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REVIEW

EFFECTIVENESS OF MAGIC-BASED (THAUMATURGIC) TECHNIQUES IN REDUCING DENTAL ANXIETY AMONG CHILDREN ACROSS COGNITIVE DEVELOPMENTAL STAGES: A SYSTEMATIC REVIEW AND META-ANALYSIS

Eficacia de las técnicas mágicas (taumatúrgicas) para reducir la ansiedad dental en niños de diferentes etapas del desarrollo cognitivo: revisión sistemática y metaanálisis

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ABSTRACT

Background: Pediatric dental anxiety had remained a major barrier to care, with the need for brief non-pharmacologic strategies, especially during local anesthesia. Thaumaturgic techniques had been hypothesized to reduce procedure-proximal anxiety through attentional capture, positive affect, and expectancy modulation aligned with the cognitive developmental stages.

Material and Methods: Six databases were searched (inception to final run), reference lists and grey literature were screened, and authors were contacted for missing data. Two reviewers independently screened, extracted data and applied Cochrane RoB 2.0. Continuous outcomes were synthesised with random-effects models using mean difference (MD) or standardized mean difference (SMD) with 95% Cis.

Results: Four randomized trials (k = 4; N = 690) met inclusion. Trick-specific syntheses showed that the thumb-and-light routine produced a pooled MD = −3.40 (95% CI −6.18 to −0.61; I^2 = 95.9%; τ^2 = 7.76; prediction interval −13.35 to 6.55), the magic coloring book yielded SMD = −2.65 (95% CI −4.02 to −1.29; I^2 = 81.5%; τ^2 = 0.80), and the item-prediction routine yielded SMD = −4.73 (95% CI −5.74 to −3.72). Qualitative synthesis showed stage-contingent benefits (visual salience favoured younger children; rule-/prediction-based routines favoured older cohorts), larger effects *versus* minimal/standard comparators than versus active audio-visual distraction, and greater impact when timed to the injection moment.

Conclusions: Thaumaturgic techniques were associated with clinically meaningful, procedure-proximal reductions in pediatric dental anxiety, with magnitude conditioned by cognitive stage, trick family, and comparator stringency.

Keywords: *Pediatric dentistry; Dental anxiety; Magic; Local anesthesia; Cognition; Meta-analysis*

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RESUMEN

Antecedentes: La ansiedad dental pediátrica ha sido una barrera importante para la atención, lo que subraya la necesidad de estrategias breves no farmacológicas, especialmente durante la anestesia local. Se ha planteado la hipótesis de que las técnicas taumatúrgicas reducen la ansiedad ante el procedimiento mediante la captación de la atención, el afecto positivo y la modulación de las expectativas, en consonancia con las etapas del desarrollo cognitivo.

Materiales y métodos: Se realizaron búsquedas en seis bases de datos (desde su inicio hasta la última revisión), se examinaron las listas de referencias y la literatura gris, y se contactó a los autores para obtener datos faltantes. Dos revisores examinaron y extrajeron los datos de forma independiente, aplicando la prueba Cochrane RoB 2.0. Los resultados continuos se sintetizaron con modelos de efectos aleatorios utilizando la diferencia de medias (DM) o la diferencia de medias estandarizada (DME) con intervalos de confianza del 95 %.

Resultados: Cuatro ensayos aleatorizados (k = 4; N = 690) cumplieron los criterios de inclusión. Las síntesis específicas de trucos mostraron que la rutina de pulgar y luz produjo una MD combinada = −3,40 (IC del 95 % −6,18 a −0,61; I^2 = 95,9 %; τ^2 = 7,76; intervalo de predicción −13,35 a 6,55), el libro mágico para colorear arrojó una SMD = −2,65 (IC del 95 % −4,02 a −1,29; I^2 = 81,5 %; τ^2 = 0,80) y la rutina de predicción de elementos arrojó una SMD = −4,73 (IC del 95 % −5,74 a −3,72). La síntesis cualitativa mostró beneficios dependientes de la etapa de desarrollo (la prominencia visual favoreció a los niños más pequeños; las rutinas basadas en reglas/predicciones favorecieron a los grupos de mayor edad), mayores efectos en comparación con los comparadores mínimos/estándar que con la distracción audiovisual activa, y un mayor impacto cuando se sincronizaba con el momento de la inyección.

Conclusión: Las técnicas taumatúrgicas se asociaron con reducciones clínicamente significativas y próximas al procedimiento en la ansiedad dental pediátrica, cuya magnitud estuvo condicionada por la etapa cognitiva, el tipo de truco utilizado y la rigurosidad del comparador.

Palabras clave: *Odontología pediátrica; Ansiedad al tratamiento odontológico; Magia; Anestesia local; Metaanálisis*

INTRODUCTION

Dental anxiety in childhood is a common, clinically significant obstacle to care that compromises cooperation, heightens physiological arousal, extends the duration of procedures, and enhances the risk of iatrogenic events.[1] Epidemiologic estimates indicate that a sizeable number of preschool and school-aged children experience clinically significant dental fear, peaking in concert with times of rapid socio-emotional and cognitive development.[2]

In pediatric dentistry, local anesthesia (LA) injection and other stages of treatment proximal to needles are uniformly reported to be the most anxiety-provoking aspects of care; these moments represent high-value targets for brief, non-pharmacological behavior-guidance strategies that can be provided chairside using no special equipment.[3] Standardized instruments, including the Children's Fear Survey Schedule–Dental Subscale, the Venham Picture Test, the Facial Image Scale, and procedure-proximal physiological indices like heart rate, permit

quantification of both subjective distress and autonomic activation, thereby enabling rigorous assessment of intervention effects within and across studies.[4]

"Thaumaturgic" techniques-structured, age-tuned *"magic-trick"* routines enacted by the clinician to capture attention, elicit positive affect, and build rapid rapport-represent a distinctive subclass of distraction-cum-engagement strategies with growing uptake in pediatric medical and dental contexts.[5] The theoretical rationale is multipronged. First, attentional control accounts predict that salient, surprising stimuli reduce the processing of nociceptive and threat-relevant cues, thereby attenuating anticipatory and procedural anxiety.[6]

Second, affect as information models posit that positive emotion induced by humor, curiosity, and mastery expectation can recalibrate threat appraisal and increase pain tolerance.[7] Third, expectancy and social-learning mechanisms suggest that an engaging, competent clinician who can reliably *"violate"* benign expectations (e.g., making a light appear from a thumb) enhances perceived control and fosters cooperative behavior in children otherwise prone to oppositionality under stress.[8] Importantly, these mechanisms are not mutually exclusive and may operate synergistically during brief clinical encounters.

These considerations together motivate a developmentally stratified synthesis focused on clinically salient moments of distress. An evidence framework that explicitly maps trick typology to cognitive stage, anchors outcomes to validated, procedure-proximal instruments, and benchmarks against standard non-pharmacologic comparators can refine guidance for chairside practice and inform training curricula in pediatric dentistry.[1,3,9-10]

It should also quantify between-study heterogeneity, explore moderators, such as cognitive stage, procedure type, trick family, and measurement domain, and test the robustness of pooled effects to risk-of-bias, small-study, and publication-bias influences.[6,7,11]

In this light, this systematic review and meta-analysis will evaluate the effectiveness of thaumaturgic techniques for reducing dental anxiety in children during dental procedures-with particular attention to LA injection-quantify pooled effects *versus* conventional behavior-guidance comparators, and estimate stage-contingent differentials and other mode-rators while appraising risk of bias and certainty of evidence.

MATERIALS AND METHODS

Registration and reporting framework

This systematic review and network meta-analysis had been prospectively registered with PROSPERO (CRD42024511937). Methods had been constructed a priori and reported according to PRISMA 2020 reporting guidelines.[12] The PECOS framework had been defined as follows:

Population (P): children aged 2-14 years undergoing dental procedures in clinical settings; analyses were planned a priori to align with cognitive developmental stages (pre-operational ≈2-7 years, concrete operational ≈7-11 years, early formal operational ≈11-14 years).

Exposure/Intervention (E): thaumaturgic (magic-based) behavior guidance techniques delivered chairside (e.g., thumb-and-light, magic coloring book, item-prediction), applied either during or immediately before anxiety-provoking procedural moments, particularly local anesthesia (LA) administration.

Comparator (C): minimal or standard non-magic behavior guidance (e.g., communicative management/tell-show-do) and, where available, active non-magic distraction (e.g., audio/video).

Outcomes (O): primary-post-procedure dental

anxiety measured with validated pediatric instruments (e.g., *Facial Anxiety Scale* [FAS], Raghavendra-Madhuri-Sujata Pictorial Scale [RMS-PS], Venham scales, Chhota-Bheem-Chutki pictorial scale); secondary-procedure-proximal physiologic arousal (heart or pulse rate, systolic/diastolic blood pressure), observer rated behavior, and acceptability.

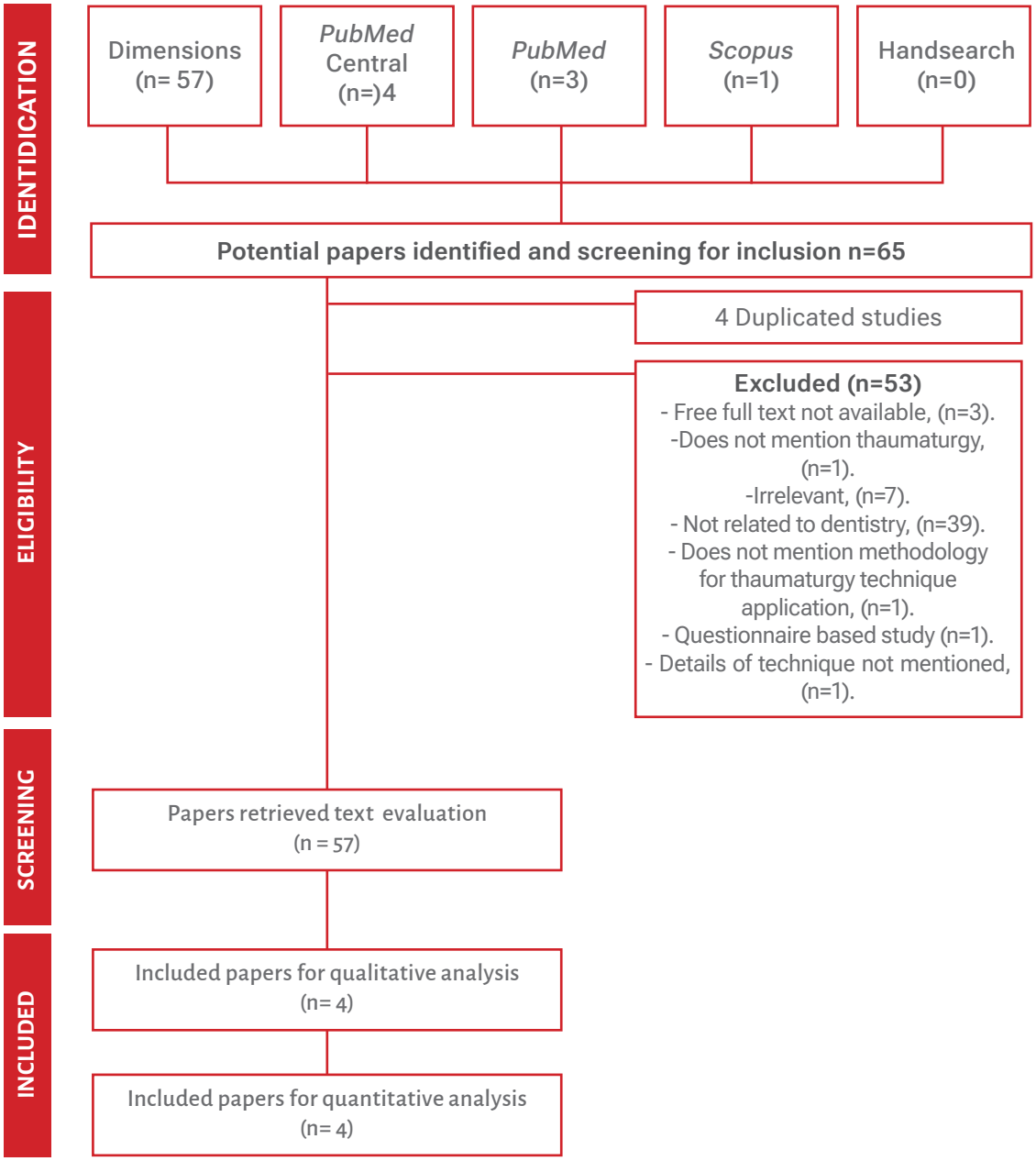
Study design (S): randomized controlled trials and quasi-experimental comparative studies; single-group pre-post studies had been retained for descriptive synthesis only.

Eligibility criteria

Studies had to meet the following criteria: enrolling human participants aged 2-14

Figure 1

Flowchart of the manuscript-screening process and their inclusion in the systematic review and statistical analysis



years; evaluating a thaumaturgic technique delivered by dental personnel; including a comparator group; and reporting at least one validated child anxiety outcome or physiologic correlate measured during the same visit as the intervention.

Non-comparative case reports/series, narrative or systematic reviews, conference abstracts without extractable data after attempts to contact authors, non-dental settings, interventions relying primarily on pharmacologic anxiolysis or restraint, and populations with conditions fundamentally altering anxiety assessment were all excluded. Articles not in English, studies outside clinical settings, and reports lacking adequate numeric data after contact with the author had been similarly excluded.

Information sources and search strategy

A comprehensive search was performed from database inception to the final search date, incorporating a 15-year recency filter at the primary run and a no-date sensitivity sweep to ensure capture. Six databases were queried: *PubMed/MEDLINE*, *Embase* (Embase.com or Ovid), *Cochrane Library* (CENTRAL and reviews), *Scopus, Web of Science* Core Collection, and Dimensions.

Controlled vocabulary (MeSH/Emtree) and free-text terms had been combined using Boolean operators and proximity operators, emphasizing constructs for *"magic/thaumaturgy," "distraction," "dental anxiety," "local anesthesia/injection," "child/adolescent,"* and named scales (FAS, RMS-PS, Venham). Filters had included English language, human studies, and pediatric age bands approximating 2-14 years; sex had not been restricted.

Data extraction and data items

Data had been extracted in duplicate with a piloted form. Extracted items included: study identifiers (first author, year, country, setting), design and recruitment period; participant characteristics (age, sex, prior dental experience), cognitive stage groupings; clinical context and procedural moment (e.g., inferior alveolar nerve block, other LA), intervention details (trick family, materials, duration, timing, deliverer, training), comparator type, and fidelity notes.

Outcome data comprised post-procedure anxiety scale (instrument, time-point, mean, SD, n), baseline anxiety (if available), physiologic measures (pulse/heart rate, blood pressure), observer-rated behavior scales, and adverse events. For multi-arm trials, arms were mapped to predefined trick families (thumb-and-light, magic coloring book, item-prediction) and to age-stage strata.

Risk of bias assessment

Two independent reviewers applied the RoB 2.0[13] to each randomized comparison by judging the risk for the following domains: randomization process; deviations from intended interventions, including blinding; missing outcome data; outcome measurement; and selection of reported results.

Statistical synthesis and meta-analysis

Because instruments differed across studies, the primary effect measure for continuous outcomes had been the standardized mean difference (Hedges g with small-sample correction). For physiologic outcomes measured on the same scale (e.g., pulse rate), mean differences had been used. Analyses had been performed in Meta-Analysis Online (MAO)[14] using a random-effects model; τ^2 had been estimated with the DerSimonian–Laird method, and 95% CIs had been calculated using the MAO default variance estimator. Heterogeneity had been quantified with I^2 and τ^2, and 95% prediction intervals had been reported when $k \geq 2$.

Figure 2

Thumb-and-Light (visual light-thumb trick): continuous outcomes (lower = less anxiety)

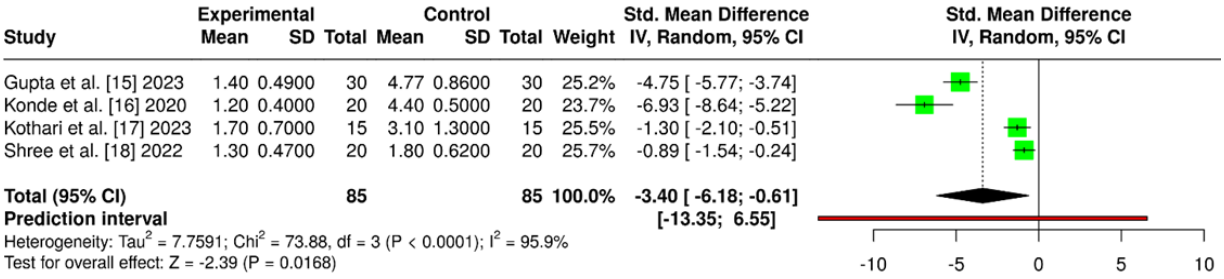


Figure 3

Magic Coloring Book: continuous outcomes (lower = less anxiety)

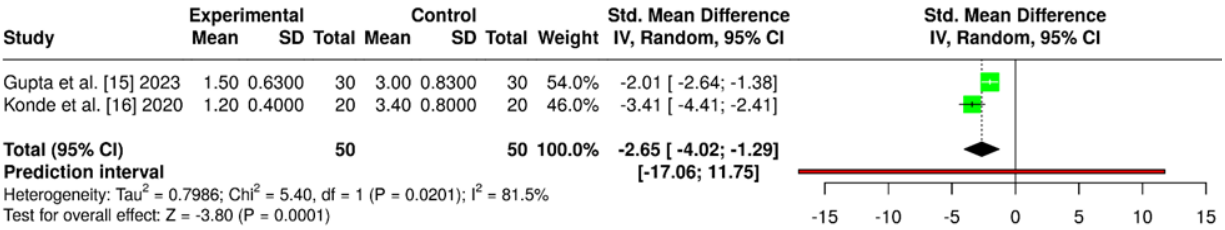


Figure 4

Item Prediction: continuous outcomes (lower = less anxiety)

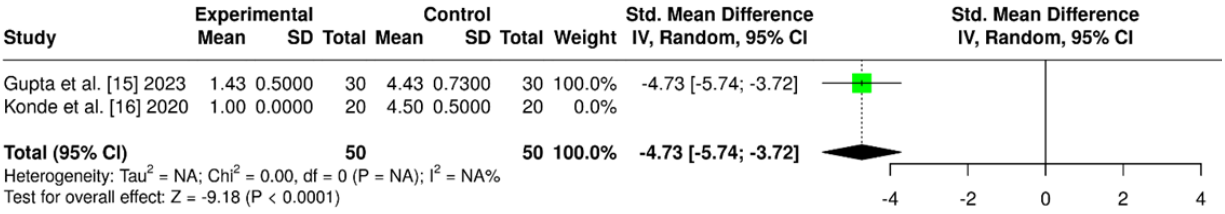
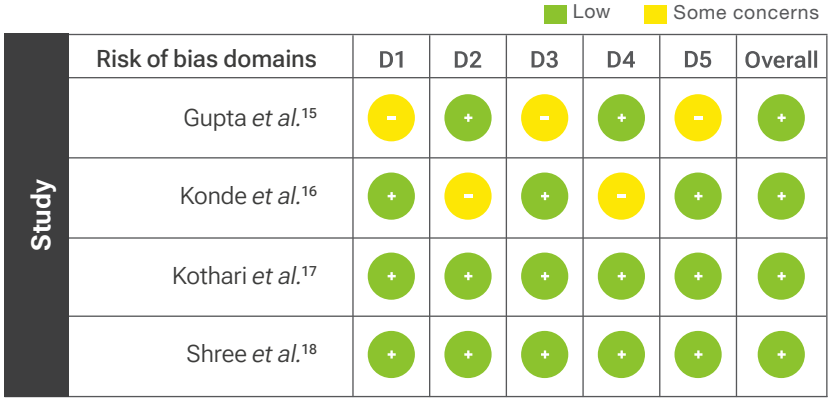


Figure 5

Bias levels assessed



Domains:
D1. Bias arising from the randomization process. **D2.** Bias due to deviations from intended intervention. **D3.** Bias due to missing outcome data. **D4.** Bias in measurement of the outcome. **D5.** Bias in selection of the reported result.

RESULTS

As shown through Figure 1, the database search retrieved 65 records (Dimensions = 57, *PubMed Central* = 4, *PubMed* = 3, *Scopus* = 1, handsearch = 0). Four studies ultimatly[15-18] fulfilled all the eligibility criteria and were included for the review.

Demographic variables assessed (Table 1)

All trials were conducted in India[15-18] in institution-based dental college clinics[15-16,18] and a tertiary dental hospital,[17] and all employed randomized controlled designs.[15-18] The recruitment period was NR for two datasets,[15-16] ~2021–2022 for one dataset,[17] and 2022 for one dataset.[18] The age range spanned 2–13 years,[15-16] 4–6 years,[17] and 4–13 years,[18] with explicit developmental sub-age strata of 2–7, 7–11, and 11–13 years specified to align analyses with cognitive stages.[15-16] The sample sizes were 360 (120 per stratum),[15] 240 (80 per stratum),[16] 30,[17] and 60.[18] Sex distribution was 15:15 (male: female),[17] approximately 1:1,[18] and NR in two datasets.[15-16]

Technique and assessment synthesis

The intervention portfolio consisted of thumb-and-light routines,[15-18] the magic coloring book routine,[15-16] and the item-prediction routine,[15-16] while comparators included no-magic control conditions,[15-16] conventional communicative management,[17] and audio/audio-video distraction arms.[18]

Randomization/allocation involved a multi-arm randomized framework,[15] random assignment with limited procedural detail,[16] 1:1 randomization with assessor blinding for behavior scales,[17] and sealed-envelope allocation by independent allocators.[18] The out-come measures included the Facial Anxiety Scale (FAS),[15-16] the Raghavendra-Madhuri-Sujata Pic-torial Scale (RMS-PS),[17] the Venham anxiety/behavior scale,[17] and the Chhota-Bheem–Chutki pictorial scale,[18] while timing captured pre-/post-procedure assessments,[15] pre-LA and post-LA assessments,[16] baseline and immediate post-IANB assessments,[17] and pre- and post-LA on the first visit assessments.[18]

Meta-Analysis observations

The random-effects synthesis for the thumb-and-light trick showed a significant post-procedure anxiety reduction *versus* comparators, with a pooled mean difference of −3.40 (95% CI, −6.18 to −0.61; Z = −2.39, p= 0.017), where negative values favoured thaumaturgy (lower scores = less anxiety). All four studies individually showed effects in the same direction, with the greatest decreases observed in the school-aged cohorts using thumb-and-light against minimal/no-magic controls and the smallest decrease when thumb-and-light was tested against an active audio-visual distraction comparator. Between-study heterogeneity was very high (τ^2 = 7.76; χ^2 = 73.88, df = 3, p< 0.0001; I^2 = 95.9%), and the prediction interval (−13.35 to 6.55) was wide and crossed the null, indicating that true effects may vary substantially across settings.

The random-effects meta-analysis of the Magic Coloring Book trick (two RCTs in children predominantly in the concrete-operational stage, ~7-11 y) resulted in a large and statistically significant anxiolytic effect *versus* minimal/no-magic controls, with a pooled standardized mean difference (SMD) = -2.65 (95% CI -4.02 to -1.29; Z = -3.80, p =0.0001), where negative values indicated lower post-procedure anxiety in the intervention. Both studies favoured the trick individually (SMDs ≈ -2.01 and -3.41).

Between-study heterogeneity was high (τ^2 = 0.80; χ^2 = 5.40, p = 0.020; I^2 = 81.5%), and the prediction interval (-17.06 to 11.75) was wide and crossed the null, suggesting substantial variability in true effects across settings.

The random-effects synthesis for the Item-

Table 1

Variables pertaining to assessed techniques and their observed correlation with anxiety

Author	Study design/ Type	Age range (year)	Sub-age groups	Sample size (N)	Sex (M: F)	Interventions	Comparator(s)	Randomizarator(s) arms allocated	Out-come measures	Timing	Age-stage mapping of effect	Core statistics	Effect sumary	Overall inference drawn
Gupta et al.[15]	RCT	2–13	2–7; 7– 11; 11–13	360 (120 perstratum)	NR	Same three thaumaturgic tricks; **Control**	Control	Randomised multiarm trial (methods summarized)	FAS (pre/ post)	Pre-and post procedure	Replicates stage-specific pattern (2–7: thumb/book; 7–11: book/ item; 11–13: item)	Student's *t*-tests; ANOVA; $p<0.05$	Post - operative comparisons across all groups significant; pairwise *versus* control significant	Strong, consistent reduction; supports cognitive-stage tailoring of thaumaturgy
Konde et al.[16]	Parallel-group RCT, institution-based (original research)	2–13	2–7; 7–11; 11–13	240 (80 per stratum)	NR	Thumb-and-light; Magic coloring book; Item prediction trick; **Control**	Control (no thaumaturgy)	Random assignment stated (details NR)	FAS scores (pre/post)	Pre-LA and post-LA visit	2–7: thumb/book better; 7–11: book/ item better;11–13: item only better	Paired *t*-tests; ANOVA with Tukey HSD; α=0.05	Significant anxiety reduction *versus* pre and *versus* control (age-dependent pattern)	Age-contingent efficacy: align trick to cognitive stage for maximal anxiety reduction
Kothari et al.[17]	RCT	4–6	N/A	30	15:15	**Thaumaturgic aid** (thumb-light) during IANB + conventional non-pharmacological guidance	Conventional non-pharmacological guidance only (communicative/euphemisms)	Randomized 1:1; assessor blinding for behavior scale reported; single-center	RMS-PS; Venham's anxiety/behavior; pulse rate	Baseline and immediately after IANB	4–6 y cohort only (no stage split)	Paired and unpaired t-tests; α=0.05	Greater post-IANB reductions with thaumaturgy *versus* control: Δ pulse −8.7 bpm; Δ Venham −1.2; Δ RMS-PS −1.3; all significant	Magic trick meaning fully reduces anxiety during IANB in anxious 4–6-year-olds
Shree	Three-arm randomized allocation	4–13	(Frankl 3-4 cohort)	60	~1:1	Thumb-and-light trick; audio; audio-video (cartoons)	Between-group (three-arm)	Random allocation via sealed envelopes (two independent allocators)	Chotta Bheem–Chutki pictorial anxiety scale (pre/post)	Pre- and post-LA on first visit	No cognitive strata; cohort 4–13 years	Kruskal-Wallis; Wilcoxon;Mann–Whitney post-hoc; $p<0.05$	Magic > audio-video > audio in anxiety reduction; intergroup p<0.05	Thumb-light thaumaturgy outperforms standard passive/AV distraction for first-visit LA

RCT: Root Canal Treatment. **N/A:** No aplicable. **M:** Male. **F:** Female. **LA:** local anesthesia. **FAS:** Facial Anxiety Scale.

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Prediction trick found an extremely large decrease in post-procedure anxiety compared with control, where the pooled SMD = -4.73 (95% CI -5.74 to -3.72; Z = -9.18, $p < 0.0001$), with negative values favouring thaumaturgy (lower scores = less anxiety). While two RCTs were included, heterogeneity could not be approximated (τ^2 and I^2 not applicable), since one trial exhibited near-zero within-group variance and contributed essentially no weight; accordingly, the pooled estimate was driven by the better-powered study in older children.

Bias levels assessed

Risk of bias, assessed with Cochrane RoB 2.0 across five domains, was predominantly low for the included trials (Figure 5). Two studies[17-18] were judged low risk in all domains: D1, randomization process; D2, deviations from intended interventions; D3, missing outcome data; D4, outcome measurement; and D5, selection of the reported result, reflecting adequate random sequence generation/allocation, protocol-concordant delivery of brief chairside interventions, near-complete outcome capture within the same visit, use of validated pediatric anxiety scales, and prespecified analyses.

DISCUSSION

Thaumaturgic techniques - short, performance-based "magic trick" illusions delivered chairside - had been described as sitting at the crossroads of pediatric behavior guidance, child cognitive development, and procedural pain management, and were most easily understood as simple tools that redirect attention, change emotion, and shape expectations in the moment.[19] In pediatric dentistry, dental anxiety had been viewed as a shifting state influenced by a child's underlying temperament, previous dental or medical experiences and the immediate situation in the operatory; thaumaturgy was deliberately used to target the child's real-time thoughts and interpretations that made the procedure feel more threatening at the chairside.[20-22]

From a mechanistic point of view, thaumaturgy had been hypothesised to operate via at least four overlapping pathways: capturing the child's attention from the out-side with surprise or novelty, helping the child voluntarily focus on the trick or task, changing how the child felt through humour or curiosity and using the interaction to build a rapid, positive relationship and a sense that the clinician was skilled and trustworthy.[23]

Accounts rooted in expectation and prediction error further suggested that gentle, clearly benign *"violations"* of expectation-such as making a light appear or disappear-might update the child's prior assumptions about the situation just before something painful or uncomfortable, leading to a smaller defensive response.[24]

Neurocognitive models had been used to make these ideas more plausible. Shifting attention away from threatening cues in the room could reduce activity in brain regions linked with fear (such as the amygdala) and change how strongly the salience network flagged the procedure as dangerous, while positive emotion and a sense of control might activate descending pain-control systems that reduce incoming pain signals during brief procedures.[25-28] Fast, interactive engagement with the child might also support top-down regulation from prefrontal areas in school-aged children who had enough executive capacity, while at the same time working through more basic, bottom-up distraction mechanisms in younger children.[29-31]

Issues of implementation extended beyond mechanisms. Training for clinicians had to cover

basic infection control and hygiene for props, the best timing in relation to key procedural steps (for example, during topical application *versus* immediately before needle insertion), age appropriate wording, and how to stop or switch strategies smoothly if the child's interest faded.[32] Maintaining fidelity required short, repeatable scripts with clear starting and ending points, but also enough flexibility to respond to each child's signals; practical tools such as brief checklists and micro-skills (including eye contact, pacing and voice tone) could help standardise delivery without making it feel artificial.[33] Ethical practice required openness with parents, seeking assent from the child as far as possible, avoiding any sense of coercion, and being sensitive to children who disliked surprise or did not want to take part; the use of *"magic"* was intended to support coping, not to bypass consent or dismiss clear signs of distress.[34]

Future studies might use dismantling designs to separate and test individual components-such as the visual aspect of the trick, the social engagement, and the narrative that shapes expectations-and examine how each part contributed to outcomes by measuring attention and affect at the same time.[35-39] Beyond average effects, a precision behaviour-guidance approach that examined moderators such as baseline anxiety, temperament, previous dental experiences and neurodevelopmental characteristics would make it possible to match specific tricks or styles of thaumaturgy to individual children and to improve chairside decision-making.[40]

Pragmatic and cluster-randomised trials in routine clinics, with methods that properly handled group sessions and operator-related clustering, would increase external validity and support decisions at service and policy level.[41-46] In contexts where multiple families of tricks co-existed and shared control groups, network meta-analytic approaches could compare these families indirectly, assess global and local consistency, and draw inferences under appropriate assumptions of transitivity and connectivity.[47-51]

Limitations

The evidence base had been limited by a small number of single-country trials, high between-study heterogeneity, variable outcome instruments and timing, and incomplete reporting of allocation concealment and blinding. Active comparator arms reduced apparent effect sizes and complicated cross-study pooling. Dichotomous responder definitions and longer-term outcomes were seldom reported, and publication bias could not be reliably assessed (k <10).

CONCLUSIONS

Thaumaturgic behaviour modification techniques significantly reduce anxiety in children undergoing dental procedures. The effect is most pronounced when interventions are cognitively tailored to age groups. Thaumaturgic techniques have been beneficial in managing the behaviour of children at various age groups. While imaginative tricks fascinate the younger children, older children require logical reasoning to maintain interest and reduce anxiety in clinical settings. This indicates that thaumaturgic techniques are age sensitive and developmentally dependent.

REFERENCES

1. Grisolia BM, Dos Santos APP, Dhyppolito IM, Buchanan H, Hill K, Oliveira BH. Prevalence of dental anxiety in children and adolescents globally: A systematic review with meta-analyses. Int J Paediatr Dent. 2021;31(2):168-183. https://doi.org/10.1111/ipd.12712. Epub 2020 Sep 9. PMID: 33245591.
2. Nakai Y, Hirakawa T, Milgrom P, Coolidge T, Heima M, Mori Y, Ishihara C, Yakushiji N, Yoshida T, Shimono T. The Children's Fear Survey Schedule-Dental Subscale in Japan. Community Dent Oral Epidemiol. 2005;33(3):196-204. https://doi.org/10.1111/j.1600-0528.2005.00211.x.
3. Forehand R, Long N. Strong-willed children: a challenge to parents and pediatric dentists. Pediatr Dent. 1999;21(7):463-8. PMID: 10633525.
4. Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. Int J Paediatr Dent. 2007;17(6):391-406. https://doi.org/10.1111/j.1365-263X.2007.00872.x.
5. Hart R, Walton M. Magic as a therapeutic intervention to promote coping in hospitalized pediatric patients. Pediatr Nurs. 2010 J;36(1):11-6; quiz 17. PMID: 20361440.
6. Peretz B, Gluck G. Magic trick: a behavioural strategy for the management of strong-willed children. Int J Paediatr Dent. 2005;15(6):429-36. https://doi.org/10.1111/j.1365-263X.2005.00668.x. PMID: 16238653.
7. CH CK, Priya Nagar PH, Mascarenhas AN. Magic: A modern alleviating constituent of anxiety levels in children. J South Asian Assoc Pediatr Dent 2022;5(3):121–126. https://doi.org/10.5005/jp-journals-10077-3241
8. Jain V, Sarkar S, Saha S, Haldar S. Basic behaviour guidance factors and techniques for effective child management in dental clinican update review. Int J Oral Health Med Res. 2016;2(6):177-182.
9. Lamarca GA, Vettore MV, Monteiro da Silva AM. The Influence of Stress and Anxiety on the Expectation, Perception and Memory of Dental Pain in Schoolchildren. Dent J. 2018; 6(4):60. https://doi.org/10.3390/dj6040060. PMID: 30360395; PMCID: PMC6313345.
10. Marwah N, Prabhakar AR, Raju OS. Music distraction--its efficacy in management of anxious pediatric dental patients. J Indian Soc Pedod Prev Dent. 2005;23(4):168-70. https://doi.org/10.4103/0970-4388.19003. PMID: 16327136.
11. Ram D, Peretz B. Administering local anaesthesia to paediatric dental patients -current status and prospects for the future. Int J Paediatr Dent. 2002;12(2):80-9 https://doi.org/10.1046/j.1365-263x.2002.00343.x. PMID: 11966886.
12. Page MJ, Moher D, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Shamseer L, Tetzlaff JM, Akl EA, Brennan SE, Chou R, Glanville J, Grimshaw JM, Hróbjartsson A, Lalu MM, Li T, Loder EW, Mayo-Wilson E, McDonald S, McGuinness LA, Stewart LA, Thomas J, Tricco AC, Welch VA, Whiting P, McKenzie JE. PRISMA 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. BMJ. 2021;372:n160. https://doi.org/10.1136/bmj.n160. PMID: 33781993; PMCID: PMC8005925.
13. Sterne JAC, Savović J, Page MJ, Elbers RG, Blencowe NS, Boutron I, Cates CJ, Cheng HY, Corbett MS, Eldridge SM, Emberson JR, Hernán MA, Hopewell S, Hróbjartsson A, Junqueira DR, Jüni P, Kirkham JJ, Lasserson T, Li T, McAleenan A, Reeves BC, Shepperd S, Shrier I, Stewart LA, Tilling K, White IR, Whiting PF, Higgins JPT. RoB 2: a revised tool for assessing risk of bias in randomised trials. BMJ. 2019;366:l4898. https://doi.org/10.1136/bmj.l4898. PMID: 31462531.
14. Fekete JT, Győrffy B. Meta Analysis Online.com: Web-Based Tool for the Rapid Meta-Analysis of Clinical and Epidemiological Studies. J Med Internet Res. 2025;27:e64016. https://doi.org/10.2196/64016. PMID: 39928123; PMCID: PMC11926438.
15. Gupta RK, Shah SG, Kaul B, Gupta A, Mahajan N. Comparative Evaluation of Impact of Three Different Thaumaturgic Behaviour Modification Techniques in Reduction of Anxiety at Three Different Stages of Cognition in Children Aged 2- 13 Years – A Randomised Clinical Trial. Int J Med Pharm Res. 2023;4(3): 761-766. https://doi.org/10.5281/zenodo.8080693

16. Konde S, Sumaiyya S, Agarwal M, Peethambar P. "Thaumaturgy" —A Novel Behavior— shaping Technique. Int J Clin Pediatr Dent. 2020; 13(4):318-321. https://doi.org/10.5005/jp-journals-10005-1781. PMID: 33149401; PMCID: PMC7586480.
17. Kothari P, Mathur A, Chauhan RS, Nankar M, Tirupathi S, Suvarna A. Effectiveness of thaumaturgic distraction in alleviation of anxiety in 4-6-year-old children during inferior alveolar nerve block administration: a randomized controlled trial. J Dent Anesth Pain Med. 2023;23(3):143-151. https://doi.org/10.17245/jdapm.2023.23.3.143. PMI D: 37313267; PMCID: PMC10260356.
18. Shree CC, Pooja H, Mascarenhas AN. Magic: A Modern Alleviating Constituent of Anxiety Levels in Children. J South Asian Assoc Pediatr Dent 2022; 5 (3):121-126.
19. Narayan VK, Samuel SR. Appropriateness of various behavior rating scales used in pediatric dentistry: A Review. J Global Oral Health. 2019;2(2):112-7. https://doi.org/10.25259/JGOH_64_2019.
20. Asokan S, Priya PG, Natchiyar SN, Elamathe M. Effectiveness of distraction techniques in the management of anxious children–A randomized controlled pilot trial. J Indian Soc Pedod Prev Dent. 2020;38(4):407-12. https://doi.org/10.4103/JISP P D. JISPPD_435_20.
21. Swarna K, Prathima GS, Suganya M, Sanguida A, Selvabalaji A. Recent advances in non-phar. macological behaviour management techniques in children–an overview. IOSR-JDMS. 2019;18:18-21. https://doi.org/10.9790/0853-1805101821
22. Allani S, Setty JV. Effectiveness of distraction techniques in the management of anxious children in the dental operatory. IOSR-JDMS. 2016;15(10):69-73. https://doi.org/10.9790/0853-1510026973.
23. Prabhakar AR, Marwah N, Raju OS. A comparison between audio and audiovisual distraction techniques in managing anxious pediatric dental patients. J Indian Soc Pedod Prev Dent. 2007;25(4):177-82. https://doi.org/10.4103/0970-4388.37014. PMID: 18007104.
24. McCaul KD, Malott JM. Distraction and coping with pain. Psychol Bull. 1984;95(3):516-33. PMID: 6399756.
25. Aitken JC, Wilson S, Coury D, Moursi AM. The effect of music distraction on pain, anxiety and behavior in pediatric dental patients. Pediatr Dent. 2002;24(2):114-8. PMID: 11991313.
26. Lekhwani PS, Nigam AG, Marwah N, Jain S. Comparative evaluation of Tell-Show-Do technique and its modifications in managing anxious pediatric dental patients among 4-8 years of age. J Indian Soc Pedod Prev Dent. 2023;41(2):141-148. https://doi.org/10.4103/jisppd.jisppd_242_23. PMID: 37635473.
27. Sadeghi M, Sarlak H, Nakhostin A, Almasi-Hashiani A. Which audio distraction technique is more effective for reduction the pain and anxiety of pediatric dental patients; "music" or "kids-story"? A randomized split-mouth crossover clinical trial. J Psychosom Res. 2023;168:111218. https://doi.org/10.1016/j.jpsychores.2023.111218. Epub 2023 Mar 11. PMID: 36924571.
28. Alsibai E, Bshara N, Alzoubi H, Alsabek L. Assessing an active distracting technique during primary mandibular molar pulpotomy (randomized controlled trial). Clin Exp Dent Res. 2023;9(2):283-289. https://doi.org/10.1002/cre2.702. Epub 2022 Dec 8. PMID: 36478192; PMCID: PMC10098273.
29. Bagher SM, Felemban OM, Alandijani AA, Tashkandi MM, Bhadila GY, Bagher AM. The effect of virtual reality distraction on anxiety level during dental treatment among anxious pediatric patients: a randomized clinical trial. J Clin Pediatr Dent. 2023;47(4):63-71. https://doi.org/10.22514/jocpd.2023.036. PMID: 37408348.
30. Linthoingambi A, Harsimran K, Rishika C, Ramakrishna Y. Effectiveness of intellectual color game, audio-visual and stress ball distraction methods on gagging and anxiety management in children. J Clin Pediatr Dent. 2022;46(6):6-10. https://doi.org/10.22514/jocpd. 2022.019. Epub 2022 Nov 1. PMID: 36624898.
31. Garrocho-Rangel A, Rosales-Bérber M, Ríos-Méndez D, Flores-Velázquez J, Trejo-Herbert D, Pozos-Guillén F, Pozos-Guillén A. Dog-Assisted Therapy (DAT) for the management of anxiety during paediatric dental care. A scoping review. Eur J Paediatr Dent. 2024;25(2):120-125. https://doi.org/10.23804/ejpd.2024.2001. Epub 2024 Mar 1. PMID: 38501910.

32. Tirupathi S, Krishna N, Rajasekhar S, Nuvvula S. Eye Movement Distraction: A New Distraction Technique for Management of Dental Anxiety during Intraoral Local Anesthesia Administra-tion in Children. Int J Clin Pediatr Dent. 2019; 12(6):507-509. https://doi.org/10.5005/jp-journa-ls-10005-1690. PMID: 32440064; PMCID: PMC722 9387.
33. Aggarwal P, Mathur S, Chopra R. Assessment of Medical Clowning in Influencing the Anxiety and Behavior Scores of Children Undergoing Various Dental Treatments and the Stress Levels of the Operator. Int J Clin Pediatr Dent. 2024;17(1):59-66. https://doi.org/10.5005/jp-journals-10005-2758. PMID: 38559870; PMCID: PMC10978511.
34. Chhabra N, Chhabra A, Walia G. Prevalence of dental anxiety and fear among five to ten year old children: a behaviour based cross sectional study. Minerva Stomatol. 2012;61(3):83-9. PMID: 22402299.
35. Navit S, Johri N, Khan SA, Singh RK, Chadha D, Navit P, Sharma A, Bahuguna R. Effectiveness and Comparison of Various Audio Distraction Aids in Management of Anxious Dental Paediatric Patients. J Clin Diagn Res. 2015;9(12):ZC05-9. https://doi.org/10.7860/JCDR/2015/15564.6910. PMID: 26816984; PMCID: PMC-4717707.
36. Kaur R, Jindal R, Dua R, Mahajan S, Sethi K, Garg S. Comparative evaluation of the effectiveness of audio and audiovisual distraction aids in the management of anxious pediatric dental patients. J Indian Soc Pedod Prev Dent. 2015; 33(3):192-203. https://doi.org/10.4103/0970-4388.160357. PMID: 26156272.
37. Bahrololoomi Z, Sadeghiyeh T, Rezaei M, Maghsoudi N. The Effect of Breathing Exercise Using Bubble Blower on Anxiety and Pain during Inferior Alveolar Nerve Block in Children Aged 7 to 10 Years: A Crossover Randomized Clinical Trial. Pain Res Manag. 2022;2022:7817267. https://doi.org/10.1155/2022/7817267. PMID: 350 82960; PMCID: PMC8786543.
38. Leyda-Menéndez AM, Vidigal EA, Abanto J, Ribelles-Llop M. Efficacy of two behavioural management techniques during inferior alveolar nerve block administration in pre-school children: a randomised clinical trial. Eur Arch Paediatr Dent. 2023;24(1):85-93. https://doi.org/10.1007/s40368-022-00758-y. Epub 2022 Oct 19. PMID: 36260279.
39. Lam MT, Lam HR, Chawla L. Application of magic in healthcare: A scoping review. Complement Ther Clin Pract. 2017;26:5-11. https://doi.org/10.1016/j.ctcp.2016.11.002. Epub 2016 Nov 2. PMID: 28107850.
40. Thosar NR, Bane SP, Deulkar PV, Deshpande MA, Gupta S. Effectiveness of Two Different Behavior Modification Techniques for Anxiety Reduction in Children. Cureus. 2022;14(8):e28141. https://doi.org/10.7759/cureus.28141. PMID:36134077; PMCID: PMC9482440.
41. Sharma V, Dutta B, Bagchi A, Shroff Y. Pedia tricks -Out-of-the-box thinking in paediatric dentistry. Indian J Dent Res. 2023;34(3):317-319. https://doi.org/10.4103/ijdr.ijdr_986_22. PMID: 3 8197355.
42. Lekhwani P, Tirupathi S, Afnan L. Thaumaturgical Distraction as a Modality for Reducing Dental Anxiety in Children: A Systematic Review. Int J Clin Pediatr Dent. 2024;17(11):1296-1301. https://doi.org/10.5005/jp-journals-10005-2998. Epub 2024 Dec 19. PMID: 39781396; PMCID: PMC11703761.
43. Jorge V. Use Of Magic as An Alternative in Behavioral Management in Pediatric Dentistry. ADOH. 2023; 16(4):555942. https://doi.org/10.19080/ADOH.2023.16.555942
44. Fatma N. Contemporary Distraction Tools Used In Pediatric Dentistry: An Overview. Univ J Dent Sciences2021;7(3). https://doi.org/10.21276/ujds.2021.7.3.28
45. Panda S, Quadri MFA, Hadi IH, Jably RM, Hamzi AM, Jafer MA. Does Dental Fear in Children Predict Untreated Dental Caries? An Analytical Cross-Sectional Study. Children (Basel). 2021;8(5):382. https://doi.org/10.3390/children8050382. PMID: 34066175; PMCID: PMC8151813.
46. Tsomu K, Rajain T, Namdev R, Kumar A. Evaluation of dental fear among pediatric age group and parental anxiety using validated assessment scales. Int J Pedod Rehabil 2020;5:1-6. https://doi.org/10.4103/ijpr.ijpr_2_20
47. Eregowda NI, Naidu SY, Parameshwarappa P, Kenchappa M, Korishettar R, S. KRB. An evaluation study of behavioural management technique-thaumaturgy, live modeling and tell show do. Int J Contemp Pediatr. 2023;10(6):866-872. https://doi.org/10.18203/2349-3291.ijcp202 3 1491

48. Zhu M, Yu H, Xie B, Li H, He Q, Li H, Su J, Li X. Experiential learning for children's dental anxiety: a cluster randomized trial. BMC Oral Health. 2020;20(1):216. https://doi.org/10.1186/s1-2-903-020-01204-5. PMID: 32736555; PMCID: PMC7395402.
49. Godbole RR, Khairwa AB, Bhat MA, Shekhawat DI, Garg AA. The futuristic era of paediatric dentistry: A review. J Clin Diagn Res. 2022 Nov 1;16(11):1-5.
50. Kohli N, Hugar SM, Soneta SP, Saxena N, Kadam KS, Gokhale N. Psychological behavior management techniques to alleviate dental fear and anxiety in 4-14-year-old children in pediatric dentistry: A systematic review and meta-analysis. Dent Res J (Isfahan). 2022 Jun 1;19:47. PMID: 35915712; PMCID: PMC9338387.
51. Dahlan M, Alsaywed R, Alamoudi R, Batarfi AA, Basodan OY, Gazzaz Y, Alqarni YA, Alamoudi A. Assessment of Different Distraction Behavioral Methods in Pediatric Dental Clinic: A Systematic Review. Cureus. 2023 Jul 24;15(7):e42366. https://doi.org/10.7759/cureus.42366. PMID: 37621781; PMCID: PMC10445507.

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The authors declare no conflict of interest.

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Gauri Shingi: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Writing – original draft.
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Supplementary Table 1

Search strings assessed across the databases

Database	Final search string (distinct per source)
PubMed/MEDLINE	(*"Distraction Techniques"*[Mesh] OR *"thaumaturg"**[tiab] OR *"magic"*[tiab] OR *"magic trick"**"[tiab] OR *"thumb light"*[tiab] OR *"light thumb"*[tiab] OR *"magic coloring book"*[tiab] OR *"item prediction"* [tiab]) AND (*"Anxiety, Dental"*[Mesh] OR "dental anxi"*[tiab] OR *"Facial Anxiety Scale"* [tiab] OR *FAS*[tiab] OR *"Venham"* [tiab] OR RMS-PS[tiab]) AND (*"Anesthesia,* Local" [Mesh] OR "injection"*[tiab] OR *IANB*[tiab]) AND (*"Child"* [Mesh] OR *"child"**[tiab] OR *"adolescent"* [tiab]) AND (*"Dentistry"* [Mesh] OR *"dental"* [tiab]). Filters: English; Humans; last 15 years; ages 2–14.
Embase (Embase.com/Ovid)	("*distraction'*/exp OR *thaumaturg"**:ti,ab OR *magic:ti*,ab OR *"magic trick"**":ti,ab OR *"thumb light"*:ti,ab OR *"magic coloring book"*:ti,ab OR "item prediction":ti,ab) AND (*'dental anxiety'*/ exp OR (*dental* NEXT/2 anxi*):ti,ab OR FAS:ti,ab OR *Venham:ti*,ab OR *'pictorial scale'*:ti,ab) AND (*'local anesthesia'*/exp OR inject*:ti,ab OR IANB:ti,ab) AND ('child'/exp OR "child"*: ti,ab OR adolescent*:ti,ab) AND ('dentistry'/exp OR dental:ti,ab). Limits: English; human; publication year last 15 years.
Cochrane Library (CENTRAL)	(MeSH descriptor: [Distraction Techniques] explode all *trees* OR *thaumaturg**:ti,ab,kw OR *magic*:ti,ab,kw OR *"magic trick*"*:ti,ab,kw OR *"thumb light"*:ti,ab,kw OR *"magic coloring book"*:ti,ab,kw OR *"item prediction"*:ti,ab,kw) AND (MeSH descriptor: [Anxiety, Dental] explode all *trees* OR *dental* NEAR/2 anxi*:ti,ab,kw OR FAS:ti,ab,kw OR Venham:ti,ab,kw) AND (MeSH descriptor: [*Anesthesia, Local*] explode all trees OR *inject**:ti,ab,kw OR IANB:ti,ab,kw) AND (MeSH descriptor: [Child] explode all trees) AND (MeSH descriptor: [*Dentistry*] explode all trees).
Scopus	TITLE-ABS-KEY(magic OR thaumaturg* OR "magic trick*" OR "thumb light" OR "light thumb" OR "magic coloring book" OR "item prediction") AND TITLE-ABS-KEY("dental anxi*" OR "Facial Anxiety Scale" OR venham OR "pictorial scale" OR RMS-PS) AND TITLE-ABS-KEY("local anesthe*" OR inject* OR IANB) AND TITLE-ABS-KEY(child* OR adolescent*) AND TITLE-ABS-KEY(dental). Filters: English; last 15 years; document types = article/trial.
Web of Science Core Collection	TS=(magic OR thaumaturg* OR "magic trick*" OR "thumb light" OR "magic coloring book" OR "item prediction") AND TS=(dental NEAR/2 anxi* OR "Facial Anxiety Scale" OR Venham OR RMS-PS OR "pictorial scale") AND TS=(local NEAR/2 anesthe* OR inject* OR IANB) AND TS=(child* OR adolescent*) AND TS=(dental OR dentistry). Timespan: last 15 years; Language: English.
Dimensions	(full_data.search): (magic OR thaumaturg* OR "magic trick*" OR "thumb light" OR "magic coloring book" OR "item prediction") AND ("dental anxiety" OR "Facial Anxiety Scale" OR Venham OR RMS-PS OR "pictorial scale") AND ("local anesthesia" OR injection OR IANB) AND (child OR children OR pediatric OR adolescent) AND (dental OR dentistry). Filters: publication type = article/trial; year = last 15 years; language = English.