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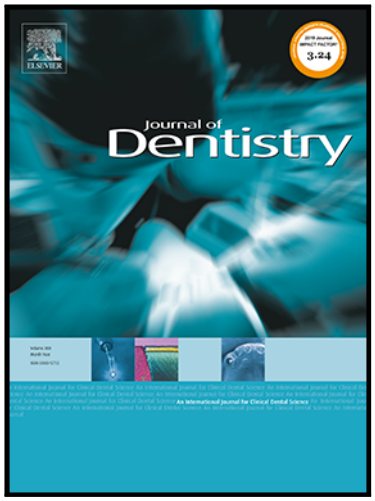

Basic behavioral management techniques in paediatric dentistry: A systematic review and meta-analysis

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Basic behavioral management techniques in paediatric dentistry: A systematic review and meta-analysis.

Short title: Behavioral management in paediatric dentistry.

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ABSTRACT

Objective: To systematically retrieve and assess studies regarding the effectiveness of basic behavioral management techniques (BMTs) in paediatric patients. **Data sources:** Electronic and hand searches were conducted to locate Randomized Controlled Trials (RCTs) reporting on objective and subjective evaluation of anxiety and behavior of children up to 12 years of age. Data extraction and risk of bias evaluation, using the Cochrane risk of bias tool (RoB 2.0 Tool), were performed independently and in duplicate for all included studies. Mean differences and standard deviations were used to summarize the data from each study and meta-analyses were conducted with studies of limited heterogeneity. **Study selection:** A total of 708 papers were identified and screened, 122 retrieved for full text appraisal and 62 finally included. Results suggested that all basic BMTs have acceptable effectiveness on paediatric patients' anxiety, fear and behavior during dental treatment. Meta-analysis showed a statistically significant difference in favor of distraction for subjective anxiety using facial scale (Mean diff.: 2.78; 95% CI: -3.08, -0.53; p=0.005) and Modified Child Dental Anxiety Scale (Mean diff.: 12.76; 95% CI: -6.09, -4.47; p=0.001) and a non-significant difference for heart rate (Mean diff.: 1.70; 95% CI: -6.54, 0.46; p=0.09). Music significantly reduced heart rate when compared to a control comparator, underlining the superiority of the BMT (Mean diff.: 2.71; 95% CI: -3.70, -0.59; p=0.007). **Conclusions:** Limited evidence about efficacy of one technique over another raises important issues on the topic for future research regarding the management of the child patient in the dental setting of the 21st century.

Clinical significance: Behavioral management comprises a challenge for clinicians, who need to be familiar with a range of techniques to meet patients' needs at individual level and be flexible in their implementation. Appropriate technique should incorporate patients' personality and parents' active involvement, within the contents of the changes in modern societies.

Key Words: *behavioral management, basic techniques, dental anxiety, dental fear, child behavior.*

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1. ntroduction

Behavioral management is a form of art and a skill built on various sciences and involves procedures that enhance children's coping skills. It aims at reducing and alleviating fear and anxiety, improving disruptive behavior and achieving full acceptance to undertake dental treatment [1-3]. It should not be considered as the plain application of specific techniques to deal with children, but as a concise and continuous evolving method of establishing a rigid relationship of trust between the patient and the clinician. It may vary as children exhibit a wide range of intellectual, emotional and social development, while at the same time they are characterized by different temperaments and attitudes affected by their family background and their social environment.

Clinicians should therefore, have a wide range of techniques to meet patients' needs at individual level and be flexible in their implementation [4]. Behavioral management techniques (BMTs) are divided into basic (e.g. Tell-Show-Do, Distraction, Reinforcement, Voice control, Modelling and Parental Presence) and Advanced (e.g. active and passive restraint, sedation and general anaesthesia) [1], with basic techniques being more commonly used by practitioners. Basic techniques are simple and most of them do not require special and costly equipment. Although they depend on practitioner's personality, level of education and clinical experience, they are easily applicable, without any evident harm for the patients [4]. Despite the fact that they can be time-consuming they have a positive influence on behavior which leads in establishing a good relationship between the patient and the dentist in the future [5-7].

Choice of appropriate technique should incorporate patients' personality, parents' active involvement and informed consent and practitioner's skills and all within the contents of the changes in modern societies. Dynamic social factors, such as parenting styles, children less self-controlled, more difficulty adopted and technology dependent, still directly affect technique selection and its successful application. Worldwide technological advances and the wider access to the internet and the social media have also changed people's perspective towards oral health care. Recently, new techniques that encompass these advances, by diverting patient's attention from unpleasant procedures have been developed [1,8,9]. These distraction techniques may be active, involving patient's direct participation during treatment with the use of toys, controlled breathing, guided imaginary or Cognitive Behavioral Therapy, or passive through the use of methods of relaxation and observation of stimulus with auditory and/or audiovisual content [2,10-13].

Up to date, the evidence regarding basic BMTs is provided by clinical trials that mainly focus on the effectiveness of specific techniques. Initial studies provided limited evidence for simple techniques mainly using distraction and modelling, while lately there is a trend for focus on more technologically advanced ones. All studies, though, mainly compared the effectiveness of the techniques to negative controls and therefore direct comparison between techniques and in children of different age groups and cognitive development levels have not yet been sufficiently addressed. Therefore, the aim of this paper was to

systematically retrieve and assess all relevant studies and pool their effect estimates stemming from the highest level of available evidence regarding the effectiveness of basic BMTs in paediatric patients.

2. Materials and methods

The study protocol was submitted to the PROSPERO international prospective register of systematic reviews hosted by the National Institute for Health Research (NIHR), University of York, UK, Center for Reviews and Dissemination and was allocated the identification number CRD42021257572.

2.1 Reporting format

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) were adopted throughout the process of the present systematic review and the PICO methodology (Table 1) was utilized to formulate the research question: "What are the outcomes of clinical trials in children on the effectiveness of different non-pharmacological basic behavioral management techniques?"
[14].

2.2 Inclusion and exclusion criteria

Eligibility of a study for inclusion was based on the following criteria:

- Studies on children aged up to 12 years.
- Studies reporting on any type of non-pharmacological behavioral management technique.
- Studies with at least two-arm comparators.
- Studies reporting on the efficacy of basic BMTs using objective and/or subjective measures of fear and anxiety.
- Only randomised clinical trials (RCTs). Studies on children aged >12 years, adolescents and adults, studies with one arm, case reports, cohort and cross-sectional studies, editorials and review articles were excluded.

2.3 Search strategy

Search strategies were developed and appropriately revised for each database, considering the differences in controlled vocabulary and syntax rules. The search strategy is presented in Appendix 1.

2.1.1. Electronic search

Electronic search was conducted on 5th January 2022, with no language and publication date restrictions. The following electronic databases were searched to identify eligible published studies

- The Cochrane Central Register of Controlled Trials (CENTRAL)
- MEDLINE (PubMed)

- MEDLINE through OVID (In-Process & Other Non- Indexed Citations)
- EMBASE through OVID
- LILACS
- APA PsycInfo

2.3.2. Unpublished literature

Grey literature in the register of clinical studies (www. clinicaltrials.gov), the multidisciplinary European database (www.opengrey.eu), the National Research Register, and the Pro-Quest Dissertation Abstracts and Thesis databases (https://about.proquest.com) were further searched for potentially eligible studies.

2.3.3 Manual search

The reference lists of all identified eligible studies and other previously published systematic reviews on the topic were searched manually for other possible for inclusion studies.

2.4 Study selection

Titles and abstracts were screened for eligibility independently by two authors (K.K., A.M., Cohen's *k=0.83*) and full texts of potentially included studies were reviewed. Any disagreements were resolved through discussion between the two reviewers and should this was not possible, a third author (K.S) was consulted.

2.5 Data extraction

Data were extracted independently and in duplicate by two reviewers (K.S., A.M.) and the following were recorded: publication details (authors, year of publication, country of origin), sample characteristics (participants age and medical history, previous experience, behavior rating), BMTs applied and outcome evaluated including methods of assessment. For studies with missing/unclear data (e.g. age of patients, type of method used for the assessment, overall results presented without clarification of the efficacy of each technique), the authors were contacted per e-mail for further clarifications and in cases of no response (15 days were allowed), the study was excluded.

2.6 Quality assessment

Risk of bias was assessed by two reviewers (K.S., D.K., Cohen's *k=0.92*) independently, using the Cochrane risk of bias tool (RoB 2.0 Tool) [15]. Overall quality of evidence was rated using the Grades of Recommendations, Assessment, Development and Evaluation (GRADE) approach [16]. Uncertainties were discussed in the reviewer team in order to achieve consensus.

2.7 Data analysis

Meta-analyses were conducted with studies reporting similar interventions and comparable outcomes, i.e. in the case of limited heterogeneity. Mean differences, and standard deviations were used to summarize the data from each study and mean differences and 95% Confidence Intervals (CI) were calculated across studies. Data were analyzed with Review Manager 5.4 (Review Manager (RevMan), Version 5.4, The Cochrane Collaboration, Copenhagen, 2020).

2.7.1 Heterogeneity

Clinical and methodological heterogeneity were assessed by examining the characteristics of the studies, the participants, the interventions and the outcomes as specified in the inclusion criteria. Statistical heterogeneity was assessed during meta-analyses using a Chi^2 test and the I^2 statistic, with values larger than 50% indicating substantial heterogeneity.

2.7.2 Assessment of reporting bias

In the presence of more than 10 studies in a meta-analysis, the possible presence of publication bias was investigated for the primary outcome.

2.7.3 Subgroup analyses

In the case of sufficient data, subgroup analyses to explore the influence of study characteristics such as age and gender were planned to be conducted.

2.7.4 Sensitivity analysis

Analysis of studies stratified by design or by risk of bias (i.e., overall low risk versus high risk) were planned to be explored for similar or different results.

2.7.5 Unit of analysis

Some of the included studies presented data from repeated observations on participants, which could lead to unit-of-analysis errors and for that reason the advice in section 9.3.4 of the Cochrane Handbook for Systematic Reviews of Interventions was followed [17].

3. Results

3.1 Search Results

A total of 673 articles were initially identified and 198 were added after hand search (Appendix 2). After duplicates removal, 708 articles underwent title and abstract screening and 586 were excluded. A total of

122 articles were retrieved for full text appraisal, 60 were excluded with reasoning (Appendix 3) and 62 met the inclusion criteria and were finally included (Figure 1).

3.2 Study characteristics

Included studies [10,13,18-77], published between 1975 and 2021, involved a total of 4.864 patients with a mean age of 6.7 years and a non-contributory medical history in most cases (Table 2). Dental treatment undertaken, varied from simple clinical and radiographic examination and professional tooth cleaning to pulp therapy and tooth extraction. BMTs evaluated mostly were: a) Distraction, Audiovisual (n=27) and Audio (n=12), b) Modeling (n=11) and c) Parental Presence (n=4) and less frequently: Positive Dental images (n=3), Awards (n=2), Cognitive Behavioral Therapy (CBT) (n=2), Animal Assisted Therapy (AAT) (n=1) and Hypnosis (n=1). Comparator groups were mainly negative controls or other basic BMTs (TSD, voice control, etc). Primary outcomes evaluated were objective (mainly heart rate) and subjective anxiety (mainly Visual Analog Scale (VAS), Venham's picture test (VPT), Facial Image Scale (FIS)) and Behavior using mainly Frankl Scale or the North Carolina Behavior Rating Scale (NCBRS). Secondary outcomes were overall duration of the appointment and children's satisfaction.

3.3 Quality assessment

Most studies (n=36) were considered to be at unclear risk, 16 studies at low risk and 10 at high risk of bias (Figure 2). Regarding selection bias most studies were at low risk as randomization process was reported, with the technique most commonly used being the toss of a coin. One study was rated as being at high risk, as participants that could not receive the technique initially allocated to, were automatically assigned to the other group. Most studies were also rated as being at low risk for attrition bias, with four studies being at high risk as the drop-out rate for attending a second appointment was high. Detection bias in 1/3 of the studies was rated as being at low risk with ten studies being at high risk as their outcome was assessed by non-blinded evaluators.

3.4 Analysis of outcomes

Overall results supported that all techniques have acceptable effectiveness in managing the behavior of paeditaric dental patients, with some performing better than others. In most studies reduced heart rate and oxygen saturation level during dental treatment were recorded for most techniques. At the same time levels of anxiety and fear before, during and after various dental procedures was also positively affected. Specific results for each technique will be presented in sequence from the technique most frequently used as the main intervention.

3.4.1 Distraction

Audiovisual (AVD)

Effectiveness of AVD was reported in 23 studies (Table 3), reporting overall significant reduction in patients' heart rate and oxygen saturation in most studies. Anxiety levels were also reduced and overall behavior was improved, as most participants were assessed as co-operative at the end of treatment. In comparison to other BMTs, two studies [10,34] reported similar effectiveness to TSD or negative control on children's overall mean heart rate and mean anxiety levels, while one [23] significantly lower as compared to conventional techniques, with 68% of children with Down Syndrome presenting negative and definitely negative behavior during treatment.

Results comparing different AVD applications are inconclusive as some studies [27,51,57] reported that children preferred active distraction with an iPad or smartphones applications more than passive distraction with AV glasses and others [25] concluded that mobile phone game distraction was less effective than AVD. Effectiveness of a screen projector to virtual reality eyeglasses, presented similar effectiveness on children's anxiety levels, although significantly higher heart rate measurements were observed for the eyeglasses group [22,56].

Audio (AD)

Twelve studies evaluated the effect of AD (Table 3), with overall results being inconclusive. Three studies [24,33,53] showed that listening to music during dental treatment produced a reduction in mean heart rate when compared to no distraction or TSD, while five reported that music did not significantly affect pain, anxiety or disruptive behavior [41,52,73,74,75]. Another four studies, [13,25,28,55] reported that AD performed better than basic techniques but worse than AVD in reducing dental fear/anxiety of uncooperative pediatric dental patients.

3.4.2 Modeling

Ten studies evaluated live and/or video modeling (Table 4) with most (n=6) reporting that it can be an effective method, as average heart rate [26,59,69] and VAS scores [60] were significantly reduced throughout treatment accompanied by a significant decrease in children's disruptive behavior [32,77]. Three studies found that video modeling can be as effective as TSD, as no significant differences in heart rate measurements, anxiety and behavior of children were recorded. Only one paper [45] that compared modelling with Tell Play Do technique reported that the latter was more effective, as children's heart rate was reduced and their anxiety levels were significantly lower.

3.4.3. Parental Presence (PP)

The 3 studies that evaluated PP (Table 5) compared to parental absence [63,65] or other BMTs [43], reported that the technique had no impact on anxiety and cooperation level of children during dental treatment. However, AlDelhai et al. [21], reported that 74.7% of pre-school children showed positive behavior when treated with active PP as compared to 46.7% treated with passive.

3.4.4 BMT less frequently reported

Fifteen studies reported on the effectiveness of BMTs less commonly used (Table 6) with the results indicating their significant effect in reducing children's anticipatory anxiety levels, as detected by VPT scores in the majority of the studies [24,35,44,48,62,66,71,76]. Characteristically, hypnosis, AAT, and CBT combined with conventional BMTs reduced children's anxiety, with their overall mean heart rate, during and after treatment, being significantly lower as compared to the control group [18,29,44,58].

3.4.5 Secondary outcomes

Results on secondary outcomes are inconclusive with studies [23] not reporting a significant effect of AVD on overall appointment time in children with Down Syndrome and some [57] a shorter appointment time for patients using iPads, as compared to AV glasses. Regarding patients' satisfaction most studies [14,18,68,75] reported high levels of satisfaction for children who were treated with AVD or AAT as compared to negative controls or simple AD. Sensitivity analyses were considered inappropriate due to the high overall heterogeneity and were finally not performed.

3.5 Quantitative synthesis

Meta-analysis was performed implementing random effects model, excluding high risk of bias studies in the analysis (Table 7). Efficacy of distraction (AVD/VD) was compared to a comparator group by mathematically combining 8 papers in 3 different forest plots (Figures 3,4,5). A statistically significant difference in favor of distraction for subjective anxiety using facial scale (Mean diff.: 2.78; 95% CI: -3.08, -0.53; p=0.005) and MCDAS (Mean diff.: 12.76; 95% CI: -6.09, -4.47; p=0.001) and a non-significant difference for heart rate (Mean diff.: 1.70; 95% CI: -6.54, 0.46; p=0.09) was calculated. A non-significant difference in heart rate (Mean diff.: 0.81; 95% CI: -35.58, 14.75; p=0.42) was also seen when distraction was compared to TSD (Figure 6).

In another pair of comparisons involving 3 studies (Figure 7) it was shown that music significantly reduced heart rate when compared to a control comparator, underlining the superiority of the BMT (Mean diff.: 2.71; 95% CI: -3.70, -0.59; p=0.007). A non-significant difference was reported (Figure 8) for the efficacy of music regarding subjective anxiety levels (VPT) compared to no use of music (Mean diff.: 0.63; 95% CI: -0.59, 0.30; p=0.53). Finally, non-significant differences were also reported in 3 studies comparing PDI

and NI (Figure 9) regarding the effect of the BMTs in subjective anxiety reported through VPT (Mean diff.: 0.59; 95% CI: -1.65, 0.89; p=0.56).

4. Discussion

Children's dental fear and anxiety can directly affect behavior during dental treatment and comprise a challenge for the clinician and a stress factor for the parents/caregivers. Children born in the 21st-century have a lifestyle that has rapidly evolved in the past decade, as they have experienced technological advances, interacted with media and other information sources, participated in various social activities and are mainly driven by consumption.

The present review aimed at evaluating evidence regarding the effectiveness of different basic BMTs used to shape and alter paediatric patients' behavior. The literature search revealed 62 RCTs published from 1975 to 2021, with a shift towards technologically advanced techniques adopted to the orientation of modern societies. Distraction, modelling, PP and other newer techniques were compared to negative controls and their effectiveness was evaluated through objective and subjective scales at different time points throughout dental treatment. Results from most studies supported that all techniques are effective in reducing children's heart rate and oxygen saturation during dental treatment, while also managing their levels of anxiety and fear before, during and after various dental procedures.

Specifically, audiovisual and audio destruction were effective techniques for reducing children's anxiety, fear and disruptive behavior during dental treatment. This could be attributed to technique's ability to engage children's attention, thus occupying their thoughts away from the procedure and minimizing unpleasant stimuli from the dental environment. This is in accordance with previous systematic reviews, which reported a positive effect of different distraction techniques on behavior alteration during dental treatment [6,11,78-80]. Their full commitment to the distraction technique could be also associated to the reduction of treatment's duration reported in our review. This could be attributed to the great familiarization and habituation of patients with audiovisual devices, which has been increased even more after the COVID-19 pandemic that alienated children and addicted them to technology. In our study the positive effect of distraction was also underlined by its significant effect on subjective measures of fear and anxiety reported in meta-analysis. Fear and anxiety are emotional states that have an unreasonable impact on patients' attitude towards dental care and influence their perception of dental treatment [81-84]. The same analysis showed that AVD was not superior to TSD, underlining the effectiveness of common BMTs that should be considered as the fundamental behavior approach. TSD gives patients a perspective as what to expect from the procedure and therefore reduces the fear for the unknown, while distraction just aims at removing the focus away from the fearful stimuli.

Patients' preferences regarding the form of distraction seemed to be affected by age. The analysis showed that older and more mature children preferred the virtual eyeglasses or active distraction with mobile phone games [25,57], with children <8 years old showing more tolerance towards passive distraction with a tablet device or a screen attached to the dental chair [38,40,55]. Younger children's reluctance towards virtual eyeglasses was attributed to their cognitive development as it increased their existing anxiety by completely separating them from the surrounding environment [38,42].

Current review showed that modeling was also effective and can be used as an alternative to TSD technique, without though meta-analysis being feasible to support the significance of the reported results. Previous studies have reported a significant reduction in children's anxiety levels when they watched a child model of similar age being exposed to dental treatment, as this helped them familiarize with the procedure to be performed and thus increasing their cooperation [32,60,77]. Live modeling was also more effective than TSD in younger age groups [45,59,69].

Acceptable effectiveness was reported for PP in eliminating children's fear and anxiety. Nowadays, there is a tendency for parents to be present in the operating room during treatment, which can be explained by today's life-style and parent's increased active involvement in the successful implementation of treatment [79]. Although, the above assumption is based on limited evidence and without a meta-analysis to allow specific conclusions to be drawn.

Regarding less frequently reported BMTs, results from our study concluded that they are promising and can be used to manage dental anxiety and improve patient's behavior, Through different forms of comfort and distraction, they occupy children's attention and minimize tension and negative emotions, and simultaneously relieve negative thoughts about dental procedures. A non-significant effect of positive dental images and neutral images in the subjective perception of fear was showed in the current review underlining that the overall effect of the technique regardless of the form used.

Newer techniques based on combining systematic de-sensitization and relaxation and cognitive restructuring (CBT, hypnosis) are also effective. This is mainly attributed to their ability to help children enhance control over negative thoughts, reduce anxiety and therefore improve cooperation. Recent systematic reviews [12,84], based on low quality evidence techniques also reported reduction in children's anxiety, although authors highlighted the need for further clinical studies to confirm the findings.

5. Strengths and Limitations

To the best of our knowledge, the present systematic review is the first to present available data for all basic BMTs and their various effects on patient's behavior and highlighted the limited evidence about the efficacy of one technique over another and therefore raised important issues on the topic for future research regarding the management of the child patient in the dental setting.

One of its biggest strengths is that it only included RCTs; this possibly increases the quality of the outcomes reported. Also, most of the initial studies included evaluated effectiveness of techniques in anxiety levels using objective criteria that are accurate and reproducible. This strengthens the interpretation of the overall findings as not only differences between the calculated values reported before and after the treatment are directly comparable but they are also not based on the subjective judgement of the observer/evaluator. Finally, meta-analyses were performed and the significant effect of different techniques was calculated mainly against negative controls. Reporting and pooling effects from cross-over trials was decided given the effect that period effects were considered significant in real life conditions and, thus, regarded this as sound rationale for implementing them.

Despite its strengths, the review has limitations with the major being the use of basic BMTs in association to the technique under investigation as the solely effect of each technique could not be investigated. Also, in most studies, children's age and cognitive developmental stage were not assessed and therefore the impact on the implementation could not be evaluated.

6. Conclusions

- All basic BMTs have acceptable effectiveness on paediatric patients' anxiety, fear and behavior.
- Audiovisual and audio distraction significantly affect subjective fear and anxiety in the contrary to objective.
- Audiovisual distraction is not superior to TSD techniques in a significant way.
- Music significantly reduced heart rate, while a non-significant difference was reported for its efficacy regarding subjective anxiety levels (VPT).
- New BMTs are promising but more evidence is required to support a possible superiority over the other techniques.
- Overall, no BMT can be recommended over another.

Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Figure 1: PRISMA Flow Diagram.

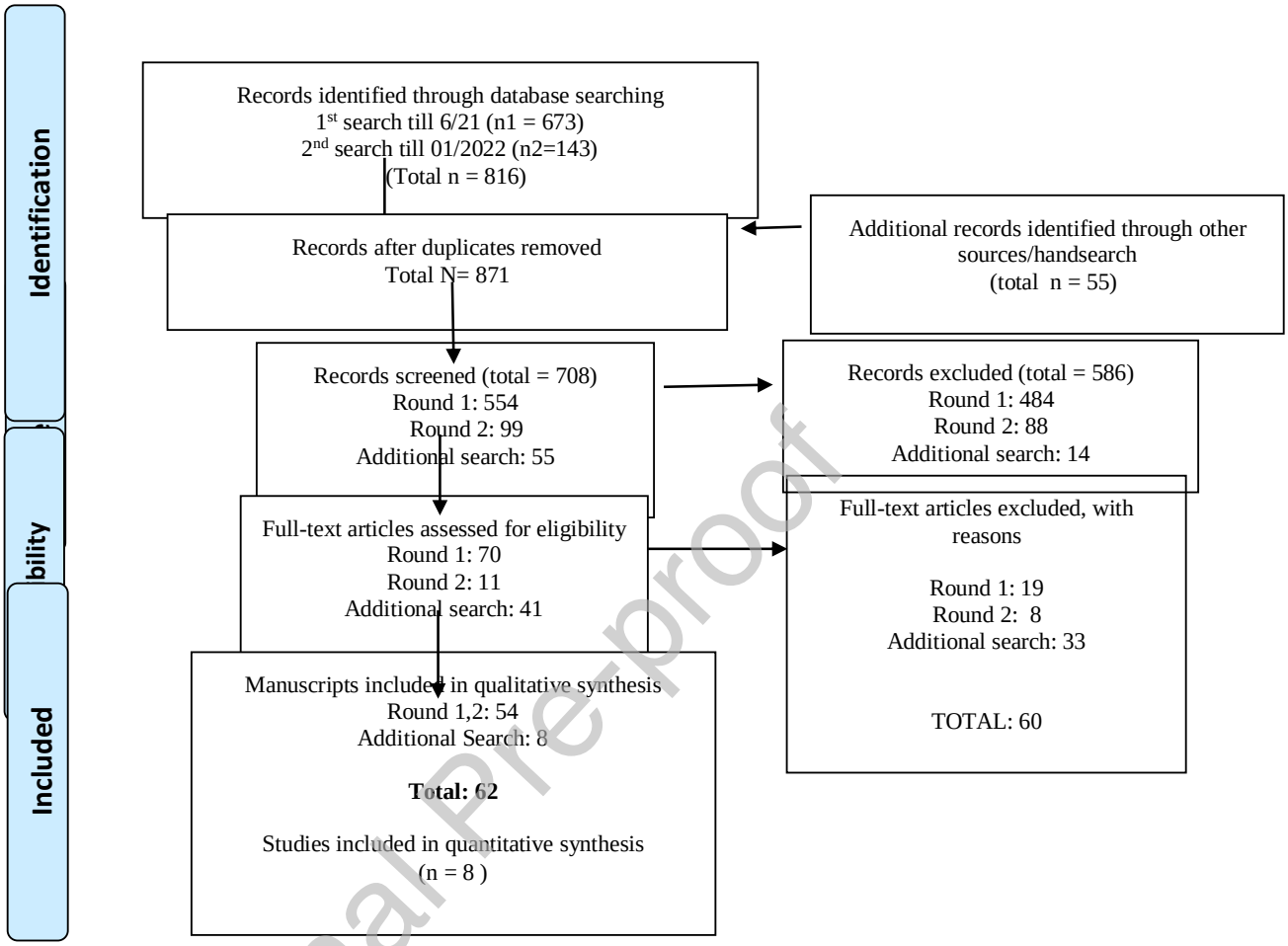
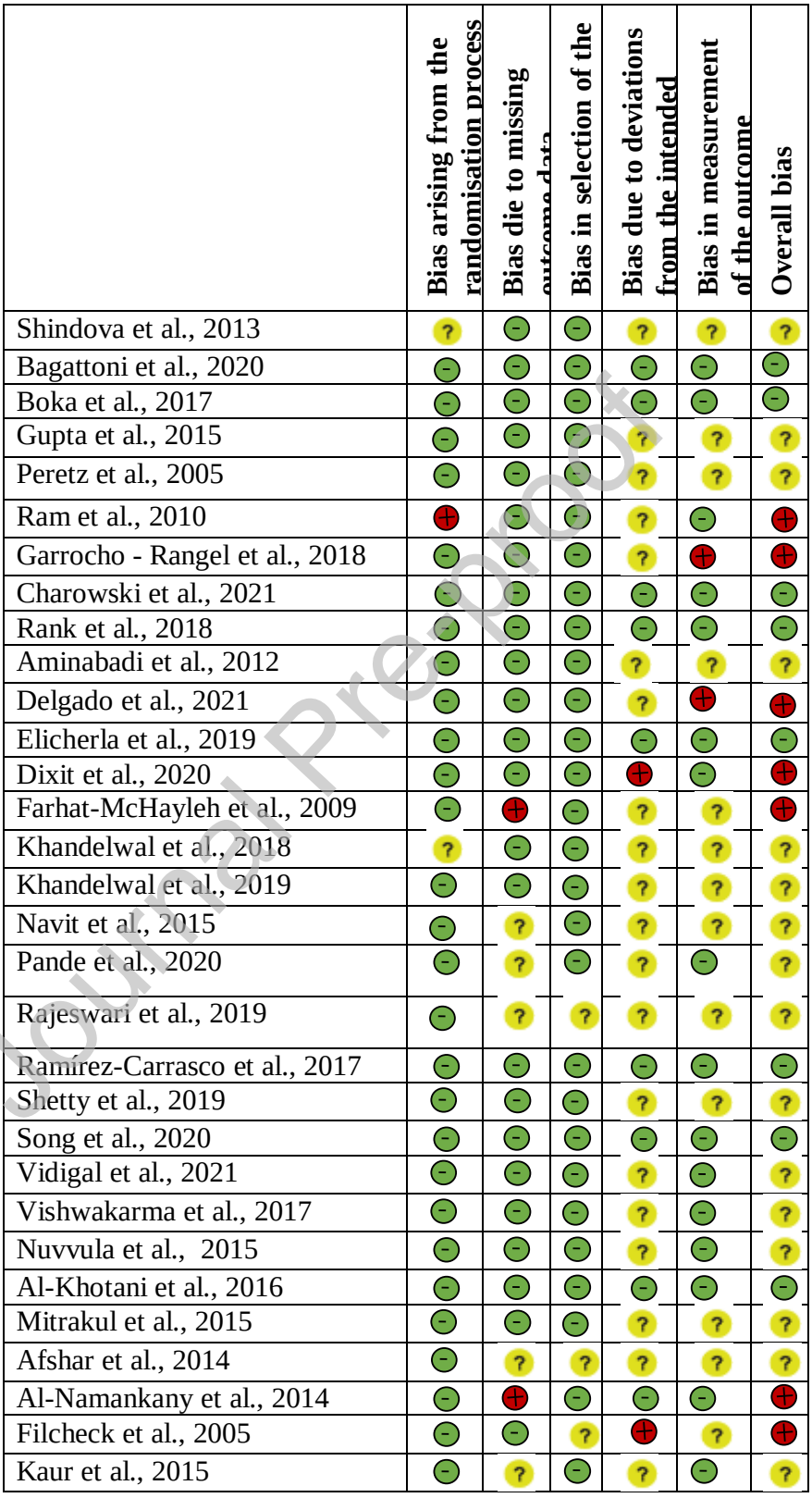


Figure 2. Quality Assessment of potential risk of bias in included studies.



Marwah et al., 2005	-	?	-	?	?	?
Roshan et al., 2018	-	-	-	?	?	?
Nunna et al., 2019	-	-	-	?	?	?
Fakhruddin et al., 2015	-	-	?	?	?	?
Paryab et al., 2014	-	-	-	?	?	?
Al Halabi et al., 2018	-	-	-	?	?	?
Niharika et al., 2018	-	-	-	?	?	?
Afsar et al., 2011	-	+	-	?	-	+
Hine et al., 2019	-	-	-	+	-	+
Kamel et al., 2017	-	-	-	?	?	?
Xia et al., 2016	-	-	-	?	?	?
Aminabadi et al., 2011	-	-	-	-	-	-
Olumide et al., 2009	-	-	-	-	-	-
Greenbaum et al., 1993	-	-	-	?	-	?
Serra-Negra et al., 2019	-	-	-	?	?	?
Aitken et al., 2002	?	?	-	?	-	?
Ramos-Jorge et al., 2011	-	-	-	-	-	-
Gangwal et al., 2014	-	-	-	-	-	-
Sayed et al., 2016	-	?	-	?	?	?
Ghadimi et al., 2018	-	-	-	?	?	?
Rojas-Alcayaga et al., 2018	-	+	-	+	?	+
AlDelhai et al., 2021	-	-	-	-	-	-
Custodio et al., 2020	-	-	-	-	-	-
Chaturvedi et al., 2016	?	-	?	?	?	?
Bansal et al., 2018	?	?	-	?	?	?
Attar et al., 2015	-	-	-	?	?	?
Melamed et al., 1975	-	?	-	?	-	?
Pickrell et al., 2007	-	-	-	?	-	?
Allani et al., 2016	-	-	?	?	?	?
Kebriaee et al., 2015	-	-	-	+	?	+
Felemban et al., 2021	-	-	-	+	?	+

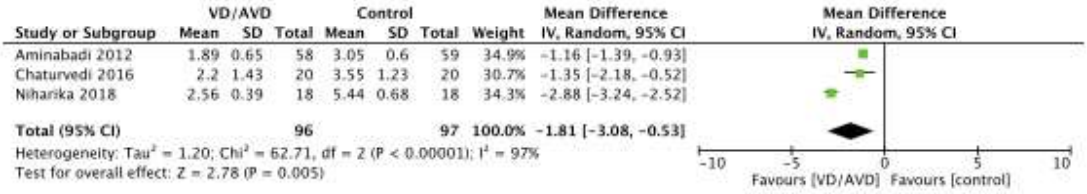


Figure 3. Forest plot for audiovisual distraction against negative controls using facial image scale.

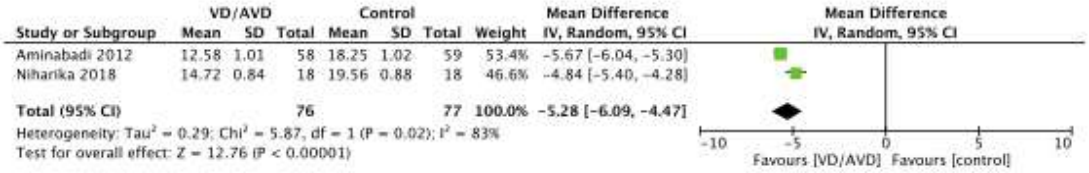


Figure 4. Forest plot for audiovisual distraction against negative controls using modified children's dental anxiety score.

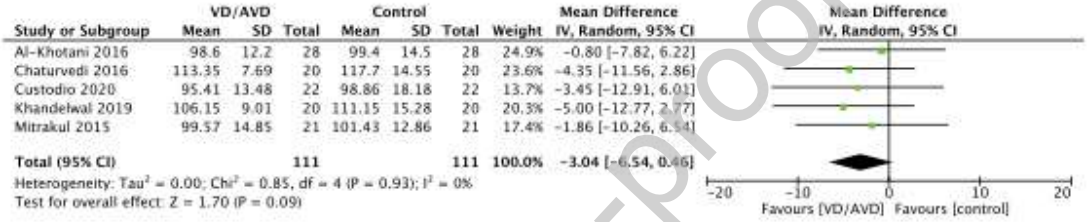


Figure 5. Forest plot for audiovisual distraction against negative controls using mean blood pressure.

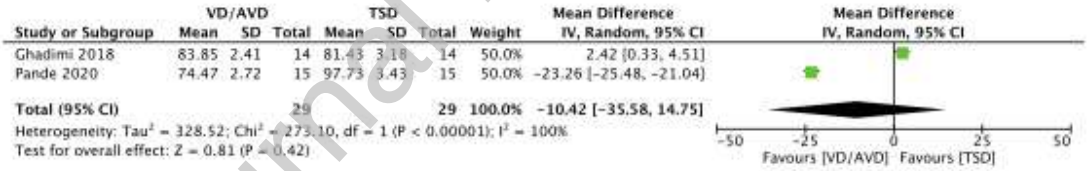


Figure 6. Forest plot for audiovisual distraction against Tell-Show-Do using mean blood pressure.

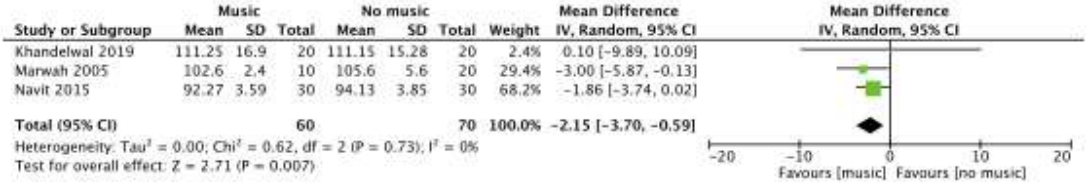


Figure 7. Forest plot for music against no music using mean blood pressure.

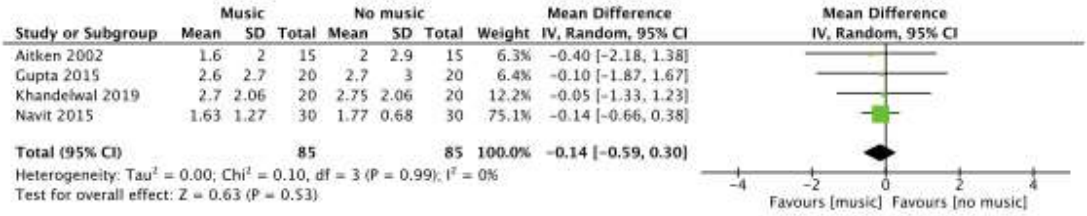


Figure 8. Forest plot for music against no music using Venham picture test.

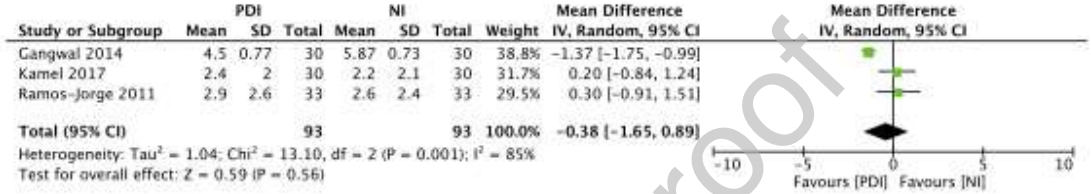


Figure 9. Forest plot for positive dental images against neutral images using Venham picture test.

Table 1: PICO Criteria

Criteria	Definition
Population	Children up to the age of 12 years, with or without a previous dental history. No restriction will be applied on participants' demographic characteristics.
Intervention	Interventions may include all possible non-pharmacological techniques for behavioral management. • Tell-show-do • Distraction (e.g. audio, visual, etc.) • Modelling • Parental presence • Hypnosis • Voice control • Desensitization • Positive reinforcement
Comparators	• Any of the above non-pharmacological techniques. • Any pharmacological interventions (e.g. nitrous oxide sedation, general anaesthesia). • No behavioral management technique used.
Outcomes	A.Primary • Objective Anxiety levels o Pulse rate (beats/minute) o Blood pressure (systolic/diastolic, mmHg) • Subjective anxiety levels o Psychometric questionnaires (mean values) o Picture Tests (mean/median values) • Patients' behavior o Frankl Behavioral Scale (mean change) o FLAAK scale (mean values) B.Secondary • Missing dental appointments /cancellation (percentage) • Patient/parent satisfaction (mean values) • Duration of dental treatment (mean time reduction)

Tabl

Author/Year/Country	*Population (Sample size/Age)*	*Medical History*	**Intervention**	**Comparator(s)**	**Previous dental experience**	*Outcomes*
Charowski et al. 2021, USA	47 children Age : 6 – 10 yrs	NC	AAT : Dog (n = 24)	No dog assisted (n=23)	(-)	Frankl Scale, Houpt Scale, HR, 0S,MCDAS
Delgado et al. 2021, USA	100 children Age : 4 – 6 yrs	NC	AVD (n= 61)	TSD/N2O (n = 39)	(+/-)	Frankl Scale Satisfaction
Vidigal et al. 2021, Brazil	52 children Age : 3 – 5 yrs	NC	HDN-T (n=26)	TSD (n = 26)	(-)	FIS Frankl Scale HR
ALDelhai et al. 2021, Egypt	150 children Age : 3 – 6 yrs	NC	PAP (n = 75)	PPP (n = 75)	(-)	FIS Frankl
Felemban et al. 2021, Saudi Arabia	50 children Age : 6 – 12 yrs	NC	AVDg (n = 25)	AVDc (n = 25)	(+/-)	HR
Bagattoni et al. 2020, Bologna	48 children Age : 5 – 12 yrs	Down Syndrome	AVD (n=24)	Voice control, non-verbal communication, TSD (n=24)	(+)/(-)	Frankl scale VAS
Dixit et al. 2020, India	120 children Age : 4 – 6 yrs	NC	BFT (n = 40) MT (n = 40) TSD (in all groups)	CTR (n = 40) TSD (in all groups)	(-)	NCBRS, FIS, HR, OS, SBP
Pande et al. 2020, India	60 children Age : 5 – 8 yrs	NC	AD (n = 15) AVD (n = 15) MG (n = 15)	TSD (n = 15)	(-)	HR SBP/DBP FIS
Song et al. 2020, Korea	48 children Age : 3 – 7 yrs	NR	Program with ICT (n = 24)	Cartoon Animation (n =20)	(-)	HR PBCL
Custodio et al. 2020, Brazil	44 children Age : 6 – 9 yrs	NC	AVD (n = 22)	CTR (n = 22)	(-) last two years	HR VPT
Elicherla et al. 2019, India	50 children Age : 7 – 11 yrs	NC	APP (n = 25)	TSD (n = 25)	(-)	HR RMS
Khandelwal et al. 2019, India	80 children Age : 4 – 10 yrs	NC	AD (n = 20) AVDch (n = 20) AVDc (n = 20)	CTR (n = 20)	(-)	RMS, VPT, HR OS
Rajeswari et al. 2019, India.	45 children Age : 6 – 10 yrs	NR	CBT (n = 15) AV (n = 15)	TSD (n = 15)	(-)	HR FIS
Shetty et al. 2019, India	120 children Age : 5 – 8 yrs	NC	VR	CTR (TSD, Voice control)	(-)	MCDAS(f)-r Salivary Cortisol
Nunna et al. 2019, India	70 children Age : 7 – 11 yrs	NC	AVD (n = 35)	CS (n = 35)	(-)	HR VCRS
Hine et al. 2019, USA	40 children Age : 3 – 6 yrs	NC	VM (n = 21)	CV (n = 19)	(+/-)	PD, VD, CD, LSD, LSA, LSO
SerraNegra et al., 2019, Brazil	34 children Age : 4 – 6 yrs	NR	Music (n = 18)	No music (n = 18)	(-)	HR
Garrocho – Rangel et al. 2018, Mexico	40 children Age : 5 – 8 yrs	NC	AVD (n = 40)	TSD (n = 40)	(-)	HR OS
Rank et al. 2018, Brazil	306 children Age : 4 – 6 yrs	NC	Award (n = 156)	No award (n = 150)	(-)	VPT
Khandelwal et al. 2018, India	400 children Age : 5 – 8 yrs	NC	AVD AVD + TSD TSD	CTR	(-)	FIS, VPT, SBP, HR, OS
Roshan et al. 2018, India	20 children Age : 6 – 9 yrs	NC	FM (n = 10)	TSD (n = 10)	(-)	HR Venham's score
Al-Halabi et al. 2018, Syria	102 children Age : 6 – 10 yrs	NC	AVDg (n = 34)	AVDt (n = 34) CTR (n = 34)	(-)	HR FLACC Scale
Niharika et al. 2018, India	36 children Age : 4 -8 yrs	NC	AVD (n = 18) 2st visit: AVDa 3rd visit: AVDb	CTR (n = 18) 2nd visit: CTRb 3rd visit: CTRa	(-)	HR OS MCDAS
Ghadimi et al. 2018, Iran	28 children Age : 4 -5 yrs	NC	VD (cartoon) (n = 14)	TSD (n = 14)	(-)	HR, VPT, Frankl Scale,

PP : Parental presence , PA : parental absence, PAP : parental active presence, PPP : parental passive presence, AVD : audiovisual distraction, TSD : Tell-Show-Do, AD: audio distraction, VD : video distraction, CBT : cognitive behavior technique, VEES : video eyeglasses, earphones system, AAT : animal assisted therapy, TPD : tell- play-do, VR : virtual reality, LM : live modelling, LMM: live modelling mother, LMF : live modelling father, FM : film modelling, N2O : nitrous oxide, APP : mobile phone application, BFT : bach flower therapy, MT : music therapy, HDN-T : hiding dental-needle technique, IM : instrumental music, MNR : musical nursery rhymes, HM : hindi movie songs, AS : audio stories, MG : mobile phone game, CS : counter stimulation, AVDg : audiovisual distraction with glasses, AVDc : audiovisual distraction ceiling television, AVDt : audiovisual distraction tablet, AVDch : audiovisual distraction dental chair television, iPad VG : iPad video game, VM : video modelling, CV : control video, PDI : positive dental images, NI : neutral images, RG : reward group, PSD : pictorial story – dentist, PSB : pictorial story – barbershop, DL : dental information leaflet, EL : healthy eating information leaflet, RT : reassuring touch, NT : no touch, CTR : control (negative), MR : memory restructuring, FS :modified version of the self-report faces, HR : heart rate, OS: 02 Interview for Dental Anxiety, CFSS-DS : children's fear survey schedule–Dental Subscale, PBCL : procedure behavior checklist, ACDAS :abeer children dental anxiety scale, MVARS : modified Venham's clinical ratings of anxiety and cooperative behavior scale, DFSS-SF = dental sub-scale of children fear survey schedule-short scale, DFS: dental fear scale, RMS pictorial scale (anxiety) : Raghavendra, Madhuri, Sujata pictorial scale, SBP/DBP : systolic/diastolic blood pressure, VCRS : Venham's clinical anxiety rating scale, PD : physical disruptions, VD : vocal disruptions, CD : combined disruptions, LSD : Likert-type scale by dentist (cooperation), LSA : Likert-type scale by dental assistant (cooperation), LSO : Likert-type scale by blinded observer (cooperation), SCARED : screening of child anxiety related disorders scale, RCPM : Raven's colored progressive matrices, SEM : Sound, Eye, and Motor Scale, SAM : self-assessment Manikin, FSF : children's fear survey scheduledental subscale (FSF 26uestionnaire), WBFPS : Wong Bakers faces pain scale, PSI : Palmar sweat index saturation, VAS : visual analog scale, VPT : Venham picture test, NCBRS : North Carolina behavior rating scale, BAT : behavioral avoidance test, FIS : facial image scale, MCDAS : modified children's dental anxiety score, SCI-DA : structured clinical, VCAS : Venham clinical anxiety scale, VCCS : Venham clinical cooperation scale.

Rojas-Alcayaga et al. 2018, Chile	176 children Age : 6 yrs	NC	Music (n = 88)	No music (n = 88)	NR	FIS Frankl Scale
Bansal et al. 2018, India	60 children Age : 6 – 10 yrs	NR	AVD	CTR : basic behavior guidance techniques	NR	HR, OS, VPT
Boka et al. 2017, Greece	61 children Age : 3 – 8 yrs	NC	PP (n=31)	PA (N=30)	NR	Frankl Scale
Ramírez-Carrasco et al. 2017, Mexico.	40 children Age : 5 – 9 yrs	NC	Hypnosis (n = 20)	Headphones (n = 20)	(-)	HR
Vishwakarma et al. 2017, India	97 children Age : 5 – 7 yrs	NC	TPD (n = 49)	LM(n = 49)	(-)	HR FIS VPT
Kamel et al. 2017, Egypt	60 children Age : 4 – 6 yrs	NC	PDI (n = 30)	NI (n = 30)	(-)	Frankl Scale VPT
Al-Khotani et al. 2016, Saudi Arabia	56 children Age : 7 – 9 yrs	NC	AV (n = 28)	CTR (n = 28)	(-)	HR, SBP / DBP FIS, MVARS
Xia et al. 2016, China	100 children Age : 3 – 12 yrs	with dental fear/anxiety (CFSS>35)	RG (n = 50)	CTR (n = 50)	(-)	CFSS-DS
Sayed et al. 2016, India	90 children Age : 7 – 9 yrs	NC	Live DOM (n = 45)	TSD (n = 45)	(-)	HR, OS, VPT
Chaturvedi et al. 2016, India	40 children Age : 6 – 10 yrs	NC	AVD (n = 20)	CTR (n = 20)	NR	WBFPS, VAS, HR
Allani et al. 2016, India	60 children Age : 4 – 8 yrs	NC	MG (n = 30)	VD (n = 30)	NR	FIS
Gupta et al. 2015, India	60 children Age : 3 – 7 yrs	NR	Upbeat Mus. (n=20) Relaxing mus. (n=20)	No music (n=20)	(+)	VPT, HR, NCBR, VAS
Navit et al. 2015, India	150 children Age : 6 – 12 yrs	NC	IM (n = 30) MNR (n = 30) HM (n = 30) AS (n = 30)	CTR (n = 30)	(-)	VPT VCRS HR
Nuvvula et al. 2015, India	90 children Age : 7 – 10 yrs	NC	AV (n = 30) Music (n = 30)	CTR (n = 30)	(-)	HR, MCDAS, Frankl Scale Houpt Scale
Mitrakul et al. 2015, Thaildand	42 children Age : 5 – 8 yrs	NC	AV (1st visit + nothing at 2nd) (n = 21)	CTR (nothing at 1st visit and AV at 2 nd) (n = 21)	(+)/ (-)	HR FPS-R
Kaur et al. 2015, India	60 children Age : 4 – 8 yrs	NC	AD (n = 20) AVD (n =20)	CTR (n = 20)	NR	HR DFSS-SF Clnical Anxiety Rating Scale
Fakhruddin et al. 2015, United Arab Emirates	60 children Age : 4 – 7 yrs	phobic (MCDAS>31)	AVDg (n = 30) 1st visit: AVDg/a 2nd visit: AVDg/b	AVDc (n = 30) 1st visit: AVDc/b 2nd visit: AVDc/a	(+)	MCDAS HR OS
Attar et al. 2015, Saudi Arabia	39 children (78 primary molars) Age : 4 – 8 yrs	NC	iPad VG (n = 39)	AVD (n = 39)	NR	MCDAS NCBRS, HR
Kebriaee et al. 2015, Iran	45 children Age : 3 – 6.5 yrs	NC	N2O (n = 15) CBT (n = 15)	CTR (n = 15)	(+)	CFSS-DS VCAS, VCCS VPT
Alrshah et al. 2014, Egypt	120 children Age : 6 – 9 yrs	NR	LMM (n = 40) LMF (n = 40)	TSD (n = 40)	(-)	HR, OS, FIS
Al-Namankany et al. 2014, London	56 children Age : 6 – 12 yrs	NC	VM (n = 29)	CTR (n = 27)	NR	ACDAS VAS
Paryab et al. 2014, Iran	46 children Age : 4-6 yrs	NC	VM (n = 23)	TSD (n = 23)	(-)	HR VCRS, Frankl Scale
Gangwal et al. 2014, India	60 children Age : 7 – 12 yrs	NR	PDI (n = 30)	NI (n = 30)	NR	VPT
Shindova et el. 2013, Bulgaria	48 children Age : 6 – 12 yrs	NC	PP (n=24)	PA (n=24)	NR	FS, HR, OS

Aminabadi et al. 2012, Iran	117 children Age : 4 – 6 yrs	NC	AVD 2nd visit: AVDa (n = 58) 3rd visit: AVDb (n = 59)	CTR 2nd visit: CTRb (n = 59) 3rd visit: CTRa (n = 58)	(-)	MCDAS
Afsar et al. 2011, Iran	67 children Age : 5yrs (1st visit) 48 children Age : 5 yrs (2nd visit)	NC	PP 1st visit (n = 32) 2nd visit (n = 24)	PA 1st visit (n = 35) 2nd visit (n = 24)	(-)	HR VCRS Frankl Scale
Aminabadi et al. 2011, Iran	80 children Age : 6 – 7 yrs	NC	PSD (n = 40)	PSB (n = 40)	(-)	SCARED, RCPM, MCDAS, SEM
Ramos – Jorge et al. 2011, Brazil	70 children Age : 4 – 11 yrs	NR	PDI (n = 35)	NI (n = 35)	NR	VPT
Ram et al. 2010, Israel	120 children Age : 5 – 10 yrs	NC	AVD (n= 61)	N2O (n = 59)	(+)	Frankl Scale, Houpt behavior, VAS
Farhat-McHayleh et al. 2009, Lebanon	155 children Age : 5 – 9 yrs	NC	LMM (n = 53) LMF (n = 51)	TSD (n = 51)	(-)	HR
Olumide et al. 2009, UK	50 children Age : 8 – 12 yrs	NR	DL (n = 25)	EL (n = 25)	NR	FIS
Pickrell et al. 2007, USA	45 children Age : 6 – 9 yrs	NC	MR (n = 24)	Neutral Discussion (n = 21)	(+/-)	CFSS-DS VAS, FIS
Peretz et al. 2005, Israel	70 children Age : 3 – 6 yrs	NR	Magic trick (n=35)	TSD (n= 35)	(-)	Frankl Scale
Filcheck et al. 2005, UK	60 children Age : 5 – 12 yrs	NC	Music (CDs) (n=30)	Headphones without music (n=30)	NR	Disruptive Behavior Code
Marwah et al. 2005, India	40 children Age : 4 – 8 yrs	NC	IM MNR	CTR	(-)	HR, 0S, VAS
Aitken et al. 2001, USA	45 children Age : 4 – 6 yrs	NC	Upbeat Mus. (n=15) Relaxing mus. (n=15)	No music (n=15)	NR	HR, VPT, NCBRS VAS
Greenbaum et al. 1993, USA	38 children Age : 3.5 – 10 yrs	NR	FT	NT	(+)	SAM
Melamed et al. 1975, USA	16 children Age : 5 – 11 yrs	NC	FM	FILM (unrelated to dental activity)	(-)	CFSS, PSI, Behavior Profile Rating

able 3. Outcomes on patients' fear, anxiety and behavior during dental procedures using distraction as behavioral management technique.

Study	***Treatment performed***	***Objective Measurements***			***Subjective Measurements***			***Behavior***			***Secondary outcomes***	
		Before	***During***	***After***	***Before***	***During***	***After***	***Before***	***During***	***After***	***Duration***	***Satisfaction***
A. Audiovisual												
elgado et al., 021	RT							**Frankl scale** NR		**Frankl scale** (++) AVD : 91.8% TSD : 35.9% (-) : AVD : 0% TSD : 10.3% (+) : AVD : 8.2% TSD : 53.9%		Children's satisfaction of AVD during treatment (NR)
elemban et al., 021	LA	**Mean HR** AVDg : 91.20 AVDc : 85.48	**Overall mean HR** AVDg : 95.80 AVDc : 86.60	**Mean HR (immediately after LA)** AVDg : 104.08 AVDc : 90.20								
aggatoni et l., 2020	RT								**Frankl Scale** negative behavior AVD : 68% CTR : 30 % **Median r-FLACC score** AVD : 7 CTR :4,5		AVD : 33.4 min CTR : 32.3min	
ustodio et al, 020	Restorative Treatment / Extraction		**Mean HR** During Anaesthesia AVD : 95.41 CTR : 98.86 During Procedure AVD : 94.59 CTR : 95.63						**Mean VBS** During Anaesthesia AVD : 0.59 CTR : 0.72 During Procedure AVD : 0.41 CTR : 1.32			All children in the intervention group reported that they enjoyed watching the cartoons and would like to use the AVE again during other visits.
ande et al., 020	RT	**Mean SBP** TSD : 133.33 AD : 133.87 AVD : 137.33 MG : 134.93 **Mean DBP** TSD : 85.60 AD : 86.80 AVD : 86.93 MG : 87.33 **Mean HR** TSD : 111.47 AD : 111.73 AVD : 112.27 MG : 111.67		**Mean SBP** TSD : 126.40 AD : 121.07 AVD : 105.33 MG : 115.20 **Mean DBP** TSD : 79.20 AD : 75.60 AVD : 66.00 MG : 71.33 **Mean HR** TSD : 97.73 AD : 89.87 AVD : 74.47 MG : 83.40	**Mean FIS** TSD : 4.53 AD : 4.53 AVD : 4.73 MG : 4.80		**Mean FIS** TSD : 2.47 AD : 2.40 AVD : 1.21 MG : 2.07					
handelwal et l., 2019	Clinical examination, Prof. tooth cleaning, RT, EXT/VPT		**Mean HR** CTR : 111.46 AD : 109.90 AVDch: 104.75 AVDc: 102.73 **Mean OS** CTR : 98.25 AD : 98.27 AVDch: 98.22 AVDc : 98.37				**Mean RMS** CTR : 1.98 AD : 1.96 AVDch : 1.71 AVDc : 1.57 **Mean VPT** CTR : 2.95 AD : 2.73 AVDch : 2.08 AVDc : 1.40					
unna et al., 019	VPT/EXT	**Mean HR** AVD : 95.30 CS : 97.15	**Mean HR** AVD : 93.34 CS : 101.67	**Mean HR** AVD : 91.56 CS : 100.51			**Mean VCRS** AVD : 0.57 CS : 0.80					

ajeswari et al., 019	Only preoperatively	**Mean HR** CBT :93.33 AVD : 94.80 TSD : 94.13	**Mean HR** CBT : 73.00 AVD : 80.93 TSD: 83.93		**FIS** CBT : score 3 : 26.7% Score 4 : 46.7% Score 5 : 26.7% AVD : Score 3 : 26.7% Score 4 : 46.7% Score 5 : 26.7% TSD : score 3 : 40% Score 4 :46.7% Score 5 : 13.3%	**FIS** CBT score 1: 80% score 2:20% AVD score 1: 26.7% score 2: 46.7% score 3: 26.7% TSD Score 2 :53.3% Score 3: 46.7%						
hetty et al., 019	VPT				**Mean MCDAS(f)-r** VR :16.18 CTR : 16.18		**Mean MCDAS(f)-r** VR : 11.28 CTR : 16.47					
l-Halabi et al., 018	Inferior alveolar nerve block anaesthesia	**Mean HR** AVDg: NR AVDt: NR CTR: NR		**Mean HR** (before vs. after anesthesia) AVDg: NR AVDt: NR CTR: NR				**Frankl scale** (++/+)				
ansal et al., 018	LA		**6 - 8 yrs** **Mean HR** AVD : 101.20 CTR : 104.00 **Mean OS** AVD : 94.27 CTR : 95.07 **8 - 10 yrs** **Mean HR** AVD : 99.87 CTR : 99.60 **Mean OS** AVD : 95.07 CTR : 95.20			**6 - 8 yrs** **Mean VPT** AVD : 3.60 CTR : 3.87 **8 - 10 yrs** **Mean VPT** AVD : 2.40 CTR : 3.53		Frankl : (+/++)				
arrocho - angel et al., 018	RT	**Mean HR** AVD : 93.94 TSD : 95.86 **Mean OS** AVD : 96.94 TSD : 96.53	**Mean HR** AVD : 95.50 TSD : 95.71 **Mean OS** AVD : 96.87 TSD :97.01									
hadimi et al., 018	Pulpotomy / SCC		**Mean HR** VC : 82.50 CV : 81.36			**Mean VPT** VC : 1.43 CV : 1.39			**Mean Frankl Score** VC : 3.29 CV : 3.36			
handelwal et l., 2018	RT	**Mean SBP** CTR : 96.69 TSD : 100.51 AVD : 96.33 AVD+TSD : 94.22 **Mean HR** CTR : 96.82 TSD : 95.65 AVD : 99.58 AVD+TSD : 96.70 **Mean OS** CTR : 98.11 TSD : 97.89 AVD : 98.13 AVD+TSD : 98.03	**Mean SBP** CTR : 98.80 TSD : 97.69 AVD : 91.25 AVD+TSD : 89.04 **Mean HR** CTR : 100.28 TSD : 92.45 AVD : 91.54 AVD+TSD : 88.64 **Mean OS** CTR : 97.80 TSD : 98.20 AVD : 98.44 AVD+TSD : 98.93	**Mean SBP** CTR : 96.58 TSD : 96.21 AVD : 92.66 AVD+TSD : 87.74 **Mean HR** CTR : 95.45 TSD : 92.37 AVD : 90.60 AVD+TSD : 84.78 **Mean OS** CTR : 97.72 TSD : 97.90 AVD : 98.44 AVD+TSD : 98.72	**Mean FIS** CTR : 2.93 TSD : 3.43 AVD : 3.17 AVD+TSD : 3.37 **Mean VPT** CTR : 3.71 TSD : 4.23 AVD : 4.12 AVD+TSD : 4.32	**Mean FIS** CTR : 3.04 TSD : 2.83 AVD : 2.31 AVD+TSD: 2.02 **Mean VPT** CTR : 3.90 TSD : 3.28 AVD : 2.67 AVD+TSD: 2.24	**Mean FIS** CTR : 2.46 TSD : 2.36 AVD : 1.92 AVD+TSD: 1.72 **Mean VPT** CTR : 3.14 TSD : 2.89 AVD : 2.23 AVD+TSD: 1.50					
iharika et al., 018	VPT		**Mean HR change** AVD : 2.8 CTR : 5.3 **Mean OS change** AVD : 2.28 CTR : 3.61		**Mean SCARED score** group a 19.61 group b 17.28	**Overall mean MCDAS** AVD : 14.58 CTR : 19.47						

l-Khotani et l., 2016	Prof. tooth cleaning, RT	**Mean HR** AV :95.7 CTR : 94.3 **Mean SBP** AV : 112.65 CTR : 111.85 **Mean DBP** AV :67.1 CTR :67.85	**Mean HR** AV :98.43 CTR : 97.23 **Mean SBP** AV:114.83 CTR : 111.3 **Mean DBP** AV :66.6 CTR : 64.93	**Mean HR** AV :95.3 CTR : 93.4 **Mean SBP** AV :110.6 CTR :111.6 **Mean DBP** AV : 63.7 CTR : 67.6	**MVARS** AV : 0.71 CTR : 0.64	**Mean FIS** AV : 1.93 CTR : 1.68	**MVARS** AV : 0.25 CTR : 0.75					
haturvedi et l., 2016	Prof. tooth cleaning, RT, VPT		**Mean HR** AVD : 115.57 CTR : 118.33			**Mean WBFPS** AVD : 1.27 CTR : 2.23 **Mean VAS** AVD : 1.57 CTR : 3.15		Frankl: (+/++)				
akhruddin et l., 2015	VPT		**Mean HR change** AVDg : 2.70 AVDc : 5.85 **Mean OS change** AVDg : 2.32 AVDc : 3.61		**Mean MCDAS change** AVDg : 13.35 AVDc : 11.37							
aur et al., 015	Prof. tooth cleaning, RT without LA, RT With LA	**Mean HR** 4 - 6 yrs : AD : 109.10 AVD : 106.60 CTR : 113.30 6 - 8 yrs : AD : 106.90 AVD: 106.16 CTR : 110.06	**Mean HR** 4-6 yrs : AD : 110.23 AVD : 100.90 CTR : 119.33 6 - 8 yrs : AD : 108.83 AVD : 100.96 CTR : 115.36	**Mean HR** 4 - 6 yrs : AD : 108.53 AVD : 97.56 CTR : 124.56 6 - 8 yrs AD : 108,06 AVD : 95.60 CTR : 121.93	**Mean DFSS-SF** 4 – 6 yrs AD : 22 AVD : 20.26 CTR : 23.70 6 - 8 yrs AD : 22.13 AVD : 20.00 CTR : 22.36	**Mean Clinical Anxiety** 4 - 6 yrs AD : 0.93 AVD : 0.40 CTR : 1.63 6 - 8 yrs AD : 0.93 AVD : 0.43 CTR : 1.90	**Mean DFSS-SF** 4 - 6 yrs AD : 20.10 AVD : 17.00 CTR : 22.86 6 - 8 yrs AD : 20.00 AVD : 16.68 CTR : 21.53					
Mitrakul et al., 015	RT	**Mean HR** Group 1 :89.23 Group 2 : 91.35	**Mean HR** Group 1 :93.60 Group 2 :95.05									
uvvula et al., 015	LA	**Mean HR** AV : 102.4 Music : 89.3 CTR : 95.4	**Mean HR** AV :109.4 Music : 104.6 CTR : 119.0		**Mean MCDAS(f)** AV :22.2 Music : 21.5 CTR : 20.6		**Mean MCDAS(f)** AV : 8.3 Music : 14.1 CTR : 20.9	**Frankl Scale** AV (-) 21.11% (+) 12.22% Music (-) 13.33% (+) 20% CTR (-) 10% (+) 23.33%	**Frankl Scale** AV (-) 2.22% (+) 6.66% (++) 24.44% Music (--) 2.22% (-) 3.33% (+) 17.77% (++) 10% CTR (--) 12.22% (-) 5.55% (+) 12.22% (++)3.33% **Mean Houpt Scale** AV : 5 Music : 5 CTR : 4			AV + Music : High levels of satisfaction
minabadi et l., 2012	Prof. tooth cleaning, RT				**Mean SCARED** group a: 16.74 group b: 16.65		**Mean MCDAS** AVD : 12.89 CTR : 17.97					
am et al., 010	RT							**Mean Frankl scale** AVD : 3.1 N2O : 2.6		**Mean Houpt scale** AVD :5.5 N2O : 5.1	AVD : 32.6 N2O : 25.0	VAS scale: 85% of the children satisfied with AVD

B. ***Audio.***

ixit et al., 020	Prof. tooth cleaning	**Mean HR** BFT: 109.2 MT: 105.5 CTR: 108 **Mean OS** BFT: 99.1 MT: 98.3 CTR: 98.1 **Mean SBP** BFT: 115.5 MT: 109 CTR: 112.3	**Mean HR** BFT: 100.8 MT: 98.4 CTR: 113.1 **Mean OS** BFT: 98 MT: 98.6 CTR: 98.8 **Mean SBP** BFT: 113.2 MT: 108.5 CTR: 113.7	**Mean HR** BFT: 103.9 MT: 102.9 CTR: 108.3 **Mean OS** BFT: 98.8 MT: 98.6 CTR: 98.3 **Mean SBP** BFT: 113.1 MT: 110 CTR: 112.2	**FSF total scores** 15-75 (for anxious children : score: >=38)	**Mean NCBRS** BFT: 0.5 MT: 1.88 CTR: 5.98	**FIS** 0=very happy BFT: 70% MT: 47.5% CTR: 60% 1=happy BFT: 17.5% MT: 40% CTR: 25% 2=neutral BFT: 10% MT: 12.5% CTR: 15% 3=sad BFT: 0% MT: 0% CTR: 0% 4=very sad BFT: 2.5% MT: 0% CTR: 0%					
ande et al., 020	RT	**Mean SBP** TSD : 133.33 AD : 133.87 AVD : 137.33 MG : 134.93 **Mean DBP** TSD : 85.60 AD : 86.80 AVD : 86.93 MG : 87.33 **Mean HR** TSD : 111.47 AD : 111.73 AVD : 112.27 MG : 111.67		**Mean SBP** TSD : 126.40 AD : 121.07 AVD : 105.33 MG : 115.20 **Mean DBP** TSD : 79.20 AD : 75.60 AVD : 66.00 MG : 71.33 **Mean HR** TSD : 97.73 AD : 89.87 AVD : 74.47 MG : 83.40	**Mean FIS** TSD : 4.53 AD : 4.53 AVD : 4.73 MG : 4.80		**Mean FIS** TSD : 2.47 AD : 2.40 AVD : 1.21 MG : 2.07					
handelwal et l., 2019	Clinical examination, Prof. tooth cleaning, RT, EXT/VPT (with LA)		**Mean HR** CTR : 111.46 AD : 109.90 AVDch : 104.75 AVDc : 102.73 **Mean OS** CTR : 98.25 AD : 98.27 AVDch : 98.22 AVDc : 98.37				**Mean RMS** CTR : 1.98 AD : 1.96 AVDch : 1.71 AVDc : 1.57 **Mean VPT** CTR : 2.95 AD : 2.73 AVDch : 2.08 AVDc : 1.40					
erraNegra et l., 2019	1st vst : Clinical Examination 2nd/ 3st vst : Restorative Treatment	**Mean HR** 1st vst Music : 113.00 No Music : 98.00 2nd vst Music : 100.00 No music : 115.00 3st vst : Music : 99.00 No music : 99.50	**Mean HR** 1st vst Music : 100.00 No music : 120.00 2nd vst Music : 100.00 No music : 113.50 3rd vst Music : 100.00 No music : 100.00	**Mean HR** 1st vst Music : 99.00 No music : 100.00 2nd vst Music : 99.00 No music : 100.00 3rd vst Music 100.00 No music : 100.00								
ojas-Alcayaga t al., 2018	Clinical examination				**Mean FIS** Music : 1.57 No music : 1.67		**Mean FIS** Music : 1.44 No music : 1.33	**Mean Frankl** Music : 3.1 No music : 3.2		**Mean Frankl** Music : 3.4 No music : 3.4		
avit et al., 015	Clinical examination, Prof. tooth cleaning, RT, EXT/VPT (with LA)		**Mean HR** CTR : 97.84 IM : 96.42 MNR : 95.76 HM : 94.83 AS : 93.57				**Mean VPT** CTR : 1.92 IM : 1.88 MNR : 1.64 HM : 1.78 AS : 1.51 **Mean VCRS** CTR : 0.9 IM : 2.93 MNR : 3.44 HM : 1.03 AS : 0.85					

uvvula et al., 015	LA	**Mean HR** AV : 102.4 Music : 89.3 Ctr : 95.4	**Mean HR** AV :109.4 Music : 104.6 Ctr : 119.0		**Mean MCDAS(f)** AV :22.2 Music : 21.5 Ctr : 20.6		**Mean MCDAS(f)** AV : 8.3 Music : 14.1 Ctr : 20.9	**Frankl Scale** AV (-) 21.11% (+) 12.22% Music (-) 13.33% (+) 20% Ctr (-) 10% (+) 23.33%	**Frankl Scale** AV (-) 2.22% (+) 6.66% (++) 24.44% Music (--) 2.22% (-) 3.33% (+) 17.77% (++) 10% Ctr (--) 12.22% (-) 5.55% (+) 12.22% (++)3.33% **Mean Houpt Scale** AV : 5 Music : 5 Ctr : 4			AV + Music : High levels of satisfaction
ilcheck et al., 005	RT								**Disruptive Behavior Code** Very Cooperative Music : 26.7% CTR : 13.33% Cooperative Music : 16,6% CTR : 16.6% Uncooperative Music : 6.6% CTR : n = 20%			
Marwah et al., 005	Prof. Tooth cleaning,RT, EXT		**Mean HR** IM : 102.6 MNR : 104.8 CTR : 105.6 **Mean OS** IM :98.6 MNR : 97.2 CTR : 97.7			**Mean VAS** IM : 1.0 MNR : 1.4 CTR :1.1						
itken et al., 001	2 vsts : Restorative Treatment	**HR :** No significant difference in heart rate was found among the groups during visit #1 or visit #2 .			**Mean VP**T 1st vst Upb. Mus : 2.5 Rel. Mus : 1.6 No mus : 1.8 2nd vst : Upb. Mus : 2.0 Rel. Mus : 1.2 No mus : 1.6	**Mean VAS** 1st vst Upb.Mus : 37.2 Rel.Mus : 58.5 No mus. : 28.2 2nd vst : Upb. Mus : 29.4 Rel. Mus : 28.8 No mus : 40.0	**Mean VPT** 1st vst Upb.Mus :1.8 Rel. Mus : 2.8 No mus : 2.0 2nd vst Upb.Mus : 1.6 Rel.Mus : 2.0 No mus : 2.0		**Mean NCBRS** Crying: Upb. Mus : 5.7 Rel.Mus : 10.8 No mus :4.4 Hand movement Upb. Mus : 2.1 Rel. Mus : 7.0 No mus : 2.5 Leg movement Upb. Mus :0.4 Rel. Mus : 0.5 No mus : 0.4 Oral phys res Upb. Mus : 3.1 Rel. Mus : 0.5 No mus : 0.2 Quiet Upb. mus : 88.4 Rel. Mus : 81.0 No mus : 92.3			93%in both groups said they enjoyed listening to the music. 87% in the upbeat music group and 93% in the relaxing music group would like listening to music at next vst.

PP : Parental presence , PA : parental absence, PAP : parental active presence, PPP : parental passive presence, AVD : audiovisual distraction, TSD : Tell-Show-Do, AD: audio distraction, VD : video distraction, CBT : cognitive behavior technique, VEES : video eyeglasses, earphones system, AAT : animal assisted therapy, TPD : tell- play-do, VR : virtual reality, LM : live modelling, LMM: live modelling mother, LMF : live modelling father, FM : film modelling, N2O : nitrous oxide, APP : mobile phone application, BFT : bach flower therapy, MT : music therapy, HDN-T : hiding dental-needle technique, IM : instrumental music, MNR : musical nursery rhymes, HM : hindi movie songs, AS : audio stories, MG : mobile phone game, CS : counter stimulation, AVDg : audiovisual distraction with glasses, AVDc : audiovisual distraction ceiling television, AVDt : audiovisual distraction tablet, AVDch : audiovisual distraction dental chair television, iPad VG : iPad video game, VM : video modelling, CV : control video, PDI : positive dental images, NI : neutral images, RG : reward group, PSD : pictorial story – dentist, PSB : pictorial story – barbershop, DL : dental information leaflet, EL : healthy eating information leaflet, RT : reassuring touch, NT : no touch, CTR : control (negative), MR : memory restructuring, FS :modified version of the self-report faces, HR : heart rate, OS: 02 Interview for Dental Anxiety, CFSS-DS : children's fear survey schedule–Dental Subscale, PBCL : procedure behavior checklist, ACDAS :abeer children dental anxiety scale, MVARS : modified Venham's clinical ratings of anxiety and cooperative behavior scale, DFSS-SF = dental sub-scale of children fear survey schedule-short scale, DFS: dental fear scale, RMS pictorial scale (anxiety) : Raghavendra, Madhuri, Sujata pictorial scale, SBP/DBP : systolic/diastolic blood pressure, VCRS : Venham's clinical anxiety rating scale, PD : physical disruptions, VD : vocal disruptions, CD : combined disruptions, LSD : Likert-type scale by dentist (cooperation), LSA : Likert-type scale by dental assistant (cooperation), LSO : Likert-type scale by blinded observer (cooperation), SCARED : screening of child anxiety related disorders scale, RCPM : Raven's colored progressive matrices, SEM : Sound, Eye, and Motor Scale, SAM : self-assessment Manikin, FSF : children's fear survey scheduledental subscale (FSF questionnare), WBFPS : Wong Bakers faces pain scale, PSI : Palmar sweat index saturation, VAS : visual analog scale, VPT : Venham picture test, NCBRS : North Carolina behavior rating scale, BAT : behavioral avoidance test, FIS : facial image scale, MCDAS : modified children's dental anxiety score, SCI-DA : structured clinical, VCAS : Venham clinical anxiety scale, VCCS : Venham clinical cooperation scale.

Table 4. Outcomes on patients' fear, anxiety and behavior during dental procedures using modelling as behavioral management technique.

Study	***Treatment performed***	***Objective Measurements***			***Subjective Measurements***			***Behavior***		
		Before	***During***	***After***	***Before***	***During***	***After***	***Before***	***During***	***After***
Song et al., 2020	RT		**Mean HR** exp:101.39 Ctr : 110.68						**Mean PCBL** exp: 2.09 Ctr : 2.89	
Hine et al., 2019	Prof. tooth cleaning								**Mean observed disrupted behavior** **PD:** VM 0.7 CV 7.5 **VD**: VM 0.6 CV 7.9 **CD:** VM 0.8 CV 11.4	**Mean LSD** VM 5.9 CV 3.8 **Mean LSA** VM 5.7 CV 4.1 **Mean LSO** VM 5.7 CV 4.4
Roshan et al., 2018	RT	**Mean HR** FM : 93.40 TSD : 93.70	**Mean HR** FM : 80,5 TSD : 83.03	**Mean HR** FM : 76.50 TSD : 79.10	**Mean Venham's** FM score 1 : 20% Score 2 : 20% Score3 : 10% TSD Score 0 : 5% Score 1 : 15% Score 2 : 20% Score 3 : 10%	**Mean Venham's** FM Score 0: 30% Score 1 : 20% TSD Score 0 : 30% Score 1 : 15% Score 2 : 5%	**Mean Venham's** FM Score 0: 40% Score 1 : 10% TSD Score 0 : 40% Score 1 : 5% Score 2 : 5$			
Vishwakarma et al., 2017	Prof . tooth cleaning, RT	**Mean HR** TPD :97.47 LM : 100.38	**Mean HR** TPD :91.64 LM :96.15		Mean **FIS** TPD :15.01 LM : 17.98 Mean VPT TPD : 14.48 LM :16.51	**FIS** TPD :13.00 LM : 20.00 VPT TPD :13.00 LM : 20.00				
Sayed et al., 2016	Restorative Treatment group A 1st visit : live DOM 2nd visit TSD group B 1st vts : TSD 2nd visit : live DOM		**Mean HR** 1st visit : Group A : 96.9 Group B : 101.6 2nd visit : Group A : 96.7 Group B : 100.6 2.OS 1st visit : Group A : 96.1 Group B : 96.0 2nd visit : Group A : 95.6 Group B : 95.7		**Mean VPT** 1st visit : Group A : 1.5 Group B : 1.8 2nd visit : Group A : 1.2 Group B : 1.2					
Alrshah et al., 2014	Prof. tooth cleaning		**Mean HR** LMM : 87.98 LMF : 104.8 TSD: 109.78 **Mean OS** LMM : 98.16 LMF : 98.26 TSD : 98.25				**Mean FIS** LMM : 2 LMF : 3 TSD : 3			
Al-Namankany et al., 2014	Prof. tooth cleaning/LA/EXT				**Mean VAS** VM : 7.05 CTR : 15.97	**Mean VAS** VM : 20.69 CTR : 61.37	**Mean ACDAS** VM : 9.37 CTR : -0.66			
Paryab et al., 2014	Prof. tooth cleaning/film of prof. tooth cleaning, RT	**Mean HR (before anesthesia)** VM : 102.80 TSD : 98.89		**Mean HR (after anesthesia)** VM : 113.90 TSD : 111.17		**Mean VCRS** VM : 1.09 TSD : 0.96			**Frankl scale** VM : 3.03 TSD : 3.02	
Farhat-McHayleh et al., 2009	Prof. tooth cleaning	**Mean HR Difference** 5-7 yrs LMM vs. LMF: -4.21 LMM vs. TSD: -5.22 LMF vs. TSD: -1.01 7-9 yrs LMM vs. LMF: 2.25 LMM vs. TSD: -3.23 LMF vs. TSD: -5.48	**Overall mean HR Difference** 5 – 7 yrs LMM vs. LMF: -8.3 LMM vs. TSD: -5.85 LMF vs. TSD: 2.45 7 – 9 yrs LMM vs. LMF: -5.32 LMM vs. TSD: -9.64 LMF vs. TSD: -4.32	**Mean HR difference** 5-7 yrs LMM vs. LMF:-11.05 LMM vs. TSD: -9.74 LMF vs. TSD: 1.31 7-9 yrs LMM vs. LMF: -8.99 LMM vs. TSD: -15.25 LMF vs. TSD: -6.26						

Melamed et al., 1975	Prof. Tooth cleaning, dental examination, RT								**Mean Behavior Profile Rating** FM : 2.67 FILM : 5.59	

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Table 5. . Outcomes on patients' fear, anxiety and behavior during dental procedures using parental presence as behavioral management technique.

Study	***Treatment performed***	***Objective Measurements***			***Subjective Measurements***			***Behavior***		
		Before	***During***	***After***	***Before***	***During***	***After***	***Before***	***During***	***After***
ALDelhai et al., 2021	Preventive Treatment				**Mean FIS** PAP : 62.7% fearful PPP : 48.0 % fearful				**Frankl :** Positive Behavior PAP : 74.7 % PPP : 46.7 %	
Boka et al., 2017	Clinical Examination, Prof. tooth cleaning, RT, EXT							**Mean Frankl** PP :1,72 PA : 1,82		**Mean Frankl** PP: 2,17 PA : 2,45
Shidova et al., 2013	Clinical Examination	**Mean HR** PP : 98,25 PA : 92,04 **Mean OS** PP:98,37 PA : 98,17	**Mean HR** PP :115,75 PA: 107,29 **Mean OS** PP : 98,65 PA : 98,21	**Mean HR** PP : 104,13 PA : 99,21 **Mean OS** PP : 98,58 PA: 98,04	**Mean FS** PP :4.58 PA : 3.54		**Mean FS** PP : 2.12 PA: 1.13			
Afsar et al., 2011	Prof. tooth cleaning, RT		**Mean HR** PP : 99.85 PA : 100.09			**Mean VCRS** PP : 1.18 PA : 1.24			**Mean Frankl :** PP : 3.15 PA : 3.11	

PP : Parental presence , PA : parental absence, PAP : parental active presence, PPP : parental passive presence, AVD : audiovisual distraction, TSD : Tell-Show-Do, AD: audio distraction, VD : video distraction, CBT : cognitive behavior technique, VEES : video eyeglasses, earphones system, AAT : animal assisted therapy, TPD : tell- play-do, VR : virtual reality, LM : live modelling, LMM: live modelling mother, LMF : live modelling father, FM : film modelling, N2O : nitrous oxide, APP : mobile phone application, BFT : bach flower therapy, MT : music therapy, HDN-T : hiding dental-needle technique, IM : instrumental music, MNR : musical nursery rhymes, HM : hindi movie songs, AS : audio stories, MG : mobile phone game, CS : counter stimulation, AVDg : audiovisual distraction with glasses, AVDc : audiovisual distraction ceiling television, AVDt : audiovisual distraction tablet, AVDch : audiovisual distraction dental chair television, iPad VG : iPad video game, VM : video modelling, CV : control video, PDI : positive dental images, NI : neutral images, RG : reward group, PSD : pictorial story – dentist, PSB : pictorial story – barbershop, DL : dental information leaflet, EL : healthy eating information leaflet, RT : reassuring touch, NT : no touch, CTR : control (negative), MR : memory restructuring, FS :modified version of the self-report faces, HR : heart rate, OS: 02 Interview for Dental Anxiety, CFSS-DS : children's fear survey schedule–Dental Subscale, PBCL : procedure behavior checklist, ACDAS :abeer children dental anxiety scale, MVARS : modified Venham's clinical ratings of anxiety and cooperative behavior scale, DFSS-SF = dental sub-scale of children fear survey schedule-short scale, DFS: dental fear scale, RMS pictorial scale (anxiety) : Raghavendra, Madhuri, Sujata pictorial scale, SBP/DBP : systolic/diastolic blood pressure, VCRS : Venham's clinical anxiety rating scale, PD : physical disruptions, VD : vocal disruptions, CD : combined disruptions, LSD : Likert-type scale by dentist (cooperation), LSA : Likert-type scale by dental assistant (cooperation), LSO : Likert-type scale by blinded observer (cooperation), SCARED : screening of child anxiety related disorders scale, RCPM : Raven's colored progressive matrices, SEM : Sound, Eye, and Motor Scale, SAM : self-assessment Manikin, FSF : children's fear survey scheduledental subscale (FSF questionnaire), WBFPS : Wong Bakers faces pain scale, PSI : Palmar sweat index saturation, VAS : visual analog scale, VPT : Venham picture test, NCBRS : North Carolina behavior rating scale, BAT : behavioral avoidance test, FIS : facial image scale, MCDAS : modified children's dental anxiety score, SCI-DA : structured clinical, VCAS : Venham clinical anxiety scale, VCCS : Venham clinical cooperation scale.

Table 6. Outcom

Study	*Treatment performed*	*Objective Measurements*			*Subjective Measurements*			*Behavior*			*Secondary outcomes*	
TSD												
		Before	***During***	***After***	***Before***	***During***	***After***	***Before***	***During***	***After***	***Duration***	***Satisfaction***
Khandelwal et al., 2018	RT	**Mean SBP** CTR : 96.69 TSD : 100.51 AVD : 96.33 AVD+TSD:94.22 **Mean HR** CTR : 96.82 TSD : 95.65 AVD : 99.58 AVD+TSD:96.70 **Mean OS** CTR : 98.11 TSD : 97.89 AVD : 98.13 AVD+TSD:98.03	**Mean SBP** CTR : 98.80 TSD : 97.69 AVD : 91.25 AVD+TSD:89.04 **Mean HR** CTR : 100.28 TSD : 92.45 AVD : 91.54 AVD+TSD:88.64 **Mean OS** CTR : 97.80 TSD : 98.20 AVD : 98.44 AVD+TSD:98.93	**Mean SBP** CTR : 96.58 TSD : 96.21 AVD : 92.66 AVD+TSD : 87.74 **Mean HR** CTR : 95.45 TSD : 92.37 AVD : 90.60 AVD+TSD : 84.78 **Mean OS** CTR : 97.72 TSD : 97.90 AVD : 98.44 AVD+TSD : 98.72	**Mean FIS** CTR : 2.93 TSD : 3.43 AVD : 3.17 AVD+TSD :3.37 **Mean VPT** CTR : 3.71 TSD : 4.23 AVD : 4.12 AVD+TSD :4.32	**Mean FIS** CTR : 3.04 TSD : 2.83 AVD : 2.31 AVD+TSD: 2.02 **Mean VPT** CTR : 3.90 TSD : 3.28 AVD : 2.67 AVD+TSD : 2.24	**Mean FIS** CTR : 2.46 TSD : 2.36 AVD : 1.92 AVD+TSD : 1.72 **Mean VPT** CTR : 3.14 TSD : 2.89 AVD : 2.23 AVD+TSD : 1.50					
Vishwakara et al., 2017	Prof. tooth cleaning, RT	**Mean HR** TPD :97.47 LM : 100.38	**Mean HR** TPD :91.64 LM :96.15		**Mean FIS** TPD :15.01 LM : 17.98 **Mean VPT** TPD : 14.48 LM :18.51	**FIS** TPD :13.00 LM : 20.00 **VPT** TPD :13.00 LM : 20.00						
AWARD												
Rank et al., 2018	Clinical examination, RT				**Mean VPT** Award No anxiety: 44% Anxiety : 56 % No award No anxiety:38.66% Anxiety : 61.34%		**Mean % VPT** Award No anxiety: 49.3% Anxiety: 50.7% No award No anxiety: 60% Anxiety : 40%					
Xia et al., 2016	RT				**Mean CFSSDS** RG : 51.12 CTR : 50.28		**Mean CFSSDS** RG : 25.98 CTR : 46.22					
HYPNOSIS												
Ramírez-Carrasco et al., 2017	LA	**Mean HR** Hypnosis :92.31 Ctr : 94.16		**Mean HR** Hypnosis : 93.57 Ctr : 99.3								
AAT (DOG)												
Charowski et al., 2021	Sealant	**Mean HR** AAT : 84.46 CTR : 84 **Mean OS** AAT : 98.33 CTR : 98.74	**Mean HR** AAT : 88.63 CTR: 87.18 **Mean OS** AAT : 98.88 CTR : 98.86	**Mean HR** AAT : 88.2 CTR : 83.86 **Mean OS** AAT : 98.63 CTR : 99.05	**Mean MCDAS** AAT : 18.95 CTR : 16.43			**Mean Frankl Scale** AAT : 4.00 CTR : 4.00 **Mean Houpt Scale** AAT : 1.00 CTR : 1.00	**Mean Frankl Scale** AAT : 4.00 CTR : 4.00 **Mean Houpt Scale** AAT : 1.00 CTR : 1.00	**Mean Frankl Scale** AAT : 4.00 CTR : 4.00 **Mean Houpt Scale** AAT : 1.00 CTR : 1.00		Satisfaction : 100% in the AAT group
H DN-T												
Vidigal et al., 2021	Ext/ VPT	**Mean HR** HDN-T : 98.56 TSD : 99.80	**Mean HR** HDN-T :101.42 TSD : 101.38		**Mean FIS** HDN-T : 2.19 TSD : 2.31	**Mean FIS** HDN-T : 1.65 TSD : 1.92			**Mean Frankl Scale** HDN-T : 1.88 TSD:2.04			
PDI												

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Kamel et al., 2017	LA, VPT, SSC				**Mean VPT** PDI : 2.4 NI : 2.2		**Mean VPT** PDI : 2.4 NI : 2.2	**Frankl scale** (--) PDI : 0% NI :3.3% (-) PDI : 3.3% NI : 13.3% (+) PDI : 43.3% NI : 46.7% (++) PDI : 53.4% NI: 36.7%	**Mean Frankl scale** (--) PDI : 3.3% NI : 6.7% (-) PDI : 21.7% NI : 13.4% (+) PDI : 36.7% NI : 48.3% (++) PDI : 38.3% NI : 31.65%	**Mean Frankl scale** (--) PDI : 0.0% NI : 6.7% (-) PDI : 16.7% NI:6.7% (+) PDI : 36.7% NI : 50.0% (++) PDI : 46.6% NI : 36.6%		
Gangwal et al., 2014	Extraction				**Mean VPT** PDI : 6.10 NI : 5.97	**Mean VPT :** PDI : 4.50 NI : 5.87	**Mean VPT** PDI : 3.70 NI : 6.00					
Ramos Jorge et al., 2011	Clinical Examination				**Mean VPT** PDI : 3.2 NI :2.7	**Mean VPT** PDI : 2.9 NI : 2.6	**Mean VPT** PDI : 2.4 NI :2.3					
PSD												
Aminabadi et al., 2011	Prof. tooth cleaning, RT				**Mean SCARED (<25)** PSD : 17.00 PSB : 17.03 **RCPM** PSD : 104.45 PSB : 104.80	**Mean MCDAS** PSD : 16.00 PSB : 25.35			**Mean SEM** PSD: 3.58 PSB : 6.03			
RT												
Greenbaum et al., 1993	Prof. tooth cleaning				**Mean DFS** RT : 38.68 NT : 36.21 **Mean SAM** Displeasure/pleasure RT : 3.32 NT : 3.32 Arousal/calmness RT : 2.79 NT : 2.68 Submission/ dominance RT : 3.00 NT : 2.58		**Mean SAM** Displeasure/pleasure RT : 3.68 NT : 3.05 Arousal/calmness RT : 2.37 NT : 2.10 Submission/ dominance RT : 2.90 NT : 2.95					
DL												
Olumide et al., 2009	leaflet reading				**Mean FIS** DL : 2.12 EL : 2.04		**Mean FIS** DL : 1.56 EL : 1.80					
Bach flower therapy												
Dixit et al., 2020	Prof. tooth cleaning	**Mean HR** BFT: 109.2 MT: 105.5 CTR: 108 **Mean OS** BFT: 99.1 MT: 98.3 CTR: 98.1 **Mean SBP** BFT: 115.5 MT: 109 CTR: 112.3	**Mean HR** BFT: 100.8 MT: 98.4 CTR: 113.1 **Mean OS** BFT: 98.9 MT: 98.6 CTR: 98.8 **Mean SBP** BFT: 113.2 MT: 108.5 CTR: 113.7	**Mean HR** BFT: 103.9 MT: 102.9 CTR: 108.3 **Mean OS** BFT: 98.8 MT: 98.6 CTR: 98.3 **Mean SBP** BFT: 113.1 MT: 110 CTR: 112.2	**FSF total scores** 15-75 (for anxious children : score: >=38)	**Mean NCBRS** BFT: 0.5 MT: 1.88 CTR: 5.98	**FIS** 0=very happy BFT: 70% MT: 47.5% CTR: 60% 1=happy BFT: 17.5% MT: 40% CTR: 25% 2=neutral BFT: 10% MT: 12.5% CTR: 15% 3=sad BFT: 0% MT: 0% CTR: 0% 4=very sad BFT: 2.5% MT: 0% CTR: 0%					
CBT												

Table 7. Summary of quality assessment according to GRADE rating .

Quality Assessment	No of patients	Effect	Quality

Rajeswari et al., 2019	Only Preoperatively	**Mean HR** CBT :93.33 AVD : 94.80 TSD : 94.13	**Mean HR** CBT : 73.00 AVD : 80.93 TSD: 83.93		**FIS** CBT : score 3 : 26.7% Score 4 : 46.7% Score 5 : 26.7% AVD : Score 3 : 26.7% Score 4 : 46.7% Score 5 : 26.7% TSD : score 3 : 40% Score 4 :46.7% Score 5 : 13.3%	**FIS** CBT score 1 : 80% score 2 : 20% AVD Score 1 : 26.7% Score 2: 46.7% Score 3 26.7% TSD Score 2 : 53.3% Score 3: 46.7%						
Kebriaree et al., 2015	Prof. tooth cleaning, VPT				**Mean CFSS-DS** N2O : 40.00 CBT : 41.86 CTR : 43.00 **Mean VCAS** N2O : 22.73 CBT : 26.77 CTR : 19.50 **Mean VCCS** N2O : 22.87 CBT : 27.37 CTR : 18.77 **Mean VPT** N2O : 4.67 CBT : 4.93 CTR : 4.71	**Mean VPT** N2O : 3.26 CBT : 2.33 CTR : 4.28						
Memory restructuring												
Pickrell et al., 2007	RT with LA (2 vts)					**Mean FIS :** **1st visit (after LA)** MR : 3.00 Neutral Discussion : 2.33 **2nd visit** **(memory of 1st visit)** MR : 2.75 Neutral Discussion : 2.95			**Behavior changes :** Improve : MR : 78% Neutral Discussion : 48% Worsen : MR : 22% Neutral Discussion : 52%			

No of studies	Design	Risk of Bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Distraction									
9	RCT	No serious risk of bias[1]	No serious inconsistency[3]	No serious indirectness[5]	No serious imprecision[6]	None	626	A significant effect for subjective anxiety and a non-significant for objective.	⊕⊕⊕O Moderate
Music									
5	RCT	No serious risk of bias[2]	No serious inconsistency[4]	No serious indirectness[5]	No serious imprecision[6]	None	300	A significantly effect on objective measures of anxiety and a non-significant on subjective anxiety levels.	⊕⊕⊕O Low
PDI									
3	RCT	No serious risk of bias	No inconsistency	No indirectness	No imprecision	None	186	A non-significant effect on subjective anxiety.	⊕⊕⊕⊕ High

[1]Five studies [28,39,40,54,64] were downgraded for lack of information on randomization of outcome measure, [2] Two studies [28,52] were downgraded for lack of information regarding randomization of outcome and two [53,74] for possible reporting bias, [3]No evidence of inconsistency as all studies use the same objective and subjective measures to evaluate fear and anxiety, [4]One study [74] downgraded for inconsistency in the group allocation, [5]No indirectness issues as all studies were conducted in children and assessed the effect of specific basic behavioral management techniques on objective and subjective fear and anxiety before and after dental treatment, [6]No serious issues for imprecision as all studies evaluated objective and subjective anxiety and fear using the same validated tools.