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ORIGINAL ARTICLE

Behaviour support in dentistry: A Delphi study to agree terminology in behaviour management

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Abstract

Objectives: Dental behaviour support (DBS) describes all specific techniques practiced to support patients in their experience of professional oral healthcare. DBS is roughly synonymous with behaviour management, which is an outdated concept. There is no agreed terminology to specify the techniques used to support patients who receive dental care. This lack of specificity may lead to imprecision in describing, understanding, teaching, evaluating and implementing behaviour support techniques in dentistry. Therefore, this e-Delphi study aimed to develop a list of agreed labels and descriptions of DBS techniques used in dentistry and sort them according to underlying principles of behaviour.

Methods: Following a registered protocol, a modified e-Delphi study was applied over two rounds with a final consensus meeting. The threshold of consensus was set a priori at 75%. Agreed techniques were then categorized by four coders, according to behavioural learning theory, to sort techniques according to their mechanism of action.

Results: The panel ($n = 35$) agreed on 42 DBS techniques from a total of 63 candidate labels and descriptions. Complete agreement was achieved regarding all labels and descriptions, while agreement was not achieved regarding distinctiveness for 17 techniques. In exploring underlying principles of learning, it became clear that multiple

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and differing principles may apply depending on the specific context and procedure in which the technique may be applied.

Discussion: Experts agreed on what each DBS technique is, what label to use, and their description, but were less likely to agree on what distinguishes one technique from another. All techniques were describable but not comprehensively categorizable according to principles of learning. While objective consistency was not attained, greater clarity and consistency now exists. The resulting list of agreed terminology marks a significant foundation for future efforts towards understanding DBS techniques in research, education and clinical care.

KEYWORDS
anaesthesia, anxiety management, behaviour management, behaviour sciences, Delphi technique, dentistry, sedation, taxonomy

1 | INTRODUCTION

Receiving dental care, such as fillings or tooth debridement, can be simultaneously beneficial, and, difficult. Patients are potentially exposed to anticipatory anxiety, pain, numbness and loss of control when they cross the threshold of a dental practice.[1–3] Yet, this same treatment is essential for general health, well-being, function and managing pain and infection.[4] In efforts to balance the effectiveness, with the experience, of dental interventions, a range of pharmacological and non-pharmacological *behaviour management* techniques have been developed. Examples range from *praise* to *general anaesthesia*: Praise being an interpersonal communication technique normally based on the principle of positive reinforcement, and general anaesthesia being a state of intentional drug-induced loss of consciousness. In this study, the authors agreed the preferred term *dental behaviour support* (DBS) to encompass all variations of pharmacological and non-pharmacological techniques.

Dentists who use DBS techniques, particularly non-pharmacological, often do so with methods they developed on the job, through processes of trial and error, without fully understanding which techniques they use, why they expect them to work, or why they choose one technique over others.[5–7] This paints DBS as an art rather than a science, a perspective clearly at odds with prevailing concepts of evidence-based practice. Evidence is thus needed to inform the practice of behaviour support across dental professions, as well as its study and teaching. As a fundamental first step in this process, dental professionals must agree on a shared language, because a lack of specification in behaviour support weakens intervention, evaluation and implementation, while promoting colloquialisms, misunderstandings and misattribution of evidence.[8]

A lack of clarity in terminology may lead to inconsistent or even contradictory evidence for specific DBS techniques, when in fact it is the definitions that are inconsistent and contradictory.[9] To illustrate this point, consider the term *desensitization*, as used across dental practices. Without an agreed description, it is likely that multiple techniques are applied under this heading. One dentist may attribute this label to a systematic desensitization procedure, while another dentist gives this same label to their offering preparatory visits to a patient. These different techniques, operating through different underlying principles, may therefore be erroneously considered a single technique, as they are given the same name. Equally, the term *acclimatization* may sometimes be used interchangeably with the term *desensitization*. As such, a single technique is erroneously considered as two distinct techniques because it is given two (or more) names. The resulting confusion is termed *jingle-jangle fallacy*.[10] Confusion of this sort ultimately impairs dental teams' ability to share a common language with which to study, teach and apply DBS techniques.

The BeSiDe group is an international, informal network of academics and clinicians with an interest in improving the science of how dental care is delivered and experienced. The core of this group was formed in 2021 to develop a research project to achieve standardization in terminology underlying the study, teaching and application of DBS, or *behaviour management*, as was the prevailing term. This terminological work was seen as a first step in ultimately improving the practice, teaching and study of DBS. The group's proximal aim was to achieve agreement in terminology, by identifying commonly used DBS labels and descriptions, achieve agreement on these terms and then structure these labels hierarchically, according to underlying theory. The first step in this process, a review of DBS labels and descriptions was recently published.[11] This modified e-Delphi study, as reported here, is the second step in the process. Specifically, this study aimed to develop consensus in the labels and descriptors used for DBS techniques, and, sort these techniques theoretically, according to their underlying principles of behaviour and learning. The specific research questions were *What are the agreed labels and descriptions of commonly reported DBS techniques, as agreed by experts? What are the putative mechanisms of action of each technique, based on the principles of learning? Can techniques be sorted by mechanism of action, according to principles of learning and behaviour?*

2 | METHODS

2.1 | Design and registration

The methods applied were loosely based on the iterative development of hierarchically related terminology in the field of *behaviour change*.[12] It is important to note that this field has refocused significantly to include a much broader range of behavioural features when explicating behaviour change, since this study began.[13] This is discussed later.

This modified e-Delphi study followed a pre-registered protocol,[14] with one major deviation: the categorization and sorting reported here, were originally protocoled as a separate, standalone study. In the end, both strands unfurled together. The Delphi technique describes an interactive process used to generate consensus on a topic.[15] In a traditional Delphi, information is gathered from panellists by interview or survey through a series of open-ended questions.[16] In a modified Delphi, the process begins with structured materials on which experts provide comments.[17] This study began with a list of 51 labels and descriptions for DBS techniques, based on a preceding scoping review.[11]

2.2 | Sampling, recruitment and registration

The recruitment goal was to have a diverse sample of professionals with expertise in multiple modalities of DBS delivery (e.g. pharmacological, physical and psychological) and from multiple disciplines of dental and related professions including paediatric dentistry, special care dentistry, psychology related to dentistry and dental anaesthesiology. The sample also included clinicians working in a range of different health services and nations, where governance frameworks, traditionally used adjuncts and training differ significantly. Purposive sampling with snowballing was employed.

Recruitment was multimodal: Members of the BeSiDe team were invited to participate and forward invites to members of their extended networks, who they knew to be expert in this field, based on academic or clinical practice. Concurrently, recruitment was also open via a social media campaign using *X* and Facebook, where professionals could register their interest. It was planned to invite panellists who met the inclusion criteria (Table 1), with a target of 25–30 participants, well within the accepted range of sample sizes for such research.[15] Interested individuals were invited to register online. Potential panellists completed a demographic survey in order to inform recruitment goals for a broad sample based on adjunct expertise, geographical spread and field of practice, as well as to ensure that panellists satisfied the selection criteria. Following the submission of the recruitment questionnaire, those who met the selection criteria (Table 1) were invited to participate.

2.3 | Data collection and analysis

Data collection occurred at four points: Registration, Round 1, Round 2 and the consensus meeting. Registration opened from 9 February 2022 to 1 March 2022; Round 1 data collection lasted from 1 March 2022 to 13 March 2022; Round 2 lasted from 23 March 2022 to 4 April 2022. The consensus meeting was held on 28 April 2022. Categorization of learning theories and sorting spanned from September 2022 to September 2023.

At registration, basic demographics were collected using a Qualtrics survey including email address, gender, years in practice, area of professional expertise, types of behaviour support techniques practiced, patient groups usually treated and country of practice. Based on these responses a purposive sample from the pool of potential participants, with maximally diverse spread across expertise, geography and discipline was selected for invitation to Round 1.

2.3.1 | Round 1

For Round 1, online instructions were presented along with operational definitions of terminology, abbreviations and a quick reference guide (see Supplemental Material S1). Panellists were offered working definitions: DBS was *any intervention that can be practiced with patients to support them to receive dental care in the dental setting. This covers any active or passive interaction with the patient using specific techniques that aim to support patients in order for them to receive dental care in the dental setting. DBS is largely synonymous with behaviour management*. A DBS technique was defined as *the smallest component of a DBS intervention that on its own*

TABLE 1 Selection criteria[a].

Inclusion	Exclusion
Dental or related professional with expertise in the application or study of a specific field of dental behaviour support.	Dental or related professional without expertise in the application or study of a specific field of dental behaviour support.
Willing to participate	Not willing to participate
Proficiency in English language	Lack of proficiency in English language

[a]*An expert* was defined as a dental or related professional with significant experience in the application and/or study of any form of dental behaviour support.

has the potential to support the patient (active ingredient). Regarding distinction between techniques, panellists were advised to merge multiple items where they feel that there was greater than 50% similarity between one label and another. They were advised to split techniques where they felt that a single label described more than one technique. These aspects allowed panellists to explore potential overlap and redundancy, similar to those aspects explored in developing the behaviour change technique taxonomy version 1.[18]

Following a sorting exercise used to familiarize panellists with the labels to be scored, the full list of 51 DBS techniques were presented and experts were asked to score their agreement or disagreement across five items relating to each technique. These items asked: *Do you agree that this is a DBS technique? Do you agree that this description is the most appropriate for this DBS technique? Do you agree that this is the most appropriate label for this DBS technique? Should this be given a different label?* and *Should this be merged with another label or split into other labels?* Open-ended responses were available for each item for suggestion or clarification. Panellists were also invited to add additional techniques that they felt were omitted from the initial list, for inclusion in further rounds. Supplemental Material S2 demonstrates the data as presented to panellists in Round 1.

2.3.2 | Round 1 analysis

Round 1 quantitative responses were analysed descriptively, with threshold for consensus set a priori using a percentage-based approach of ≥75% agreement, acknowledging a lack of universally accepted threshold.[19] When items failed to reach this threshold, they were returned to panellists for rescoring at Round 2.

2.3.3 | Round 2

In Round 2, panellists were presented with the level of agreement from Round 1 for each item, as well as all qualitative responses. Given the large volume of open-ended responses, these data were accompanied by a qualitative summary for each technique, summarized by a team of five authors (CMGP, AAF, CY, MvH and OH), with suggestions for further agreement. See Supplemental Material S3 for figure demonstrating the data as presented to panellists in Round 2 (all raw qualitative data were available separately). Experts were asked to rescore all items that failed to reach the threshold in Round 1 and score each technique on clarity. Level of agreement was also scored when items were removed or merged based on Round 1 responses. Items that reached agreement in Round 1 were not rescored, unless qualitative responses meant that significant changes were warranted. The threshold for consensus was once more set at 75%. After Round 2, the final level of agreement was accepted for all items from Round 1. For items that were newly included in Round 2, a further step was needed to achieve Round 2 scoring for these items.

2.3.4 | Consensus meeting

Similar to Round 2, the consensus meeting allowed rescoring of added techniques that were introduced in Round 2, where agreement had not already been achieved. This meeting also allowed for panellists to score their agreement regarding removal and merging of items relating to sedation and reinforcement, following in-depth discussion.

Following the consensus meeting, refinement was undertaken by five authors (CMGP, OH, AAF, AGR and JN) in groups of two or three, with the lead author present in each team. This refinement involved a review of all qualitative feedback across rounds relating to each technique to ensure that the outcome and final wordings did not conflict with qualitative remarks. Simultaneously, the wording of descriptions was reviewed to ensure that they aligned grammatically and structurally.

2.3.5 | Arbitration and refinement

At this stage, five arbiters (CMGP, OH, AAF, AGR and JN) worked in groups of two and three to review all items. Initial efforts were made to clarify whether labels and descriptions referred to a single technique (the intervention), a set of techniques (groups of interventions) or mechanisms (why interventions may work). While the study initially intended to extract only DBS techniques, the irreducible and observable active components of interventions, the literature clearly did not allow for this level of granularity. Descriptions were refined to distinguish, where possible, between a technique, sets of techniques and mechanisms (why techniques work). This was not intended to be definitive, but rather to clarify what entity was reported to simplify how labels can be related to each other and grouped later. At refinement, DBS labels and descriptions were presented to expert groups for final input before publication.

2.3.6 | Identifying mechanisms of action and sorting

Lastly, the mechanisms of action, that is how individual DBS techniques produce their effects, were categorized in pairs by four authors (OH, TN, PS and CMGP), according to principles of learning and behaviour from behavioural learning theory (see Table 2).[20] Disagreements were resolved through discussion. Selectors found it necessary to include a brief description of the context and procedure alongside each selected principle when reporting mechanisms. When the same four authors then attempted to sort techniques by mechanism of action, the inconsistent relationship between

TABLE 2 Examples of m*echanisms of action* based on behavioural learning theory and corresponding principles of learning upon which techniques may take effect.

Principles of learning	Description
Shaping (by successive approximations)	Increasing a target behaviour by providing reinforcers for each successive approximation observed for that behaviour. Approximations are continually reinforced until the complete target behaviour can be emitted.
Positive reinforcement	The presentation of a stimulus following a response that increases the future probability of that response.
Negative reinforcement	The removal of a stimulus following a response that increases the future probability of that response.
Respondent conditioning	Presenting an unconditioned stimulus with a previously neutral stimulus until the neutral stimulus elicits the same response and is termed a conditioned stimulus.
Differential reinforcement schedules	Contingencies of reinforcement whereby specific behaviours are followed by reinforcement and other responses are placed on extinction.
Contingency management	Allowing individuals to earn desirable consequences contingent on meeting an objectively verifiable goal.
Conditioned reinforcement and punishment	Stimuli that function as reinforcers or punishers because of pairings with other established reinforcers or punishers.
Positive punishment	The presentation of a stimulus following a response that decreases the future probability of that response.
Negative punishment	The removal of a stimulus following a response that decreases the future probability of that response.
Extinction of operant behaviour	No longer providing a reinforcer following a specific response. Gradually the response will no longer occur.
Extinction of respondent behaviour	The repeated presentation of a conditioned stimulus in the absence of the unconditioned stimulus. Gradually, the conditioned stimulus no longer elicits the conditioned response.
Escape extinction	A behavioural procedure that is generally used to treat escape or avoidance maintained behaviours.
Stimulus control	A change in behaviour because of the presence or absence of an antecedent stimulus.
Stimulus generalization	A response that has been reinforced in the presence of an antecedent stimulus may also occur in the presence of stimuli that share similar physical properties with the antecedent stimulus.
Stimulus equivalence	The emergence of accurate responding to untrained and nonreinforced stimulus–stimulus relations following the reinforcement of responses to some stimulus–stimulus relations.
Behavioural momentum	A response describing the rate of responding and its resistance to change following an alteration in reinforcement conditions

principle and technique made efforts to sort consistently by underlying principles impossible.

3 | RESULTS

3.1 | Recruitment and flow

Fifty-three potential panellists were recruited. Six did not meet the inclusion criteria, leaving 47 invitees to Round 1, 35 of whom submitted responses within the allocated timeframe (response rate = 74.5%). Demographic details for this group of Round 1 completers are reported below. All Round 1 completers were invited to complete Round 2, of whom 33 (response rate = 94.3%) completed Round 2 data collection. All 35 panellists were invited to the final consensus meeting, of whom 17 attended.

3.2 | Expert demographics

Regarding the 35 experts who responded to Round 1, 8 were from the United Kingdom; 4 from Canada; 3 each from Ireland, Spain, Sweden and Malaysia; 2 each from Australia and USA; and 1 each from France, Portugal, Brunei, Indonesia, Brazil, Argentina and Chile. As per Table 3, most experts were female ($n = 24$, 69%) and most had more than 10 years' practice experience ($n = 22$, 63%). Panellists reported expertise in a broad range of non-pharmacological and pharmacological supports, with the most commonly reported being *non-pharmacological behaviour support* ($n = 33$, 94%) and *general anaesthesia* ($n = 28$, 80%). Experts came from diverse disciplines including special care dentistry, paediatric dentistry, dental anaesthesiology/sedation dentistry, psychology related to dentistry and clinical holding. Nevertheless, panellists reported regularly seeing a broad range of patients including young and old patients, people

TABLE 3 Panel demographics.

	Count	%
Place of practice		
Australia	2	5.7
Asia	5	14.3
Europe	19	54.3
North America	6	17.1
South America	3	8.6
Gender		
Male	11	31.4
Female	24	68.6
Years of professional practice		
0–10	4	11.4
11–20	11	31.4
21–30	11	31.4
31+	9	25.7
Field of expertise		
Special care dentistry	15	42.9
Paediatric dentistry	11	31.4
Dental anaesthesiology/sedation dentistry	3	8.6
Psychology related to dentistry	5	14.3
Clinical holding	1	2.9
Expertise in use of adjuncts[a]		
Non-pharmacological behaviour support	33	94.3
Physical behaviour support	22	62.9
Minimal sedation	23	65.7
Moderate sedation	20	57.1
Deep sedation	11	31.4
Premedication	22	62.9
General anaesthesia	28	80.0
NA	1	2.9
Patient groups[a]		
Paediatric	21	60.0
Older adult	16	45.7
Physical disability	24	68.6
Neurodevelopmental disorder	33	94.3
Mental illness	18	51.4
Neurological disorder	21	60.0
Medically complex	25	71.4
Dental anxiety	26	74.3
Social impairment	13	37.1

[a]Respondents were able to select multiple response options.

with physical, neurological and neurodevelopmental disorders, mental illness and those with dental anxiety.

3.3 | Overview of consensus over rounds

From an initial 51 labels drawn from a scoping review[11] plus 12 expert panel generated labels, 42 labels remained by the end of the process. An overview of the flow of labels across rounds is presented in Figure 1, while a summary of agreement statistics across rounds is given in Table 4. A more detailed table of agreement by item is available in Supplemental Material S4. Details for each round are given below.

3.3.1 | Labels from scoping review

At Round 1, 51 DBS techniques were scored across five items. Of the total 255 responses, 209 (82.0%) achieved threshold for consensus in Round 1. Looking at each item, 47 labels (92.2%) surpassed threshold agreement that the technique was actually a *DBS technique* (median level of consensus at 94.3%; range = 60%–100%); 49 techniques (96.1%) achieved agreement that the *description* was most appropriate (median level of consensus at 88.6%; range = 68.6%–100%); 42 labels (82.4%) achieved agreement that the *label* was most appropriate (median level of consensus at 88.6%; range = 68.6%–100%). Scoring negatively, 44 labels (86.3%) achieved agreement that the technique should not be given a different label (median level of consensus at 88.2%; range = 62.9%–100%); scoring negatively again, 27 labels (52.9%) achieved agreement that the technique should *neither* be merged with another label *nor* split into other labels: (median level of consensus at 75.8%; range = 39.4%–93.8%). Qualitative responses were reviewed and led to changes in labels and descriptions, where relevant.

In preparing Round 2, *oral/transmucosal sedation* technique was split into *oral sedation* and *transmucosal sedation* for further scoring. Agreement was reached that six techniques should be removed including those relating to depth of sedation: *Deep sedation (87.9%)*, *conscious sedation/moderate sedation/analgesia (72.7%)*, *minimal sedation/anxiolysis* (87.9%), as well as *magic trick (97%)*, *embedded suggestion (87.9%)* and *relaxation technique (90.9%)*. Four techniques were given new labels: *caregiver presence*, *countdown*, *controlled breathing* and *socially adjusted dental environment* and 14 were given new descriptions, based on quantitative and qualitative feedback in Round 1. These were returned for further scoring alongside all items failing to reach threshold.

At Round 2, techniques were re-scored only when items failed to reach consensus ($n = 27$). Of the total of 62 responses, 42 (67.7%) achieved threshold for consensus in Round 2. This left only 20 (8.7%) of the final 230 responses below the level of threshold. Fifteen of these disagreements related to the distinctiveness of techniques (e.g. merging or splitting).

As per Table 4, in relation to the remaining 46 items from the original list still remaining by the end of Round 2, 45 labels (97.8%) reached threshold agreement that the item was actually a *DBS technique*; 43 (93.5%) achieved agreement that the *description* was most appropriate; all labels (100%) achieved agreement that the *label* was most appropriate. Scoring negatively, 45 labels (97.8%) reached threshold agreement that the technique should not be given a different label; scoring negatively again, 31 labels (67.4%) achieved

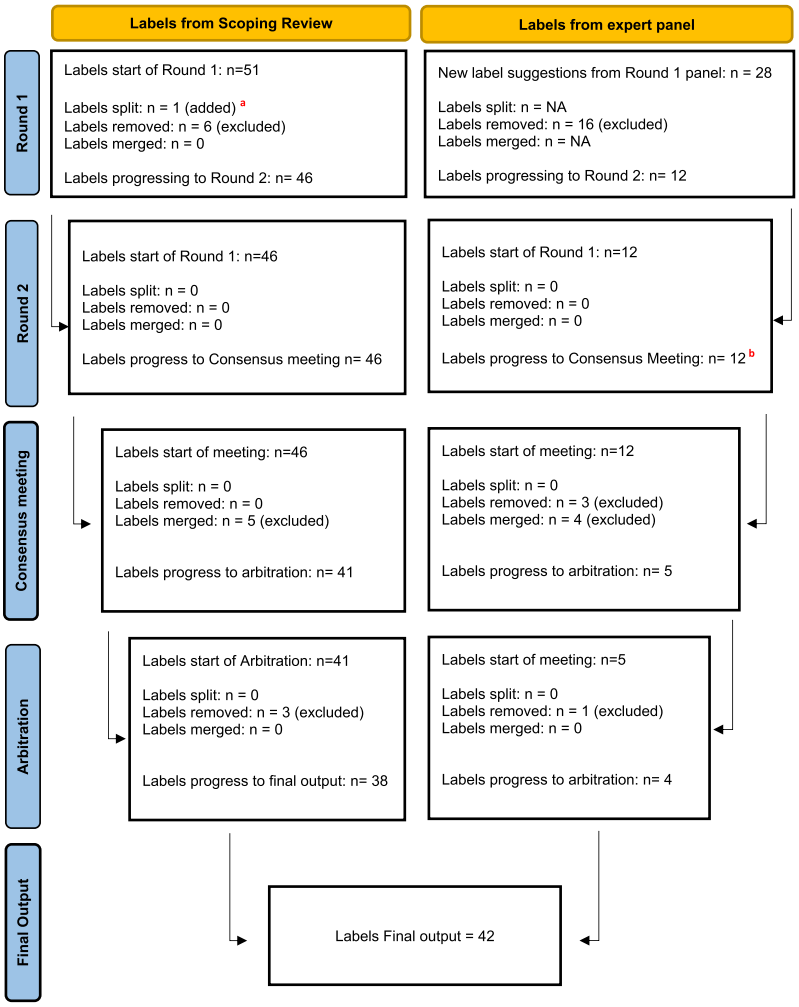

FIGURE 1 Flow diagram of labels across rounds. [a]*Oral/transmucosal sedation* technique was split into *oral sedation* and *transmucosal sedation*; [b]Despite many items scoring lowly in Round 2 for labels suggested by the panel, all were retained for further review at the consensus meeting, so as the panel could consider group responses, as per Delphi method.

agreement that the technique should *neither* be merged with another label *nor* split into other labels.

3.3.2 | Labels from expert panel

Twenty-eight new items were suggested by panellists in Round 1, of which 12 were included for initial scoring across five items each in Round 2. Of the total 60 responses, 27 (45%) achieved consensus in Round 2. Looking at each item, five labels (41.7%) exceeded threshold agreement that the technique was actually a *DBS technique* (median level of consensus 69.7%; range = 39.4%–93.9%); seven techniques (58.3%) achieved agreement that the *description* was most appropriate (median level of consensus at 77.3%; range = 54.5%–97%); four labels (33.3%) achieved agreement that the *label* was most appropriate (median level of consensus at 68.2%; range = 51.5%–93.9%). Scoring negatively, nine labels (75%) achieved agreement that the technique should not be given a different label (median level of consensus at 81.9%; range = 61.3%–96.8%); Scoring negatively again, two labels (16.7%) achieved agreement that the technique should *neither* be merged with another label *nor* split into other labels (median level of consensus at 65.1%; range = 47.4%–78.1%). Qualitative findings led to changes in labels and descriptions by consensus of the panel.

3.4 | Consensus meeting

Regarding the original labels, it was agreed that all sedation related labels (n = 5: *intramuscular*, *inhalation*; *oral*; *transmucosal* and *intravenous*) would be merged as a single *sedation* label (100% agreement). All panel generated labels were rescored at the consensus meeting. Four items were merged: *differential reinforcement* (100%); *extinction* (75%); *token economy* (100%) and *behavioural momentum* (83.3%) into an existing term (*reinforcement*). Three techniques were removed: *clown therapy* (92.3%), *spiritual recitation* (100%) and *aromatherapy* (84.6%). One technique was given a new label (*stop signal*) and three had their description modified: *task analysis*, *message to dentist* and *stop signal*. In relation to the remaining five panel generated items still present by the end of the consensus meeting, four (80%) reached threshold agreement that the item of interest was a *DBS technique*; all (100%) achieved agreement that the *description* was most appropriate; all labels (100%) achieved agreement that the *label* was most appropriate. Scoring negatively, four labels (80%) reached threshold

TABLE 4 Summary of consensus over rounds.

		Labels from scoping review							Labels from expert panel						
		A	B	C	D[a]	E[a]	F	G	A	B	C	D[a]	E[a]	F	G
Round 1	n DBS techniques	51	51	51	51	51	1	6							
	n of items reaching consensus	47	49	42	44	27	1	5							
	% of items >75% agreement	92.2	96.1	82.4	86.3	52.9	100	83.3							
	Median level of agreement	94.3	88.6	88.6	88.2	75.8	100	87.9							
	Max range	100	100	100	62.9	39.4	100	97.0							
	Lower range	60	68.6	68.6	100	93.8	100	72.7							
Round 2	n DBS techniques	46	46	46	46	46			12	12	12	12	12	4	3
	n of items reaching consensus	45	43	46	45	31			5	7	4	9	2	4	3
	% of items >75% agreement	97.8	93.5	100.0	97.8	67.4			41.7	58.3	33.3	75	16.7	100	100
	Median level of agreement	81.8	84.9	87.9	87.9	70.3			69.7	77.3	68.2	82	65.2	91.7	92.3
	Max range	97.0	97.0	97.0	69.7	36.6			93.9	97	93.9	96.8	78.1	100	100
	Lower range	72.7	69.7	78.8	93.8	93.9			39.4	54.5	51.5	61.3	47.4	75.0	84.6
Consensus meeting	n DBS techniques								5	5	5	5	5		
	n of items reaching consensus								4	5	5	4	2		
	% of items >75% agreement								80	100	100	80	60		
	Median level of agreement								69.2	92.3	92.3	53.8	69.2		
	Max range								69.2	100	100	53.8	76.9		
	Lower range								69.2	76.9	84.6	53.8	53.8		

[a]Negatively marked; A = Do you agree that this is a DBS technique? B=Do you agree that this description is the most appropriate for this DBS technique? C=Do you agree that this is the most appropriate label for this DBS technique? D=Should this be given a different label? E = Should this be merged with another label or split into other labels? F=Do you agree this technique should be merged/split? G = Do you agree this technique should be removed?

agreement that the technique should not be given a different label; scoring negatively again, three labels (60%) achieved agreement that the technique should *neither* be merged with another label *nor* split into other labels.

3.5 | Arbitration

Forty-six (41 scoping review generated, and 5 expert panel generated) techniques went forward to arbitration by five arbiters. To begin, two labels were removed from the list because they did not reach 75% agreement that they were actual DBS techniques: *fading* (69.2%) and *consistency* (72.7%). Another two were removed due to qualitative feedback suggesting that they were not DBS techniques, or did not take effect within the dental setting: *Ask-tell-ask* and *motivational interviewing*. Arbitration also saw major adjustment of two descriptions and minor adjustment of most descriptions to ensure consistency and ease of reading. Three labels were renamed at this stage due to qualitative comment review: *counting time; caregiver presence* and *stop signal*.

3.6 | External review

Next, the list was reviewed through information-sharing sessions at scientific meetings of the International Association for Dental Research (IADR) (June 2022) and the International Association for Disability and Oral Health (iADH) (August 2022). The DBS list was circulated to professional groups who may have an interest in this field. Response was received and reviewed from the British Society for Paediatric Dentistry (BSPD), the British Society for Special Care Dentistry (BSSCD), IADH and, a single patient representative from a managed care network in the United Kingdom.

3.7 | Identifying mechanisms of action and sorting

Thirteen separate principles of learning and behaviour were selected to categorize all techniques, in 85 separate instances. Although it was impossible to categorize exhaustively or exclusively, frequencies, listed for indicative purposes only, were as follows: stimulus control ($n=32$); positive reinforcement ($n=13$); differential reinforcement ($n=11$); respondent conditioning ($n=7$); non-contingent reinforcement ($n=4$), extinction ($n=4$); positive punishment ($n=4$); negative reinforcement ($n=3$); differential negative reinforcement of other behaviour (DNRO) ($n=3$); escape extinction ($n=2$); negative punishment ($n=1$); contingency management ($n=1$); and shaping by successive approximation ($n=1$). Agreed labels, descriptions, underpinning learning principle(s) are presented in Table 5. Descriptions specifying how and under what circumstances a mechanism may operate are also presented in this table, in recognition that the mechanism by which a behavioural intervention has an effect, depends on a broader range of factors than simply technique and putative mechanism.[13]

Throughout the process described above, minor changes were made to labels and descriptor for *sensory adjustment*, which was changed to *sensory-based techniques*; *music therapy*; which was changed to *music use*, given a mismatch in the use of these terms in behavioural science and as intended by the Delphi panel. The final agreed list of labels and descriptions is given in Table 5.

4 | DISCUSSION

4.1 | Agreement

This Delphi study was successful in developing consensus regarding the labels and descriptions used to describe DBS techniques. The panel were able to agree labels and descriptions representing actual DBS techniques. Starting with a list of 51 techniques derived from a scoping review,[11] 12 more were added by panellists themselves. Thus, a total of 63 candidate techniques were considered, leading to the final BeSiDe list of 42 agreed terms. Full agreement was achieved that each was considered an actual DBS technique, and that the label, and description were most appropriate. There was far less agreement on what distinguished one technique from another: agreement was not achieved regarding distinctiveness for 17 techniques. This demonstrates a lack of clarity on the distinction between techniques, highlighting the need for this study.

When labels and descriptions from within the dental literature were available and acceptable to the panel, they were maintained. This created a natural bias towards the language that dentists already use. For example, positive reinforcement, while technically a principle of learning rather than a technique, was maintained in the list of techniques to fit the natural language of the professions. Panellists likely lacked specific knowledge in relation to differentiations of this type. When descriptions were not available in the dental literature, efforts were made to align with terminology of the same techniques in the psychological literature, adopting authoritative sources such as the American Psychological Association, and notable others.[23] This was done in an effort to align dental terminology with other fields of behavioural sciences to hopefully facilitate knowledge transfer across disciplines. Behavioural scientists have long faced challenges in integrating their methodologies into various professions, often due to aversion to specialized terminology or *jargon*.[33] Establishing connections between practical language and technical terminology, as demonstrated in this study, might help bridge this gap in dental science.[34]

For this study, DBS techniques were defined as irreducible, that is the smallest component of a DBS intervention that on its own has the potential to support the patient (active ingredient). The findings suggest that this definition is unsuitable for two reasons. Firstly, this level of granularity was not forthcoming from the literature, and subdivision to this level would have been pointless. For example, there is little advantage, or possibility, of listing all sensory based techniques as part of the BeSiDe list. Secondly, in many instances the unit of interest was at a higher level than the irreducible constituent

TABLE 5 The BeSiDe list of DBS techniques.

	Label	Description [source][a]	Underpinning learning principle(s)[b]	Description of context, setting, delivery and procedure, in which listed underpinning learning principle may apply[c]
1	Enhancing control	A technique that allows the patient to assume an active role in the dental experience by enhancing their feeling of control.[21]	Stimulus control	Stimulus control is applied if a dental professional tells the patient prior to treatment that they can actively make choices to modify, avoid or reduce perceived discomfort. The provision of such instructions/choices by the dental professional can exert stimulus control over the patient's behaviour.
2	Stop signal	A technique whereby a patient is enabled to stop treatment by presenting an agreed signal. Delphi panel	Stimulus control	Stimulus control is applied if a dental professional tells the patient prior to treatment that they can actively make choices to stop treatment. Patient's controlling response is under the stimulus control of the dentist's instructions.
3	Counting time	A technique of counting with the patient to provide meaningful intervals of time in the dental experience. Delphi panel	Stimulus control	Stimulus control is applied if a dental professional counts down time with the patient to indicate how long a treatment stage or a break from treatment may last. By using intervals of time, the aversive situation is lessened or avoided providing relief to the patient from potential distress. Counting exerts stimulus control over the patient's cooperative behaviour.
			Differential negative reinforcement of other behaviour (DNRO)	DNRO is applied if the patient tolerates the treatment during counting and then receives a break. DNRO involves the delivery of reinforcement and the removal of an aversive stimulus contingent on the absence of avoidance or escape behaviour.
4	Timed breaks	A technique of providing breaks from demands in relation to a prescribed period of time and is not related (contingent) upon patient behaviour in the dental experience. A form of noncontingent escape. Delphi panel	Non-contingent reinforcement	During a procedure the patient and dental professional may agree breaks from treatment. By using breaks that are non-contingent on specific behaviour, the aversive situation is lessened or avoided during treatment and provides relief to the patient from a stressful experience. Patient self-management is facilitated.
			Differential negative reinforcement of other behaviour (DNRO)	DNRO is applied if the patient tolerates the treatment and then receives a break. DNRO involves the delivery of reinforcement and the removal of an aversive stimulus contingent on the absence of avoidance or escape behaviour.
5	Memory restructuring	A technique of helping patients develop positive memories of the dental experience.[22]	Non-contingent reinforcement	Providing non-contingent reinforcement such as positive pictures of treatment, or positive feedback promoting a sense of accomplishment or control following the dental experience. For example, suggesting to a patient that they did well, regardless of the objective experience at the time, promotes the formation of positive memories of the dental experience.
6	Augmentative, alternative communication (AAC)	A set of communication techniques used in the dental experience that are not verbal/vocal, which can be aided (e.g. device, communication book) or unaided (e.g. sign language).[23]	Stimulus control	Stimulus control is applied if behaviours are supported by the presence of a set of communication options (e.g. a communication board, a tablet screen, a switch). For example, if a dental professional utilizes a communication system that is suitable for the patient to engage in the dental experience (antecedent-based communication by dental professional).
			Positive reinforcement	The patient may use the AAC in order to access a desired outcome (e.g. request a drink, a break, movement or a sensory item) and this describes positive reinforcement.
			Negative reinforcement	The patient may also use the AAC in order to reduce, avoid or terminate a perceived stressor stimulus, for example, request to not participate or to stop an activity or to reduce the sensation of the activity and this describes negative reinforcement.
7	Visual supports	A set of communication displays that support the patient to undertake dental treatment.[23]	Stimulus control	Visual supports describe an array of techniques that could involve pictures or video walkthroughs/models or objects. These can be used to prompt a patient to participate in required activities. They can also support a patient to predict what is happening and know what to expect. In these ways, visual supports may exert stimulus control over a patient's behaviour. Visual supports can also be patient-led as an example of a behavioural self-management strategy. Some examples may include a social story, visual schedule or video demonstration.

TABLE 5 (Continued)

	Label	Description [source a]	Underpinning learning principle(s) [b]	Description of context, setting, delivery and procedure, in which listed underpinning learning principle may apply [c]
8	Message to dentist	A specific set of techniques including a written communication aid to encourage the patient to inform the dentist of their specific worries and planned coping strategies.[24]	Stimulus control	This technique is used to evoke a patient's communication regarding their expectations, concerns, planned coping strategies to determine how these can be met by the dental professionals. Both patient and dentist behaviour may be under stimulus control in this instance. This set of techniques illustrates a contingency for self-management strategies by the patient. Further details are available.[24]
9	Clinical empathy	A system of communication involving active assessment of a patient's emotions and responding to patient cues to support the patient during the dental experience.[25]	Negative reinforcement	Removal and/or reducing stressor stimuli when distressed behavioural signs are observed describes negative reinforcement and providing positive outcomes for specific actions by the patient describes positive reinforcement.
			Positive reinforcement	Clinical empathy responses by a dental professional are learned behaviours as a result of discrimination training during past experience.
			Stimulus control	Conveying the intentions to the patient that such outcomes will occur is an example of stimulus control (antecedent-based communication by dental professional).
10	Non-verbal prompts	Gestural or physical cues used with the patient to support them in engaging in specific behaviours during the dental experience. de novo (Influenced by Prompting[23])	Stimulus control	Manipulating antecedent stimuli can cue a response. Techniques could involve body language, facial expressions, gesturing towards what is expected, modelling required movements, leading to the patient engaging in the required activity (e.g. opening the mouth wide).
11	Voice control	A technique involving deliberate alteration of voice volume, tone, or pace in the dental experience to direct the patient's behaviour.[21]	Stimulus control	Manipulating antecedent stimuli can cue a response. In this instance, manipulating paraverbal communication to encourage a patient to engage in positive dental behaviours. Modification of timbre, tone, metre, etc. may exert stimulus control over the patient's responses.
12	Person-centred communication	A set of communication techniques which involve intentionally adapting communication to align with the patient's preferred communication style. Delphi panel	Stimulus control	Manipulating antecedent stimuli can cue a response. These techniques involve altering the dental professional's communication towards the patient based on the patient's needs, preferences and strengths. For example, using developmentally appropriate terms to request the patient to complete actions during treatment. These techniques are developmentally appropriate communication styles.
13	Instruction	Providing clear instructions to guide the patient in engaging in a targeted behaviour in the dental experience. Delphi panel	Stimulus control	Manipulating antecedent stimuli can cue a response such as following directions during the dental experience. An array of techniques could be used to present unambiguous instructions or provide feedback to a patient. For example, single word rather than complex sentences and specificity in what behaviours are required.
14	Reassurance	Providing assurance to guide the patient in engaging in a targeted behaviour in the dental experience. Reassurance may involve the explanation of symptoms, informing the person of upcoming procedures, and letting the person know that there is nothing to be concerned about. Delphi panel	Stimulus control	Where explanation of symptoms and preparation for treatment is utilized, stimulus control strategies are employed.
			Positive reinforcement	When reassurance is provided as a response to a patient's behaviour (e.g. using positive statements following specific responses) this describes positive reinforcement.
			Non-contingent reinforcement	When reassurance is provided without the patient having emitted a required response, non-contingent reinforcement is described.

(Continues)

TABLE 5 (Continued)

	Label	Description [source a]	Underpinning learning principle(s) [b]	Description of context, setting, delivery and procedure, in which listed underpinning learning principle may apply [c]
15	Behaviour shaping	Reinforcement of successive approximations to a behaviour in the dental experience to produce new forms of operant behaviour.[26]	Shaping by successive approximation	Shaping involves the use of reinforcement of successive approximations of a desired behaviour. Shaping techniques involve providing reinforcement for an approximation to the desired end behaviour. Behaviours that are not approximations of the desired behaviour are not reinforced. For example, a desired patient end behaviour is opening mouth wide for long durations; approximates to this may involve parting lips, opening mouth, stretching mouth wide, holding position for periods, etc. each approximate would result in reinforcement until the end behaviour is acquired by the patient.
16	Positive reinforcement	A technique of presenting a reinforcer after a response that increases the probability of a preferred behaviour in the dental experience.[26]	Positive reinforcement	Positive reinforcement is a principle of learning that describes the mechanism for many techniques that increase the probability of behaviour. When a behaviour is followed by the presentation of some form of reinforcer and that behaviour occurs again and again, positive reinforcement has occurred. Reinforcers presented can include social commodities, tangible items and activities, etc. Examples of positive reinforcement techniques include behaviour specific praise, token reinforcement systems, social recognition and primary reinforcers (food, drink, rest and safety).
17	Negative reinforcement	A mechanism of removing, preventing, or postponing an aversive stimulus as a consequence of a behaviour in the dental experience, which, in turn, increases the probability of that behaviour.[26]	Negative reinforcement	Negative reinforcement is a principle of learning that describes the mechanism for many techniques that increase the probability of behaviour. When a behaviour is followed by the removal or reduction of some form of perceived negative stimulus and that behaviour occurs again and again, negative reinforcement has occurred. Examples of negative reinforcement include avoidance-based and escape-based techniques.
18	Distraction	A mechanism of diverting attention from what may be perceived as unpleasant in the dental experience.[21]	Stimulus control Differential reinforcement	Manipulating antecedent stimuli can cue a response. Distraction, for example with an audiovisual device, could alter a patient's attention away from feared stimuli. Differential reinforcement of incompatible behaviour (DRI) is a weakening procedure that is based on reinforcement. The behaviour that is reinforced is one that is both desirable and topographically incompatible with the target behaviour. In this instance, one may not be able attend to one (fear eliciting) stimulus when attending to another conditioned stimulus. Examples include virtual reality, phone apps, guided imagery, audiovisual distractions, guiding a patient to focus on another body part or function.
19	Guided imagery	A relaxation technique in which words, sounds, etc., are used to evoke positive mental images, feelings and thoughts in the dental setting. https://www.dictionary.com/browse/guided-imagery	Stimulus control Differential reinforcement	Manipulating antecedent stimuli can cue a response. Guided imagery could alter a patient's attention away from feared stimuli. Differential reinforcement of incompatible behaviour (DRI) is a weakening procedure that is based on reinforcement. The behaviour that is reinforced is one that is both desirable and topographically incompatible with the target behaviour. In this instance, imagining a pleasant event is both desirable and topographically incompatible with anxiety related behaviours.
20	Clinical hypnosis	A therapeutic communication conveyed verbally, that directs the patient's imagination to elicit intended alterations in sensations, perceptions, feelings, thoughts and behaviour in the dental experience.[27]	Stimulus control Respondent conditioning Differential reinforcement	Manipulating antecedent stimuli can cue a response. Clinical hypnosis could alter a patient's attention to feared stimuli. In this instance, one cannot attend to one (fear eliciting) stimulus when attending to another relaxing or trance inducing stimulus. Clinical hypnosis could describe respondent conditioning where techniques involve conditioning stimuli (through stimulus–stimulus pairing for example) to reduce distress. The presentation of the conditioned stimulus (e.g. hypnotic anchor) during the dental experience may elicit certain autonomic responses. Differential reinforcement of incompatible behaviour (DRI) is a weakening procedure that is based on reinforcement. The behaviour that is reinforced is one that is both desirable and topographically incompatible with the target behaviour. Relaxation is both desirable and topographically incompatible with anxiety related behaviours.

TABLE 5 (Continued)

	Label	Description [source][a]	Underpinning learning principle(s)[b]	Description of context, setting, delivery and procedure, in which listed underpinning learning principle may apply[c]
21	Music use	Using music as an adjunct to enhance the patient's psychological, physical, cognitive or social functioning in the dental experience.[26]	Stimulus control	Manipulating antecedent stimuli can cue a response. Music could alter a patient's attention away from feared stimuli.
			Respondent conditioning	Music could describe respondent conditioning where techniques involve conditioning stimuli (through stimulus–stimulus pairing for example) to reduce distress, that is, conditioning music (through pairing with another established conditioned stimulus). In this way, listening to music (the conditioned stimulus) during the dental experience elicits autonomic responses (positive sensations).
22	Progressive muscle relaxation	A technique used to train a person to relax the entire body in the dental experience by becoming aware of tensions in various muscle groups and then relaxing one muscle group at a time.[26]	Stimulus control	Manipulating antecedent stimuli can cue a response. Progressive muscle relaxation could alter a patient's attention to feared stimuli (e.g. verbal guidance to focus on the sensation of relaxation from repeated tightening and relaxation of muscle groups) to reduce distress.
			Differential reinforcement	Differential reinforcement of incompatible behaviour (DRI) is a weakening procedure that is based on reinforcement. The behaviour that is reinforced is one that is both desirable and topographically incompatible with the target behaviour. Relaxation is both desirable and topographically incompatible with anxiety related behaviours.
			Positive reinforcement	This technique could involve automatic reinforcement and socially mediated positive reinforcement. For example, the instructor could provide positive reinforcement (social approvals) following each instruction to relax a muscle group. This could also be automatically reinforcing for the patient (it produces changes in autonomic arousal and 'feels good'). The reinforcement could be automatic, socially mediated or both.
23	Breathing retraining	A set of techniques such as modelling and corrective feedback used to teach patients how to slow diaphragmatic breathing to promote relaxation in the dental setting.[26]	Positive reinforcement	A patient may be asked to engage in a breathing exercise that results in autonomic changes (e.g. noradrenaline production). The reinforcement could be automatic, socially mediated or both.
			Stimulus control	Where the breathing technique is prompted (e.g. modelled) stimulus control is involved.
24	Social environment	A set of techniques where the social environment of the dental experience is intentionally structured to convey a welcoming, positive and non-anxiety eliciting experience to the patient and those who support them. Delphi panel	Stimulus control	An array of techniques that could involve new stimuli, altering stimuli or removing stimuli non-contingent on any patient behaviour. Some examples may include establishing a welcoming clinic, promoting comfort through staff communication, ensuring preferred staff are present, modification of odours and pictures of children experiencing dental treatment in waiting room.
25	Social stories	A technique that describes social situations in the dental context in order to highlight relevant features of a target behaviour or skill and offer examples of appropriate responding.[23]	Stimulus control	Social stories could be used to prepare a patient to participate in required activities (antecedent-based). They can also support a patient to predict what is happening and know what to expect during the dental experience (in situ). Social stories can involve modelling the required patient behaviour during the dental experience.
26	Pre-visit preparation	A set of techniques of intentionally preparing the patient and/ or dental team through home-based preparation and sharing preparatory information about the dental setting and/ or the patient. Delphi panel	Stimulus control	An array of techniques practiced at home prior to attendance involving new stimuli. Some examples include behavioural rehearsal at home, like practicing opening the mouth or having hands on tummy.

(Continues)

TABLE 5 (Continued)

	Label	Description [source][a]	Underpinning learning principle(s)[b]	Description of context, setting, delivery and procedure, in which listed underpinning learning principle may apply[c]
27	Patient-centred scheduling	A technique of intentionally structuring the timing of the dental experience to the patient's needs and preferences. Delphi panel	Stimulus control	By altering the time, content or length of the dental visit, stimuli would also be altered (e.g. reduction in visual and auditory stressor stimuli).
			Differential negative reinforcement of other behaviour (DNRO)	Where appointments are made shorter, for example, patients may tolerate the environment for a short period, followed by leaving (escape). The omission of problem behaviour is reinforced.
28	Sensory-based techniques	A set of techniques that present sensory adjustments (visual, olfactory, auditory, tactile, proprioceptive and vestibular) to support positive behaviour in the dental experience.[23]	Stimulus control	Where techniques include the provision of antecedent-based stimuli to support a patient (non-contingent on any behaviour) stimulus control is described.
			Differential reinforcement of incompatible behaviour (DRI)	In this way, the sensory stimuli utilized by the patient could alter attention to stressor stimuli (DRI).
			Non-contingent reinforcement	Sensory items could be provided non-contingently for the patient to utilize during treatment.
			Positive reinforcement	Scents, audio, visual or tactile items could all be examples of sensory-based techniques that could produce automatic reinforcement or socially mediated reinforcement or both for the patient.
29	Animal assisted therapy	A goal-oriented intervention which utilizes a trained animal in a healthcare setting to improve interactions or decrease a patient's anxiety, pain or distress.[21]	Respondent conditioning	If the therapeutic pet is a conditioned stimulus that elicits positive autonomic arousal, the presence of the pet during the dental experience involves respondent conditioning, that is, they elicit calm responses.
			Stimulus control	The animal could also be a distraction for the patient and the presence of the animal is an example of stimulus control and may distract the patient from stressor stimuli.
30	Caregiver presence	A technique of selectively modifying the presence or absence of a parent or other significant other to increase the likelihood of applying or engaging in a behaviour in the dental setting. Delphi panel	Respondent conditioning	If the presence of the caregiver elicits positive autonomic arousal, their presence during the dental experience involves respondent conditioning, that is, they elicit calm responses.
			Stimulus control	The presence of a caregiver is an example of stimulus control and may distract the patient from stressor stimuli.
			Negative punishment	The presence or absence of the caregiver is usually a proactive strategy (asking them to leave prior to treatment) rather than reactive (asking them to leave during treatment). If the caregiver is asked to leave contingent on problem behaviour emitted by the patient and the problem behaviour subsequently reduces, this is an example of negative punishment.
			Positive reinforcement	If the caregiver is asked to return contingent on specific behaviours emitted by the patient (e.g. coping with or tolerating a treatment) and these behaviours increase, this is an example of positive reinforcement.
31	Preparatory visit	A technique of intentionally preparing the patient and dental team for the dental experience through preparatory visit(s). Delphi panel	Stimulus control	An array of techniques that could involve new stimuli, altering stimuli or removing stimuli both contingent and non-contingent on patient behaviour. Some examples include, behavioural rehearsal, discrimination training and contingency management

TABLE 5 (Continued)

	Label	Description [source][a]	Underpinning learning principle(s)[b]	Description of context, setting, delivery and procedure, in which listed underpinning learning principle may apply[c]
32	Desensitization	A mechanism that reduces emotional or physical reactivity to stimuli in the dental experience. This is often achieved by such means as exposure, deconditioning, rehearsal or breathing techniques to control anxiety.[26]	Respondent conditioning	Techniques may involve the presentation of a stimulus related to the dental experience (e.g. sounds) and pairing it with a conditioned stimulus (e.g. preference items). In this way a respondent conditioning process is undertaken.
			Extinction	Where a patient is exposed to a stressor stimulus and required to cope with it by not escaping, this is an example of exposure and response prevention or escape extinction.
			Differential reinforcement of incompatible behaviour (DRI)	When a patient engages in an incompatible behaviour and receives reinforcement, DRI is described.
			Positive reinforcement	When positive reinforcers are delivered for engaging in a required response, for example, tolerating a sensory stressor and tolerance increases, this involves positive reinforcement.
33	Graded exposure	A technique, whereby anxiety-provoking stimuli related to the dental experience are listed in order from weakest to strongest; and each of these situations is presented in imagination or in reality, beginning with the weakest. Delphi panel	Extinction	Where a patient is exposed to a stressor stimulus and required to cope with it by not escaping, this is an example of exposure and response prevention or escape extinction.
			Differential reinforcement of incompatible behaviour (DRI)	When a patient engages in an incompatible behaviour and receives reinforcement, DRI is described.
			Positive reinforcement	When positive reinforcers are delivered for engaging in a required response, for example, tolerating a sensory stressor and tolerance increases, this involves positive reinforcement.
			Stimulus control	Stimulus control is in effect when a hierarchy of stimuli are presented from weakest to strongest.
34	Cognitive behavioural therapy (CBT)[c]	A set of specific psychotherapeutic techniques that integrate theories of cognition and learning with treatment techniques derived from cognitive therapy and behaviour therapy.[26]	Extinction	This includes numerous techniques and mechanisms tailored to the patient's needs and can be utilized in preparation for treatment or in situ. Where a patient is exposed to a stressor stimulus and required to cope with it by not escaping, this is an example of exposure and response prevention or escape extinction.
			Differential reinforcement (DRI)	When a patient engages in an incompatible behaviour and receives reinforcement, DRI is described.
			Positive reinforcement	When positive reinforcers are delivered for engaging in a required response, for example, tolerating a sensory stressor and tolerance increases, this involves positive reinforcement.
			Respondent conditioning	Techniques may involve the presentation of a stimulus related to the dental experience (e.g. sounds) and pairing it with a conditioned stimulus (e.g. preference items). In this way a respondent conditioning process is undertaken.
			Stimulus control	Stimulus control is in effect when a hierarchy of stimuli are presented from weakest to strongest.
			Contingency management	When antecedents (A) are presented by the dental professional, followed by patient responses (B), consequences (C) occur that can increase or decrease these responses. This is referred to as the three-term contingency (ABC).

(Continues)

TABLE 5 (Continued)

	Label	Description [source][a]	Underpinning learning principle(s)[b]	Description of context, setting, delivery and procedure, in which listed underpinning learning principle may apply[c]
35	Systematic desensitization	A set of specific techniques in which counterconditioning is used to reduce anxiety associated with the dental experience involving three steps: (a) patient is trained in deep-muscle relaxation; (b) Anxiety-provoking stimuli related to the dental experience are listed in order from weakest to strongest; and (c) each of these situations is presented in imagination or in reality, beginning with the weakest, while the patient practices muscle relaxation [added from Ref. 28] or reinforcement.[26]	Respondent conditioning	Techniques may involve the presentation of a stimulus related to the dental experience (e.g. sounds) and pairing it with a conditioned stimulus (e.g. preference items). In this way a respondent conditioning process is undertaken.
			Extinction	Where a patient is exposed to a stressor stimulus and required to cope with it by not escaping, this is an example of exposure and response prevention or escape extinction.
			Differential reinforcement of incompatible behaviour (DRI)	When a patient engages in an incompatible behaviour (such as muscle relaxation) and receives reinforcement, DRI is described.
			Positive reinforcement	When positive reinforcers are delivered for engaging in a required response, for example, tolerating a sensory stressor and tolerance increases, this involves positive reinforcement.
			Stimulus control	Stimulus control is in effect when a hierarchy of stimuli are presented from weakest to strongest.
36	Tell-show-do	A set of techniques involving verbal explanations of procedures in phrases appropriate to the developmental level of the patient (tell); demonstrations for the patient of the visual, auditory, olfactory and tactile aspects of the procedure in a carefully defined, nonthreatening setting (show); and then, without deviating from the explanation and demonstration, completion of the procedure (do).[21]	Stimulus control	Stimulus control is in effect when novel or altered stimuli are demonstrated, with prompting, leading to rehearsal and modelling the required behaviour.
37	Modelling	A technique used in the dental experience in which learning occurs through observation and imitation. Delphi panel	Stimulus control	Techniques involve the presentation of stimuli in some form (live, recorded, observe another individual or first-person point of view) to evoke the target behaviour.
			Positive Reinforcement	When the patient experiences positive reinforcement for the modelled behaviour this can be most effective.

TABLE 5 (Continued)

	Label	Description [source][a]	Underpinning learning principle(s)[b]	Description of context, setting, delivery and procedure, in which listed underpinning learning principle may apply[c]
38	Premedication	A dose of medication taken prior to the dental procedure. Premedication may be given to facilitate sleep the night before treatment, or to promote anxiolysis or alter behaviour on the day of the appointment. The medication may be taken pre-facility prior to arrival to allow entry to the facility. A low dose is selected to make sedation unlikely. [Delphi panel]	Differential reinforcement of incompatible behaviour (DRI)	When a patient engages in an incompatible behaviour (such as relaxation from sub-sedative doses of sedative medication), the patient is less likely engage in anxiety related behaviours, DRI is described.
39	Sedation	A set of techniques in which the use of a drug or drugs produces a state of depression of the central nervous system enabling dental treatment to be carried out. Sedation is often described according to depth of sedation or route of delivery. Modified from reference.[29]	Differential reinforcement of incompatible behaviour (DRI) Positive punishment	If sedation is utilized to promote anxiolysis, a patient could engage in an incompatible behaviour (such as relaxation from sedative medication), the patient is less likely engage in anxiety-related (e.g. avoidance or escape) behaviours, DRI is described. Using sedatives could act as an establishing operation for incompatible behaviour. If sedation is utilized contingent on distressed behaviour and a person cannot actively participate in the dental treatment, this involves positive punishment, that is, the addition of a stimulus following a behaviour to reduce or suppress that behaviour.
40	General anaesthesia	A drug-induced loss of consciousness during which patients are not arousable, even by painful stimulation. The ability to independently maintain ventilatory function is often impaired. Patients often require assistance in maintaining a patent airway, and positive pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function. Cardiovascular function may be impaired.[30]	Positive punishment	If general anaesthesia is utilized contingent on distressed behaviour and a person cannot actively participate in the dental treatment, this involves positive punishment, that is, the addition of a stimulus following a behaviour to reduce or suppress that behaviour. Using a general anaesthetic could act as an establishing operation for incompatible behaviour.

(Continues)

TABLE 5 (Continued)

	Label	Description [source][a]	Underpinning learning principle(s)[b]	Description of context, setting, delivery and procedure, in which listed underpinning learning principle may apply[c]
41	Clinical holding	A set of techniques using physical holds to assist or support a patient to receive dental care or treatment in situations where their behaviour may limit the ability of the dental team to effectively deliver treatment, or where the patient's behaviour may present a safety risk to themselves, members of the dental team or other accompanying persons.[31]	Positive punishment	If a clinical hold is utilized contingent on distressed behaviour this involves positive punishment, that is, the addition of a stimulus following a behaviour to reduce or suppress that behaviour. If the distressed behaviour reduces as a result of the clinical hold, the hold is a punisher.
			Escape extinction	If a clinical hold is used because distressed behaviour is expected but not yet observed, and the patient's distressed behaviour functions to escape the dental experience (or specific related stimuli), the clinical hold prevents escape, that is, escape extinction.
			Stimulus control	In cases where holds are applied at the request of a patient (e.g. in dystonia), this is an example of stimulus control.
42	Protective stabilization	A set of techniques utilized in dentistry for the physical limitation of a patient's movement *by a person or restrictive equipment, materials or devices* for a finite period of time in order to safely provide examination, diagnosis and/or treatment.[32]	Positive punishment	If devices are utilized contingent on distressed behaviour this involves positive punishment, that is, the addition of a stimulus following a behaviour to reduce or suppress that behaviour. If the distressed behaviour reduces as a result of the device, this is a punisher.
			Escape extinction	If a device is used because distressed behaviour is expected but not yet observed, and the patient's distressed behaviour functions to escape the dental experience (or specific related stimuli), the device prevents escape, that is, escape extinction.

[a]Source document for description. All source text has been modified as part of the Delphi process.

[b]Listed principles are not comprehensive. Different principles will apply depending on procedure context and other factors.

[c]In line with trends in behaviour science, this column is presented with recognition that the mechanism by which a behavioural intervention has an effect, depends on a broader range of factors than simply technique and putative learning principle. Therefore, brief examples are given of contexts and procedures within which the learning principle may apply for each technique. These principles will not apply in situations where entities relating to the intervention change, such as change in context or intensity of intervention; personal responsiveness of the patient; interpersonal relationship between patient and dentist; drug dosage, etc.

components: CBT and tell-show-do are obvious examples of sets of techniques rather irreducible components, and yet it is at this level of presentation that they possess meaning in dentistry. So, many labels were most meaningfully considering as sets, rather than their individual constituents. Consequently, a pragmatic decision was made to list techniques, as well as *sets of techniques* and even *mechanisms* under the heading *techniques*. This outcome is incongruous with the initial definitions applied earlier in this study. Therefore, the authors suggest the following definitions in further research; *DBS*: Any passive or active interaction with the patient, using specific techniques, to support patients' experience and acceptance of professional oral healthcare. DBS therefore *promotes* behaviours that enable acceptable oral healthcare, or *prevents* behaviours that inhibit acceptable oral healthcare; *DBS technique*: The smallest active component or meaningful set of components of a DBS intervention that on its own, or together, have the potential to support the patient (active ingredient(s)) to receive professional oral healthcare. The defining features of a DBS technique are that it is observable; replicable; meaningful; a component of a DBS intervention; a postulated active ingredient within the intervention.[35]

Agreeing the term *sedation* was complicated because it was often presented with descriptors based on either route of delivery (e.g. IV v oral), drug type or depth of sedation (e.g. minimal vs. moderate). Over rounds, the panellists shared strong and often opposing perspectives regarding how this ought to be described. Given that individual perspectives reflected customs and regulatory or legislative contexts, the panel eventually decided to simply describe these routes/depths under the term *sedation*, which can be described and conceived according to the specific needs of those, who describe it and, does not counter working definitions across countries.[29,30]

Comparisons with existing syntheses demonstrate significant overlap with the BeSiDe list presented here,[36–40] suggesting promising content coverage. Nevertheless, notable omissions were evident. While the prototype list used here has recently demonstrated excellent coverage of DBS interventions,[41] it notably excludes *aromatherapy*, which is commonly reported. Furthermore, labels like *fading* and *task analysis* were excluded despite their use in dental and behavioural science.[23,42,43] They were omitted by the panel, probably because of a lack of familiarity.

4.2 | Underlying principles

In this study, all techniques were found to have the potential to take effect, and be understood, according to principles of learning. This is a significant and novel perspective cutting across fields. Selected principles included *stimulus control*, *reinforcement*, *respondent conditioning*, *punishment*, *extinction*, *escape extinction*, *contingency management* and *shaping*. When identifying the underlying principles, it became clear that the specific mechanism of action for each technique was dependent on more than simply technique and procedure, as originally conceived. Other entities such as context or intensity of intervention; personal responsiveness of the patient; interpersonal relationship between patient and dentist; drug dosage, etc. obviously shaped the mechanism. Notably, many techniques were also assumed to operate distally, fostering self-management in the dental setting. Together, this meant that single techniques were considered to possess multiple potential mechanisms, depending on their procedure. This issue of specific behavioural techniques having multiple putative mechanisms of action is a familiar challenge in behavioural science.[44] Recent developments in the field of behaviour change have been driven by efforts to address this complexity.[13] Therefore, brief examples of how, and in what circumstances the learning principle may apply for each technique were needed. It is important to note the context dependency of these relationships: listed principles will not apply in situations where features of the techniques or procedure change.

4.3 | Sorting

One study aim was to sort techniques based on theory to generate a taxonomy of techniques. For example, 'enhancing control', 'stop signal' and 'counting' might be grouped under the principle of stimulus control, while 'desensitization', 'graded exposure' and 'systematic desensitization' might fall under the principles of extinction and differential reinforcement. This study failed to sort techniques in this way because the fit between technique and underlying principle was found to be highly context dependent, which precluded sorting exhaustively or exclusively. The effort to do so illustrated that multiple mechanisms can potentially be activated by the same DBS technique, depending on its application. This finding is crucial for dental professionals, as they underpin the effectiveness of their techniques. The understanding, application and effectiveness of any technique is context dependent. Certain mechanisms might only be active under specific circumstances, largely influenced by context, the professional's application and the patient's response.

DBS techniques have previously been grouped based on acceptability, degree of complexity and, mode of delivery, among other categorizations.[21,45–47] While none of these approaches offer a perfect frame for relating techniques to each other, their variety conveys a function in their diversity, having a range of ways to group techniques. This is often seen in sedation guidelines where techniques can be grouped interchangeably by mode of delivery (e.g. intravenous vs. inhalational), mode of action (i.e. moderate vs. deep) or pharmacological agent (i.e. midazolam vs. nitrous oxide), depending on the purpose of the grouping, even within single guidelines.

4.4 | Strength and weaknesses

The e-Delphi method is known to suffer from a number of drawbacks. First, while a Delphi can generate agreement, it is not a suitable method for testing the validity of agreed outputs. In short, the panel may agree, but may also be wrong in that agreement.[48] In this study, efforts were made to mitigate this by starting with a systematic

search of the literature and by engaging a diverse expert panel across disciplines. Another recognized issue in Delphi methods involves panel retention.[49] However, this study demonstrated high retention of panellists between rounds. This study involved additional steps of theoretical exploration and sorting in efforts to develop a taxonomy. Using these methods, the team applied principles of behaviour to specific techniques, albeit in specific circumstances only. The resultant frame did not allow for sorting and thus, for meaningful taxonomy development. Nevertheless, the process did allow for a deeper understanding of DBS, of its underlying principles, and of the need for detailed reporting of how techniques are applied. The resultant list is extensive, but not comprehensive. While initial research into coverage is positive,[41] the list will need updating. Ideally, a dynamic list is preferred with a real-time interactive interface. Resources such as GitHub may be useful in this regard in the future.

4.5 | Implications

Fundamentally, this research offers a new window through which to consider DBS. The labels and descriptions listed here offer distinctiveness that was previously lacking, thereby offering a chance for consistent terminology across practice, research and education, if potential users choose to adopt it. While a taxonomy has not been achieved, this list can guide the development, reporting, and evaluation of DBS interventions. Primarily, the labels and descriptions in this list can be used to improve the conceptualization, description and distinction of DBS interventions in research. At the intervention development stage, researchers are encouraged to specify and describe the constituent DBS techniques active (or activatable) in their intervention. The list presented here can, at worst, offer a starting point in that process, and at best, promote consistent description that allows comparison across studies and predictable transfer into practice. This study also emphasizes the highly context-dependent nature of the mechanisms underlying DBS techniques. This highlights the need to report the mechanisms by which interventions are expected to take effect. The principles of learning and behaviour can function well in this role, but only when sufficient detail is reported. Based on these findings, interventionists are encouraged to expand on which DBS techniques work in their interventions, how and, why. Thus, interventions must be reported, at a minimum, according to technique, mechanism and procedure, but interventionists should not stop there. In fact, this level of detail is increasingly seen as insufficient for the reporting of effective behavioural interventions. Recent shifts in this field encourage a wider focus on the reporting of a broader range of entities, or attributes, that ought to be described when explicating behavioural interventions. For further discussion on these attributes, see Michie et al.[13] Resources such as TiDieR criteria, and guidance on intervention development, may also be useful when developing and reporting DBS interventions.[50,51]

Clearer description should allow for reliable knowledge transfer into practice. The BeSiDe list is not intended to stifle creativity or diminish techniques that work for patients and clinicians. Rather, clinicians should have access to evidence for the effectiveness, and safety of their DBS practice. In essence, this list should encourage clinicians to reflect on which DBS techniques they use, why they do so, why they expect them to work, for whom and in what way. This is important because dentists have been found to lack an understanding of the DBS techniques that they practice.[6] The findings of this study suggest that understanding the principles of behaviour and learning may help dental teams shift their practice of DBS from an art to a science. As a result, education on behavioural learning theory is recommended across dental science.

5 | CONCLUSIONS

This Delphi study led to the creation of the BeSiDe list of 42 DBS techniques. Experts agreed on what each DBS technique is, what label to use, and their description, but were less likely to agree on what distinguishes one technique from another. The definition of what constitutes a DBS technique was tested and refined. All techniques were describable but not comprehensively categorizable according to principles of learning. This meant that theoretical sorting was too inconsistent to use as a basis for taxonomy development. While a taxonomy was not attained, a greater understanding of DBS emerged. The words of Michie and colleagues, in their endeavours to explore the description of behaviour interventions ring true: 'Even if full objective consistency cannot be attained, greater clarity and consistency must always be better in science than lower clarity and consistency'.[13] The resulting list of agreed terminology marks a significant foundation for future efforts towards understanding DBS techniques in research, education and clinical care.

AUTHOR CONTRIBUTIONS

The corresponding author has read the journal policies on author responsibilities and submits this manuscript in accordance with those policies.

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The authors declare that they have no competing interests.

CONSENT TO PARTICIPATE

All panellists explicitly consented to participate in this study.

PROTOCOL REGISTRATION

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DATA AVAILABILITY STATEMENT

All relevant data are presented in the study and supplementary files. Further data are available from the author upon reasonable request.

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SUPPORTING INFORMATION

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

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