
Article:
Mac Giolla Phadraig, C. orcid.org/0000-0002-7797-1126, Ahmad Fisal, A.B. orcid.org/0000-0002-3655-123X, Bird, J. et al. (3 more authors) (2024) A scoping review of interventions and outcome measures in trials of dental behavior support. Special Care in Dentistry, 44 (3). pp. 676-685. ISSN 0275-1879

https://doi.org/10.1111/scd.12949

Received: 18 September 2023 | Revised: 27 November 2023 | Accepted: 29 November 2023

DOI: 10.1111/scd.12949

WILEY

SYSTEMATIC REVIEW

A scoping review of interventions and outcome measures in trials of dental behavior support

Caoimhin Mac Giolla Phadraig[1] | **Aisyah Binti Ahmad Fisal**[2] | **James Bird**[3] | **Pedro Vitali Kammer**[4] | **Isabel Fleischmann**[5] | **Andrew Geddis-Regan**[6]

[1]School of Dental Science, Trinity College Dublin, Dublin Dental University Hospital, Dublin, Ireland

[2]Department of Paediatric Dentistry and Orthodontics, Faculty of Dentistry, Universiti Malaya, Kuala Lumpur, Malaysia

[3]Sheffield Teaching Hospitals NHS Foundation Trust and School of Clinical Dentistry, The University of Sheffield, Sheffield, UK

[4]Federal University of Santa Catarina, Florianopolis, Brazil

[5]Trinity College Dublin, Dublin Dental University Hospital, Dublin, Ireland

[6]Manchester University NHS Foundation Trust, Manchester, UK

Correspondence
Caoimhin Mac Giolla Phadraig, School of Dental Science, Trinity College Dublin, Dublin Dental University Hospital, Dublin, Ireland.
Email: macgiolla@dental.tcd.ie

Registration Open Science Framework database: https://osf.io/v98kt

Abstract

Background: Dental behavior support (DBS) describes all techniques used by dental professionals to ensure that dental care is safe, effective, and acceptable. There is a need to standardize outcome measures across DBS techniques to reduce heterogeneity, limit selective reporting, promote consistency, and optimize outcomes across DBS research. A comprehensive review of existing measures is a prerequisite to understanding potential outcomes related to the area of interest.

Aim: This review had three aims: first, to identify the outcome measures (OMs) reported in trials of dental behavior support; second, to categorize the component DBS techniques reported within interventions according to emerging agreed terminology; and, third, to map outcome measures to intervention type.

Methods: A scoping review of trials evaluating DBS techniques was undertaken from 2012 to 2022. The review was prospectively registered. Studies were identified through Medline, Embase, and PsycINFO. Study abstracts were screened by two reviewers. Data were extracted by single selector. Outcome measures were sorted according to measurement domains (physiological, behavioral, psychological, and treatment). Responses were assimilated and summed to produce a refined list of distinguishable outcome measures. Intervention types were categorized according to accepted descriptors. Frequencies were presented; associations between outcome domain and DBS type were also reported (Chi-square test of independence).

Results: A total of 344 trials were included in the review from an initial 14,793 titles / title and abstracts screened. Most involved children ($n = 215$), most were from India ($n = 104$), involving basic dental care ($n = 117$). The median number of outcome measures per trial was four (range = 1–12); 1,317 individual outcomes were reported, categorized as: psychological ($n = 501$, 38.0%); physiological ($n = 491$, 37.3%), behavioral ($n = 123$, 9.3%) or, treatment-related ($n = 202$,

15.3%). DBS interventions were split between 239 (45.7%) pharmacological and 283 (54.1%) non-pharmacological; 96.6% of interventions mapped to accepted descriptors. A significant relationship was noted between the type of intervention and the outcome domain reported.

Conclusion: The findings demonstrate massive variation in outcome measures of DBS interventions that likely lead to unnecessary heterogeneity, selective reporting, and questionable relevance in the literature. A large range of DBS interventions were mapped according to BeSiDe list. There is a need for consensus on a core outcome set across the spectrum of DBS techniques.

KEYWORDS
anesthesia, cognitive behavioral therapy, dental anxiety, dental behavior support, dental phobia, sedation

1 | INTRODUCTION

Professional oral healthcare is important because it helps maintain and restore health, function, and quality of life. However, the delivery of such care can present a dilemma. While oral healthcare produces positive health outcomes, the experience of this same care can be difficult for patients, even traumatic. This is because dentistry can elicit pain, discomfort, stress, anxiety, and vulnerability, leading to a range of escape or avoidance behaviors, among other sequelae. While this dilemma probably impacts most patients to some degree, there are some groups, for whom, the potential impact is greater and the sequelae more impactful.[1–3] Many people with dental anxiety clearly fall into this category, as do young children, autistic people, those with intellectual disabilities, people who have experienced trauma, and frail older adults.[4–8]

It is incumbent on the dental profession, therefore, to improve patients' experiences of professional oral healthcare. One area that specifically focuses on this, is the field of dental behavior support (DBS). This term covers all techniques used by dental professionals to ensure that dental care is safe, effective, and acceptable. DBS techniques can be broadly classified as either environmental, communication-based, physical, or pharmacological. Specific examples of this broad field include music, systematic desensitization, clinical holding, and general anesthesia.[9,10]

When dental teams and patients choose which DBS to use, this involves an explicit or implicit comparison between DBS techniques and their outcomes to select the best option with the patient, considering the best evidence available. As these decisions must be evidence-based, there is a need for data on the effectiveness and safety of specific DBS techniques. However, it is not clear which of the outcomes commonly reported in the literature are best suited to measure effectiveness in trials of DBS techniques. A core set of outcome measures would address this issue by facilitating measures of effectiveness that are comparable across studies. This will lead to improved patient care, reduced heterogeneity, less selective reporting, and improved consistency.[11,12]

Ideally, this *Core Outcome Set* should also be applicable across all DBS techniques, because the selection of one technique (or combinations thereof) implies a comparison to, and non-selection of, alternative options (or combinations thereof). It is therefore essential to understand the effectiveness of DBS techniques (in isolation or combination) relative to others. Given the diversity of techniques involved, this may be a challenge. It is therefore reasonable to seek consensus on outcome measures within and across DBS intervention types.

To this end, this research team is developing a Core Outcome Set to achieve consensus on outcome measures across DBS effectiveness research. This process starts with this review of existing measures, which is a prerequisite to developing any core outcome set.[13] This review answers three questions. First, what are the outcome measures reported in DBS trials; Second, what were the types of interventions studied in these trials (categorized according to the BeSiDe prototype list of DBS techniques[10]); Third, which outcome measures are used for specific intervention types, broadly classified as either non-pharmacological or pharmacological? Ultimately, the measures identified in this review will be used to develop a prototype list of techniques for later phases of Core Outcome Set development.

2 | METHODS

A scoping review of trials evaluating the effectiveness of DBS techniques was undertaken. The review was prospectively registered on the Open Science Framework database: https://osf.io/v98kt. This review is part of a larger project informing the development of a Core Outcome Set for DBS, registered on the COMET database (https://www.comet-initiative.org/Studies/Details/2101).

2.1 | Search strategy

Preliminary informal searches were undertaken and revealed a vast number of studies. A decision was made only to include randomized or non-randomized trials adopting experimental and pre-experimental designs, publication date was limited to the past 11 years (2012–2022). The following databases were searched: MEDLINE via OVID; Embase via OVID; PsycINFO via OVID. The specific search strategy was adjusted to meet the requirements and format used within each database.[14–16] Given the nature of the studies sought, the PICOS tool was used to guide the search strategy.[17] Population: Patients receiving dental care or those parents or carers supporting them (care includes dental attendance, examination, or treatment, including simulated or 'mock' dental procedures). Intervention: Any form of dental behavior support (DBS). This includes pharmacological approaches (such as sedation and general anesthesia [GA]), non-pharmacological approaches (such as distraction and enhancement of control), and any other active or passive specific technique that dental professionals use when supporting patients to receive dental care. Comparison: Studies comparing DBS to no DBS, or one DBS technique to another, or studies generally exploring the efficacy or effectiveness of DBS techniques. Outcome: Any relevant outcome regarding DBS. Study type: Randomized or non-randomized- controlled trials and crossover trials. Selection criteria are specified in Table 1. Searches were limited to the English language and humans. In a change to the published protocol, the reference lists of identified studies were not screened to identify any further applicable studies due to the large volume of search results. Searches were also not re-run. Unpublished studies were not sought. A search string for one database is provided in the Supplemental materials.

2.2 | Study screening

Identified studies were imported into Rayyan,[18] where duplicates were removed. The study team independently screened 20 papers by title and abstract to ensure the team members similarly interpreted the inclusion and exclusion criteria. Following this, study titles and abstracts were screened by at least two blinded reviewers. Disagreement was addressed through discussion with a third reviewer. Full texts were next assessed by teams of two reviewers independently with discussion to address disagreements. The reason for exclusion was recorded at this stage.

2.3 | Data extraction

Following training exercises, data were extracted by one single reviewer onto a bespoke extraction sheet (Andrew Geddis-Regan, Caoimhin Mac Giolla Phadraig, Aisyah Binti Ahmad Fisal, and James Bird each extracted a proportion of studies). The specific data to be extracted included: authors, year of publication, country undertaken, study aim and context, study participants, the type(s) of DBS in each arm, as categorized according to accepted descriptors, all outcome measures, response type, and interval. All sheets were then reviewed and standardized by one assessor (Caoimhin Mac Giolla Phadraig).

2.4 | Analysis and synthesis

Outcome measures were initially sorted according to domains: measurement domains (physiological, behavioral, psychological, and treatment); respondent type (self-report, proxy report, clinician report, and other); and response interval (immediate, short-term, long-term, or other). Responses were then refined and recategorized into subcategories to produce a refined list. Given the volume of studies, descriptive statistics are provided to summarize the findings. Chi-square tests of independence were applied to test the relationship between the type of intervention and the type of outcome measure. Quality assessment was not used, consistent with scoping review methods.[19]

3 | RESULTS

3.1 | Study selection

Following duplicate removal, 14 793 titles and abstracts were screened and 432 progressed to full text screening. After removing 88 further trials at full text stage, 344 trials were included in the review. See the PRISMA flow diagram (Figure 1) for details below and Supplemental material for reasons for exclusion.

TABLE 1 Selection criteria

Inclusion criteria	Exclusion criteria
Population: Patients receiving dental care or those parents or carers supporting them (care includes dental attendance, examination, treatment, including simulated or 'mock' dental procedures but excludes oral hygiene measures outside of the dental setting)	**Population**: Patients not undergoing any form of dental care (care includes dental attendance, examination, or treatment, including simulated or 'mock' dental procedures but excludes oral hygiene measures outside of the dental setting)
Intervention: Any form of DBS (any active or passive interaction with a patient to support a patient to receive dental care)	**Intervention**: Studies of the effectiveness of local anesthesia or studies where the primary intervention of the phenomenon under investigation were not a DBS
Outcomes: Outcomes are related to the DBS under investigation	**Outcomes**: Outcomes are unrelated to the DBS under investigation, such as post-operative pain, tooth survival, etc.
Study type: Randomized or non-randomized-controlled trials; crossover trials; multiple baseline design.	**Study type**: Studies using purely qualitative methods, reviews or summary articles, cohort studies, case-controlled studies, cross-sectional surveys, pre- and post-treatment studies, one-shot post-observation studies, audits or service evaluations, case series or case studies, Gray literature

Abbreviation: DBS, dental behavior support.

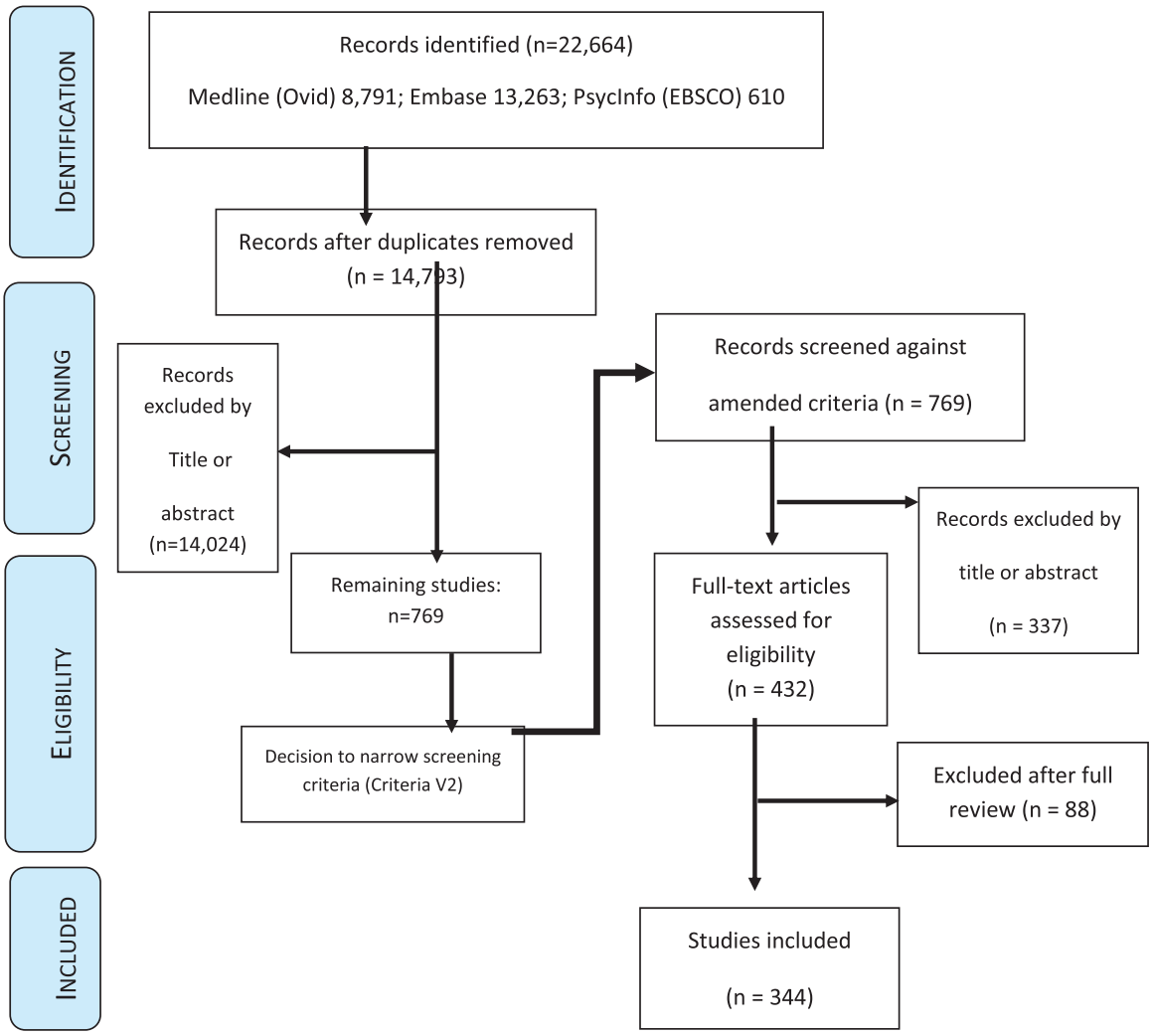

FIGURE 1 PRISMA flow.

3.2 | Description of included studies

3.2.1 | Time and place

Table 2 summarizes the characteristics of included trials (full list available in the Supplemental materials 3). The median year of publication was 2019 (range = 2012–2022). As shown, studies were undertaken in 46 countries across all WHO regions. Countries where research was undertaken included India ($n = 104$); Iran ($n = 40$); Brazil ($n = 25$); Turkey ($n = 25$); USA ($n = 21$); China ($n = 15$); Saudi Arabia ($n = 12$); Spain ($n = 9$); Japan ($n = 9$); UK ($n = 7$); Israel, Italy, and Indonesia ($n = 5$ each); Egypt, Syria, Germany, and Korea ($n = 4$ each); Mexico, UAE, Greece, Norway, and Malaysia ($n = 3$ each); Canada, Jordan, Finland, Switzerland, Pakistan, and Singapore ($n = 2$ each); and South Africa, Chile, Guatemala, Iraq, Bulgaria, Czech Republic, Denmark, France, Austria, Lithuania, Macedonia, Netherlands, Romania, Serbia, Sweden, Nepal, Taiwan, and Thailand ($n = 1$ each). In one study, country was unknown.

3.2.2 | Design and sample

Most studies adopted a randomized controlled trial (RCT) design ($n = 260$), with 62 reported as crossover studies; 21 were nRCTs and one adopted a multiple baseline design. Nine studies were reported as feasibility or pilot studies. Regarding participants, most studies were of children only ($n = 215$), with fewer focusing on adults ($n = 116$) and a minority mixed. Many studies of children included healthy young children undergoing basic dental care. Most studies of adults were of healthy adults receiving dental extractions. While many studies excluded neurodiverse groups, some exceptions focused specifically on samples with autism spectrum disorder or Down syndrome. Specific studies focused on dentally anxious adults and children.

3.2.3 | Type of treatment

The type of treatment provided varied. Most studies focused on basic dental care. Usually, treatments were comprehensive covering extractions, fillings, pulp treatments, and crowns. These were provided with a range of adjuncts including none, LA, sedation and GA. Specific treatments were also undertaken including pulp treatments, implant placement, preventive treatments, third molar removal, and other surgery. Local anesthesia only was the procedure studied in 16 studies; cognitive behavioral therapy attendance first attendances to the dental

TABLE 2 Description of included studies

Studies ($n = 344$)	N	%
WHO Region ($n = 343$)[a]		
Southeast Asian region	111	32.4
European region	76	22.2
Eastern Mediterranean region	68	19.8
Region of the Americas	53	15.5
Western Pacific	34	9.9
African region	1	0.3
Study design ($n = 344$)[b]		
Randomized controlled trial	260	75.6
Crossover trial	62	18.0
Non-RCT	21	6.1
Multiple baseline design	1	0.3
Age group ($n = 342$)[c]		
Children	215	62.9
Adults	116	33.9
Children and adults	11	3.2
Dental treatment ($n = 308$)		
Basic dental care[d]	117	38.0
Surgical[e]	91	29.5
Pulp therapy[f]	31	10.1
Preventive care[g]	18	5.8
Local anesthesia only	16	5.2
Not specified	11	3.6
Dental attendance[h]	8	2.6
Periodontal therapy	7	2.3
Simulation only	3	1.0
Impressions	2	0.6
Orthodontics [i]	2	0.6
Mask induction	1	0.3
CBT	1	0.3

Abbreviations: CBT, cognitive behavioral therapy; non-RCT, non-randomized-controlled trial.

[a]One study unknown country of origin;

[b]nine of these studies described themselves as pilot or feasibility studies.;

[c]two studies not clear re. age group;

[d]including treatment of dental caries with and without local anesthetic, with sedation and with anesthesia, mixed treatments including restorations and extractions, application of a range of restorative materials including composite and glass ionomer cement, and application of atraumatic restorative technique, stainless steel crown application +/- pulpotomy, and generic treatment, without detail.

[e]including extractions of deciduous and permanent teeth, impacted extractions, wisdom tooth extractions, surgical extractions, biopsy, cleft palate repair, and implant placement

[f]including seven involving deciduous pulp therapy;

[g]including oral prophylaxis, fissure sealants and varnish application;

[h]including first visit to dentist, attending for an appointment and sitting in the dental waiting room; [i]including arch wire placement and bond up.

practice and simulated attendance to the dental practice were also evaluated. Type of setting ranged across studies too: 126 studies were undertaken in pediatric services; 44 studies were undertaken in oral surgical/maxillofacial offices; 52 in University or Hospital settings, and only 17 in practice.

3.3 | Type of DBS interventions

Each of the 344 included trials consisted of at least one intervention arm, meaning that a total of 344 DBS intervention arms were compared to at least one comparison arm. The comparison arms consisted of 179 alternative DBS interventions and 165 no treatments (placebo/standard care/no intervention/and crossover control). This meant that a total of 523 ($n = 344 + 179$) DBS interventions were compared in all trial arms. Of these, 239 (45.7%) were pharmacological, 283 (54.1%) were non-pharmacological, and one (0.2%) was physical. The breakdown of constituent DBS techniques can be seen in Table 3.

Most interventions tested in individual studies were compared to similar types of intervention, that is, techniques within the same category of pharmacological or non-pharmacological: there were 145 comparisons of non-pharmacological DBS versus no treatment/placebo; 66 non-pharmacological DBS versus non-pharmacological DBS; 107 pharmacological versus pharmacological; 20 pharmacological versus placebo; five pharmacological versus non-pharmacological, and one pharmacological/physical versus physical DBS intervention. Audiovisual devices were often compared to no treatment or other non-pharmacological techniques. No studies comparing GA to non-pharmacological techniques were reported. Eighteen (3.4%) did not fit the DBS list applied to categorize findings. The majority of sensory adjustment techniques related to aromatherapy.

3.4 | Type of outcomes

A total of $n = 1317$ outcomes were reported in the included studies. A summary of the type of outcome measure is presented in Table 4, with a breakdown across types of DBS. Supplemental materials 4 gives a more detailed list of DBS techniques. A median $n = 4$ (Range 1–12) was reported in each study. Most outcomes were psychological ($n = 501$, 38.0%), of which $n = 263$ measured anxiety. The most commonly reported anxiety scale was the modified child dental anxiety scale (MCDAS) ($n = 36$). Patient, parent, or clinician measures of satisfaction ($n = 44$), experience ($n = 34$), and acceptability ($n = 14$) were also recorded. Pain was measured in 114 instances, most commonly adopting the Wong–Baker Facial Rating Scale (W-BFRS) ($n = 37$).

The second most common outcome was physiological ($n = 491$, 37.3%). Physiological measures were most consistent: $n = 294$ were cardiovascular (mainly heart rate or blood pressure); $n = 150$ were respiratory (mainly SpO2, then respiratory rate); $n = 14$ were neurological (Bispectral index); with $n = 33$ others including salivary ($n = 22$) and skin conductance measurements ($n = 4$).

Treatment-related outcome measures were diverse and accounted for 15.3% of outcome measures ($n = 202$). These mainly consisted of sedation score (mostly with Ramsay Sedation Scale), multiple measures of duration (to onset, maximum effect, recovery, or discharge), varied measures of success, adverse events, and recovery. One study measured cost.

Most behavioral outcome measures ($n = 123$, 9.3%) were reported adopting standardized behavioral scales, the two most commonly reported being the Houpt Behavior Rating Scale ($n = 39$) and Frankl Behavior Rating Scale ($n = 36$).

A significant relationship was noted between reporting of physiological, psychological, and treatment outcome measures, and whether the intervention arm of included studies was pharmacological or not pharmacological (see Table 4).

4 | DISCUSSION

4.1 | Major findings

This review answered three questions. First, what are the outcome measures reported in DBS trials; second, what were the types of interventions studied in included trials, as categorized according to the BeSiDe prototype list of DBS techniques; and third, how do outcome measures map to intervention type, broadly classified as either non-pharmacological or pharmacological?

Regarding the first question, 1317 outcome measures have been reported across DBS research, adopting 154 distinguishable outcomes. These include 28 measures of behavior, 15 physiological measures (i.e., various cardiovascular, respiratory, neurological, and salivary measures), 46 measures of anxiety (i.e., a range of dental, state, trait, or separation anxiety measures) or affect, 12 measures of pain (i.e., behavioral measures and rating scales), six measures of cognition, 10 measures of perception (acceptability, satisfaction, experience, and recall), and 38 measures of treatment (i.e., time to various stages of treatment, various sedation scoring systems, adverse events, measures of recovery, drug use, and recovery). The most commonly reported outcomes were heart rate, oxygen saturation, blood pressure, and respiratory rate. On average, studies included

TABLE 3 Types of dental behavior support (DBS) intervention studied

Technique (as per BeSiDe list)	Frequency	Percent	Percent (active interventions)
Communication and environmental			
Distraction+	77	11.2	14.7
Guided imagery	2	0.3	0.4
Clinical hypnosis+	3	0.4	0.6
Breathing retraining	5	0.7	1.0
Progressive muscle relaxation	1	0.1	0.2
Pre-visit preparation	33	4.8	6.3
Social story	1	0.1	0.2
Visual supports	3	0.4	0.6
Augmentative, alternative communication	1	0.1	0.2
Person-centered communication	2	0.3	0.4
Voice control+	3	0.4	0.6
Reassurance	1	0.1	0.2
Enhancing control	3	0.4	0.6
Music	29	4.2	5.5
Sensory adjustment	11	1.6	2.1
Aromatherapy	16	2.3	3.1
Caregiver presence	13	1.9	2.5
Animal assisted therapy	3	0.4	0.6
Modelling	16	2.3	3.1
Tell-show-do	26	3.8	5.0
Positive reinforcement	2	0.3	0.4
Behavior shaping	1	0.1	0.2
Systematic desensitization	2	0.3	0.4
Exposure therapy+	4	0.6	0.8
CBT	6	0.9	1.1
Message to dentist	1	0.1	0.2
Other*	18	2.6	3.4
Pharmacological			
Premedication	15	2.2	2.9
Sedation	207	30.1	39.6
General anesthesia	17	2.5	3.3
Physical			
Protective stabilization	1	0.1	0.2
Total techniques evaluated	523		
No treatment/Standard care/Placebo	165	24.0	NA
Total	688	100	100.0

Abbreviation: CBT, cognitive behavior therapy.

*Other = acupuncture, auricular plaster therapy, biofeedback, EDMR, Play, ABMT, and LA; + indicates where a technique was sometimes listed combined with other techniques.

four measures with a range of one to 12. All outcome measures were usefully grouped into *biological, psychological, behavioral*, and *treatment* measurement categories. There was a tendency for physiological and treatment-related measures to be reported in pharmacological DBS studies and psychological outcome measures in non-pharmacological DBS studies. The above demonstrates a massive variation in outcome selection and highlights the need to streamline outcome measures to facilitate comparison across studies, across intervention types, and

TABLE 4 Distribution of outcome measures across dental behavior support (DBS) intervention type

Behavioral	Total		Pharmacological*		Nonpharmacological	
Behavioral tool	113	91.9%	58	92.1%	55	91.7%
Behavioral score	8	6.5%	5	7.9%	3	5.0%
Gag	2	1.6%	0	0.0%	2	3.3%
Physiological ($p < .001$)						
Cardiovascular	294	59.9%	139	53.1%	155	67.7%
Respiratory	150	30.5%	106	40.5%	44	19.2%
Neurological	14	2.9%	14	5.3%	0	0.0%
Other	33	6.7%	3	1.1%	30	13.1%
Psychological ($p < .001$)						
Acceptability	14	2.8%	8	6.3%	6	1.6%
Affect	9	1.8%	2	1.6%	7	1.9%
Anxiety	263	52.5%	36	28.1%	227	60.9%
Beliefs	5	1.0%	0	0.0%	5	1.3%
Cognitive	2	0.4%	1	0.8%	1	0.3%
Experience	34	6.8%	13	10.2%	21	5.6%
Intentions	3	0.6%	0	0.0%	3	0.8%
Pain	114	22.8%	26	20.3%	88	23.6%
Recall	13	2.6%	11	8.6%	2	0.5%
Satisfaction	44	8.8%	31	24.2%	13	3.5%
Treatment ($p < .05$)						
Adverse events	34	16.8%	30	16.7%	4	18.2%
Cost	1	0.5%	0	0.0%	1	4.5%
Drug use	7	3.5%	7	3.9%	0	0.0%
Duration	38	18.8%	31	17.2%	7	31.8%
Recovery	30	14.9%	27	15.0%	3	13.6%
Sedation score	62	30.7%	60	33.3%	2	9.1%
Success	30	14.9%	25	13.9%	5	22.7%

*Distinction between pharmacological and nonpharmacological based on intervention arm of study only.

to facilitate the synthesis and application of evidence in this field.

Regarding the second question, sedation was by far the most commonly studied DBS technique, followed by distraction, which was often achieved through audiovisual or other technological devices. In all, over 30 distinct DBS techniques were studied. In its first prospective use, 96.6% of DBS techniques were codable according to the BeSiDe prototype list,[10] suggesting good content coverage. Techniques not listed in the BeSiDe prototype list included aromatherapy and play. Further developments to the BeSiDe list should include aromatherapy and play.

Regarding the third question, the findings clearly demonstrate a split in the use of outcome measures across DBS types. Nonpharmacological interventions were more likely to be assessed using psychological outcome measures such as anxiety, pain, and experience, whereas pharmacological studies were more likely to report on duration, success, recovery, adverse events, drug use, and respiratory measures. Behavioral and cardiovascular measures were adopted similarly across DBS categories.

4.2 | Comparison to other studies

With no comparable literature on outcome measures in DBS, it is most useful to compare the findings here to several aligned areas, such as studies of outcome measures in sedation and dentistry.

Comparisons within the field of dentistry are difficult because no published Core Outcome Sets have focused on DBS. Only one study on patient-centered outcomes for adult oral health, included a record of pain as one of the 25 items of the Adult Oral Health Standard Set.[20]

Comparisons within the field of procedural sedation are also tricky, this time because of how outcomes have been categorized. The sedation consortium on endpoints and procedures for treatment, education, and research has

chosen to categorize based on measures of safety, efficacy, patient-centered and/or family-centered outcomes, and efficiency.[21] During this review, it was often not specified why outcomes were measured. For example, are blood pressure readings a measure of effect or safety? Therefore, the authors did not apply these domains for data extraction or analysis. Rather, the team categorized outcome measures according to categories of physiological, behavioral, psychological, and treatment-related. This decision was made after pilot extractions to fit the data rather than in the application of a specific theoretical framework. Further work with key stakeholders will be needed to explore the suitability of these domains and/or reclassification into other domains for core outcome set development.

Nevertheless, broad similarities are seen in the outcomes reported here in this review and other studies of outcome measures in sedation and dentistry. In a systematic review looking at pediatric procedural sedation, for example, outcomes included sedation scales, behavioral scales, satisfaction ratings, and pain ratings.[22] These are similar to those reported in the current review.

4.3 | Strengths and weaknesses

This study was limited by a restriction to articles published in English. Arguably, most of the studies were from the Southeast Asian region, where some of the studies may have been published in other languages. The ability to include a large volume of studies in this review was both a strength and a weakness. Positively, it allowed a comprehensive coverage of outcomes measured and interventions reported. Negatively, the outcomes arising from such a diverse set of studies were difficult to report. Thus, descriptive statistics were necessary rather than reporting of individual studies.

4.4 | Implications

Firstly, this is the first time that the outcome measures for GA, sedation, or other DBS techniques have been synthesized in dentistry. The diversity of measures and domains reflects the diversity of DBS techniques studied, and their intended outcomes. It is not yet clear if the variation in measures can be reconciled to allow comparable, consistent, homogeneous, and reliable evidence across DBS techniques. This research team hopes that it is. The plan to establish a Core Outcome Set that will pave the way for comparable research across this field, as well as ensuring that clinically relevant outcomes are identified from a variety of stakeholders.[23]

Secondly, the mapping of all interventions reported in the literature over the last 11 years allowed for a test of the content coverage of the BeSiDe list. This suggests that the list possesses an acceptable initial coverage of DBS techniques and suggests further refinements to this list. Using the BeSiDe list,[10] the findings clearly demonstrate diversity in outcome measurement across types of intervention.

5 | CONCLUSIONS

This review demonstrates massive variation in outcome measures reported in the evaluation of DBS interventions. This likely leads to unnecessary heterogeneity, selective reporting, and questionable relevance in the literature. The findings support a need for consensus on a core outcome set across the spectrum of DBS techniques. The included trials compared a large range of DBS interventions that mapped well to the BeSiDe prototype list of DBS techniques. There was a significant difference in the outcomes reported in pharmacological interventions compared to non-pharmacological interventions. This variety will be difficult to reconcile in later stages of Core Outcome Set development, which must include an exploration of the patient's voice in the experience of dental care. This research team looks forward to exploring this in further research, which will ultimately lead to a core set of outcome measures for DBS.

AUTHOR CONTRIBUTIONS

Caoimhin Mac Giolla Phadraig and Andrew Geddis-Regan: study conception. Isabel Fleischmann designed the search strategy with advice from Andrew Geddis-Regan and Caoimhin Mac Giolla Phadraig. Andrew Geddis-Regan, Caoimhin Mac Giolla Phadraig, Pedro Vitali Kammer, Aisyah Binti Ahmad Fisal, and James Bird screened studies for inclusion/exclusion.

Caoimhin Mac Giolla Phadraig: data cleaning and analysis of data. Caoimhin Mac Giolla Phadraig: first draft. Final draft: Andrew Geddis-Regan.

All authors commented on and approved the final manuscript.

ACKNOWLEDGEMENTS

Open access funding provided by IReL.

CONFLICTS OF INTEREST STATEMENT

The corresponding author declares on behalf of all authors that they have no conflict of interest. Declarations: The authors declare no conflict of interest.

FUNDING INFORMATION

James Bird is funded by the National Institute for Health Research (NIHR) in-practice fellowship NIHR302811. The views expressed are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care.

ORCID

Caoimhin Mac Giolla Phadraig https://orcid.org/0000-0002-7797-1126

Aisyah Binti Ahmad Fisal https://orcid.org/0000-0002-3655-123X

Pedro Vitali Kammer https://orcid.org/0000-0001-6086-4810

REFERENCES

1. Armfield JM. What goes around comes around: revisiting the hypothesized vicious cycle of dental fear and avoidance. *Community Dent Oral Epidemiol*. 2013b;41(3):279-287.
2. Armfield JM. Predicting dental avoidance among dentally fearful Australian adults. *Eur J Oral Sci*. 2013;121(3 Pt 2):240-246.
3. Murad M, Ingle N, Assery M. Evaluating factors associated with fear and anxiety to dental treatment—A systematic review. *J Family Med Prim Care*. 2020;9(9):4530.
4. Burghardt S, Koranyi S, Magnucki G, Strauss B, Rosendahl J. Non-pharmacological interventions for reducing mental distress in patients undergoing dental procedures: systematic review and meta-analysis. *J Dent*. 2018;69:22-31.
5. Mac Giolla Phadraig C, Griffiths C, McCallion P, McCarron M, Donnelly-Swift E, Nunn J. Pharmacological behaviour support for adults with intellectual disabilities: frequency and predictors in a national cross-sectional survey. *Community Dent Oral Epidemiol*. 2018;46(3):231-237.
6. Mac Giolla Phadraig C, Asimakopoulou K, Daly B, , Fleischmann I, Nunn J. Nonpharmacological techniques to support patients with intellectual developmental disorders to receive dental treatment: a systematic review of behavior change techniques. *Special Care in Dentistry*. 2020;40(1):10-25.
7. Akpinar H. Evaluation of general anesthesia and sedation during dental treatment in patients with special needs: a retrospective study. *J Dent Anesth Pain Med*. 2019;19(4):191-199.
8. Geddis-Regan A, Gray D, Buckingham S, Misra U, Boyle C. The use of general anaesthesia in special care dentistry: a clinical guideline from the British Society for Disability and Oral Health. *Spec Care in Dentist*. 2022;42:3-32.
9. Mac Giolla Phadraig C, Newton T, Daly B, et al. BeSiDe time to move behavior support in dentistry from an art to a science: a position paper from the BeSiDe (Behavior Support in Dentistry) Group. *Spec Care in Dentist*. 2022;42(1):28-31.
10. Mac Giolla Phadraig C, Kammer PV, Asimakopoulou K, et al. Labels and descriptions of dental behaviour support techniques: a scoping review of clinical practice guidelines. *Community Dent Oral Epidemiol*. 2023;51(6):1065-1077. doi:10.1111/cdoe.12890
11. Lamont TJ, Clarkson J. Core Outcome Sets and Dental Patient Reported Outcomes. *J Evid-Based Dent Pract*. 2022;22(15):1-7.
12. Williamson PR, Altman DG, Blazeby JM, et al. Developing core outcome sets for clinical trials: issues to consider. *Trials*. 2012;13(1):132.
13. Williamson PR, Altman DG, Bagley H, et al. The COMET Handbook: version 1.0. *Trials*. 2017;18(S3):280.
14. Wong SS, Wilczynski NL, Haynes RB. Developing optimal search strategies for detecting clinically relevant qualitative studies in MEDLINE. *Stud Health Technol Informat*. 2004;107:311-316.
15. Wilczynski NL, Marks S, Haynes RB. Search strategies for identifying qualitative studies in CINAHL. *Qual Health Res*. 2007;17(5):705-710.
16. McKibbon KA, Wilczynski NL, Haynes RB. Developing optimal search strategies for retrieving qualitative studies in PsycINFO. *Eval Health Prof*. 2006;29(4):440-454.
17. Methley AM, Campbell S, Chew-Graham C, McNally R, Cheraghi-Sohi S. PICO, PICOS and SPIDER: a comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews. *BMC Health Serv Res*. 2014;14(1):579.
18. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Syst Rev*. 2016;5(1):210. doi:10.1186/s13643-016-0384-4
19. Peters MDJ, Godfrey CM, Khalil H, McInerney P, Parker D, Soares CB. Guidance for conducting systematic scoping reviews. *Int J Evid Based Healthc*. 2015;13(3):141-146.
20. Riordain RN, Glick M, Mashhadani SSA, et al. Developing a Standard Set of Patient-centred Outcomes for Adult Oral Health—An International, Cross-disciplinary Consensus. *Int Dent J*. 2021;71(1):40-52.
21. Williams MR, Ward DS, Carlson D, et al. Evaluating patient-centered outcomes in clinical trials of procedural sedation, part 1 efficacy: sedation consortium on endpoints and procedures for treatment, education, and research recommendations. *Anesth Analg*. 2017;124(3):821-830.
22. Williams MR, Nayshtut M, Hoefnagel A, et al. Efficacy Outcome measures for pediatric procedural sedation clinical trials: an ACTTION systematic review. *Anesth Analg*. 2018;126(3):956-967.
23. Webbe J, Sinha I, Gale C. Core outcome sets. *Arch Dis Child—Educ Pract Ed*. 103(3):163-166.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Mac Giolla Phadraig C, Ahmad Fisal AB, Bird J, Kammer PV, Fleischmann I, Geddis-Regan A. A scoping review of interventions and outcome measures in trials of dental behavior support. *Spec Care Dentist*. 2023;1-10. https://doi.org/10.1111/scd.12949