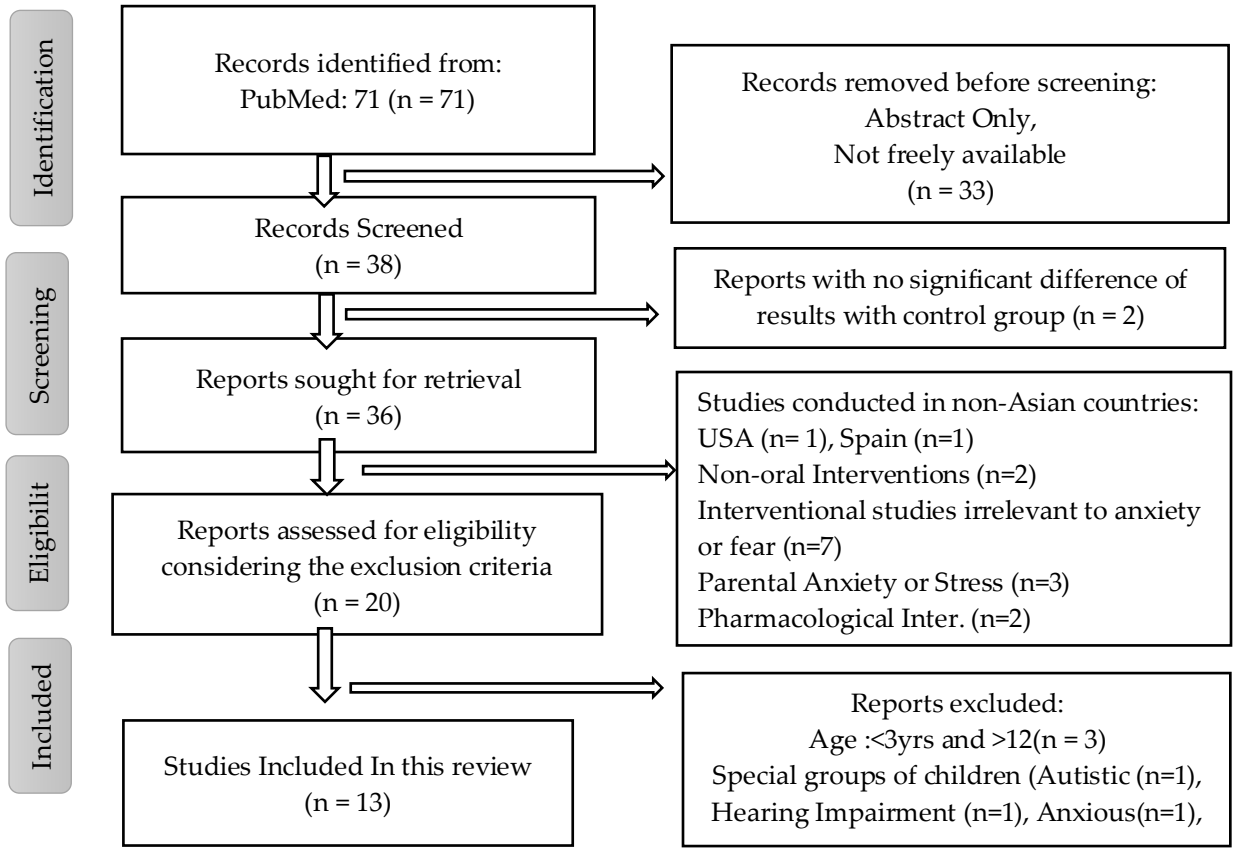

Figure: *PRISMA Flow Chart adapted from Moher et al. (2009) for selection of Articles*

Data Extraction

To promote objectivity and minimize bias, the evaluation was conducted independently by two investigators. Subsequently, a full-text review was performed for studies meeting the initial screening criteria. Mismatches between reviewers are corrected through discussions with a third reviewer as suggested by Shetty et al. (2019) for the relevant data extraction. Key information is systematically extracted from the selected studies using standardized data extraction forms. For quality assessment in this review, a widely used tool, Critical Appraisal Skills Programme (CASP), which offers organized checklists for judging the scientific quality of different types of research studies, was used.

Results and Discussion

This review analysed thirteen randomized controlled trials published across different Asian countries: India (7), while others are from different Asian countries: China (2), Turkey (1), Syria (1), Saudi Arabia (1), Korea (1), providing broad geographical representation to examine nonpharmacological interventions for reducing fear in dental procedures. Sample sizes ranged from small pilot studies (n=40) to larger clinical trials (n=380), with participants (total n=1624) representing diverse age groups within the target population of children under 12 years. Study populations ranged from preschoolers (ages 3-5 years) to school-age children (ages 6-12 years), with most studies focusing on the 6-12 age group. All studies were conducted in paediatric dental clinics affiliated with dental schools or hospitals in Asian countries, ensuring standardized clinical settings and protocols.

The reviewed studies consistently showed that non-pharmacological interventions effectively reduced dental anxiety in children across different age groups (3-12 years) in various dental procedures, including extractions, restorative treatments, local anaesthesia administration, and pulpotomy procedures. The interventions demonstrated cultural appropriateness and feasibility within Asian healthcare contexts. Outcome measures varied across studies but commonly included validated anxiety assessment scales,

behavioural observation tools, and physiological markers (such as salivary biomarkers) for evaluating intervention effects across multiple domains of child experience during dental procedures. The analysis revealed four key themes mentioned below:

1. Technology-Enhanced Distraction Interventions attract children's attention

Virtual reality (VR) and digital technologies emerged as prominent interventions across multiple studies (5 out of the selected 13 studies). Felemban et al. (2021) demonstrated that VR distraction significantly reduced pain and anxiety during the administration of anaesthesia in paediatric patients. Similarly, Ran et al. (2021) explored VR applications for non-pharmacological behavioural management during short-term dental procedures, establishing the feasibility of technology-based interventions in clinical settings. Du et al. (2022) extended these findings by implementing VR helmets specifically during local anaesthesia administration and primary teeth extraction, showing measurable reductions in dental anxiety among children. The digital intervention approach was further supported by Bali et al. (2025), who assessed smartphone-based active distraction combined with audio analgesia for managing air rotor-related anxiety. Üstün et al. (2025) incorporated cartoon-assisted visual and auditory distraction in their randomized crossover clinical trial, evaluating effects on patient anxiety, pain, and behaviour. All of these studies collectively indicate that technology-enhanced interventions provide engaging, immersive experiences, distracting children's attention from dental procedures while reducing anxiety and fear.

2. Audio-based sensory distractions are ideal for school-age children

Various sound-based distraction methods have been examined in 3 out of 13 studies. White noise, brown noise, and pink noise were effective for children between 8-12 years on dental anxiety during extraction procedures, and emphasized that specific acoustic frequencies are involved in anxiety reduction (Kolhe et al., 2024). Bhusari et al. (2023) expanded this research by comparing no music conditions with monaural beats and binaural auditory beats as audio distraction techniques during restorative treatment in children aged 6-12 years, demonstrating the effectiveness of specific audio frequencies in behaviour guidance. Chawla et al. (2025) also conducted a comprehensive comparison of various sensory distractors, including audio components, for reducing dental anxiety in children aged 6-9 years. The convergence of findings across these studies suggests that carefully selected audio interventions can modulate children's anxiety responses through sensory engagement and cognitive distraction.

3. Educational and Behavioural Interventions reduce fear

Song et al. (2020) implemented a psychological behaviour management programme that significantly reduced dental fear and anxiety in children through structured behavioural interventions, establishing the foundation for educational approaches. Mittal et al. (2025) demonstrated how narrative techniques, including Tell-Show-Do can prepare children for dental procedures, reducing the anxiety compared with distractions such as telling folk stories. This approach was complemented by Deshpande et al. (2022), who evaluated the effectiveness of self-designed dental storybooks as behaviour modification techniques, showing significant improvements in anxiety management. Cognitive/behavioural programmes and role modelling

Story-telling based interventions reduced dental fear (Song et al., 2020; Mittal et al., 2025; Deshpande et al., 2022). Active distraction techniques such as interactive stories, smartphone-based distraction, guided stories, and role-modelling often outperformed passive methods in behavioural outcomes (Alsibai et al., 2023; Mittal et al., 2025; Bali et al., 2025). These interventions tend to be low-cost, easily implemented in clinics when developmentally appropriate content is used (Deshpande et al., 2022; Mittal et al., 2025).

4. *Matter of Multiple Measurement Modalities*

Diverse sophisticated measurement tools (including Venham's Picture Test (VPT), Children's Fear Survey Schedule-Dental Subscale, and Visual Analog Scale) and assessment methodologies were employed across the selected studies, reflecting the evolution towards multi-dimensional frameworks. Heart Rate Monitoring is implemented in 4 studies using pulse oximetry, showing variable responses to different interventions. Singh et al. (2023) pioneered objective physiological assessment using salivary biomarkers (cortisol and alpha-amylase), providing quantifiable stress indicators during dental procedures. Multiple studies employed validated psychological assessment scales and behavioural observation tools (Üstün et al., 2025; Alsibai et al., 2023), capturing real-time behavioural responses and cooperation levels. Multidimensional tools offer a more accurate understanding of children's dental anxiety. Thus, proper measurement tools to be adopted for the accuracy of data alongside the nature of the experiences in paediatric dental care.

Discussion and Conclusion

This review of 13 studies conducted across Asian countries provides compelling evidence for the effectiveness of non-pharmacological interventions in reducing dental anxiety among children under 12 years. Findings elaborated lead to emerge four key themes: Technology-Enhanced Distraction Interventions attract children's attention, Audio-based sensory distractions are ideal for school-age children, Educational and Behavioural Interventions are effective, and Multiple Measurement Modalities are available for assessing fear or anxiety. These findings demonstrate the multifaceted nature of paediatric dental anxiety and the diverse strategies available to address this clinical challenge.

Limited geographical coverage, with potential bias, and data extraction limitations were found. In addition, heterogeneity in age groups, various non-pharmacological approaches, different scales, and physiological markers used to assess anxiety might have affected the outcomes. Most interventions were tested during particular dental treatments, limiting the generalizability of interventions to all dental procedures for the reduction of anxiety.

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References

Alsibai, E., Bshara, N., Alzoubi, H., & Alsabek, L. (2023). Assessing an active distracting technique during primary mandibular molar pulpotomy (randomized controlled trial). Clinical and experimental dental research, 9(2), 283–289. https://doi.org/10.1002/cre2.702

Bali, K., Ailawadi, R., Karuna, Y. M., Srikant, N., Rao, A., Nayak, P. A., & Thimmaiah, C. (2025). Assessment of smartphone-based active distraction in association with audioanalgesia for overcoming airotor-related anxiety in children: a randomized controlled trial. BMC research notes, 18(1), 46. https://doi.org/10.1186/s13104-025-07119-0

Bhusari, B. N., Hugar, S. M., Kohli, N., Karmarkar, S., Gokhale, N., & Saxena, N. (2023). Comparative evaluation of anxiety level during restorative treatment using no music, monaural beats, and binaural auditory beats as audio distraction behavior guidance technique in children aged 6-12 years: A randomized clinical trial. Journal of the Indian Society of Pedodontics and Preventive Dentistry, 41(2), 156–162. https://doi.org/10.4103/jisppd.jisppd_104_23

Chawla, T., Nangia, T., Srivastava, M., Kalra, G., & Langpoklakpam, C. (2025). Comparative evaluation of effectiveness among various sensory distractors for reducing dental anxiety in pediatric population aged 6-9 years - A randomized controlled trial. Journal of the Indian Society of Pedodontics and Preventive Dentistry, 43(1), 104–110. https://doi.org/10.4103/jisppd.jisppd_18_25

Deshpande, A., Jain, A., Shah, Y., Jaiswal, V., & Wadhwa, M. (2022). Effectiveness of self-designed dental storybook as behavior modification technique in 5 - 7 year-old children: A randomized controlled study. Journal of the Indian Society of Pedodontics and Preventive Dentistry, 40(3), 253–259. https://doi.org/10.4103/jisppd.jisppd_237_22

Du, Q., Ma, X., Wang, S., Zhou, S., Luo, C., Tian, K., Fei, W., & Liu, X. (2022). A digital intervention using virtual reality helmets to reduce dental anxiety of children under local anesthesia and primary teeth extraction: A randomized clinical trial. Brain and behavior, 12(6), e2600. https://doi.org/10.1002/brb3.2600

Felemban, O.M., Alshamrani, R.M., Aljeddawi, D.H. et al. Effect of virtual reality distraction on pain and anxiety during infiltration anesthesia in pediatric patients: a randomized clinical trial. BMC Oral Health 21, 321 (2021). https://doi.org/10.1186/s12903-021-01678-x

Kolhe, S., Dialani, P., Bondarde, P., Pande, R., Patil, P., & Vishwakarma, A. P. (2024). A comparative evaluation of the effects of white noise, brown noise, and pink noise on dental anxiety of pediatric patients undergoing dental extraction treatment: A randomized control study. Journal of the Indian Society of Pedodontics and Preventive Dentistry, 42(4), 273–279. https://doi.org/10.4103/jisppd.jisppd_69_24

Mittal, M., Chopra, R., Malhotra, D., Dharmasya, T., Gupta, N., Lokade, A., & Atri, M. (2025). Impact of dentistry modeling story on dental anxiety in 6-8-year-old children of industrial workers: A randomized controlled trial. Journal of the Indian Society of Pedodontics and Preventive Dentistry, 43(1), 95–103. https://doi.org/10.4103/jisppd.jisppd_469_24

Ran, L., Zhao, N., Fan, L., Zhou, P., Zhang, C., & Yu, C. (2021). Application of virtual reality on non-drug behavioural management of short-term dental procedure in children. Trials, 22(1), 562. https://doi.org/10.1186/s13063-021-05540-x

Singh, Y., Parameshwarappa, P., Mathew, M. G., Meghana, S. B., Kenchappa, M., & Nagaveni, N. B. (2023). Comparison of distraction techniques using salivary biomarkers during local anaesthesia administration in children aged 3-5 years: A clinical study. Indian journal of dental research : official publication of Indian Society for Dental Research, 34(2), 169–173. https://doi.org/10.4103/ijdr.ijdr_132_22

Song, J. S., Chung, H. C., Sohn, S., & Kim, Y. J. (2020). Effects of psychological behaviour management programme on dental fear and anxiety in children: A randomised controlled clinical trial. European journal of paediatric dentistry, 21(4), 287–291. https://doi.org/10.23804/ejpd.2020.21.04.6

Üstün, N., Akgöl, B. B., & Bayram, M. (2025). Cartoon-assisted visual/auditory distraction usage in paediatric dental care, assessment of effects on patient anxiety, pain, and behaviour: a randomised crossover clinical trial. BMC oral health, 25(1), 425. https://doi.org/10.1186/s12903-025-05770-4