Article:
Gupta, C., Barber, M., Boissonade, F. et al. (2026) The use of pain scales in scientific studies on dentin hypersensitivity: A scoping study. Periodontology 2000. ISSN: 0906-6713

https://doi.org/10.1111/prd.70043

Received: 9 February 2026 | Revised: 6 March 2026 | Accepted: 15 March 2026

DOI: 10.1111/prd.70043

Periodontology 2000 WILEY

REVIEW ARTICLE

The use of pain scales in scientific studies on dentin hypersensitivity: A scoping study

C. Gupta | M. Barber | F. Boissonade | N. Flannigan | N. Wong | B. J. Gibson

School of Clinical Dentistry, The University of Sheffield, Sheffield, UK

Correspondence
C. Gupta, School of Clinical Dentistry, The University of Sheffield, Claremont Crescent, South Yorkshire, Sheffield, S10 2TA, UK.
Email: cgupta1@sheffield.ac.uk

Abstract

Objective: This scoping review aimed to identify the pain scales used to clinically evaluate dentin hypersensitivity (DH) in existing literature and the references provided for their selection.

Methods: The scoping review followed the PRISMA and JBI guidelines. An electronic search of the literature was conducted across Web of Science, PubMed (Medline), Scopus, and CINAHL. Eligible studies included adult participants with DH who were assessed using pain scales. After screening, data were extracted and synthesised to identify the most commonly used pain scales and the theoretical and methodological justification for their use.

Results: Seventy-one studies were included in the review, and most of them were randomised studies (randomised clinical studies + RCTs = 81.7%). The visual analog scale (VAS) was the most frequently used pain measurement, followed by the Schiff Cold Air Sensitivity scale (SCASS). Use of both scales together was also identified as a common practice. There were inconsistencies in the references provided as the rationale for the use of the pain measurement tools.

Conclusions: VAS and SCASS are unidimensional scales that are used in DH research without an adequate theoretical understanding of the condition and methodological considerations. More research needs to be conducted on the methodological suitability of the pain scales and the conceptual understanding of pain management in DH.

KEYWORDS
dental pain, dentin hypersensitivity, pain assessment, pain indicators, pain measurement, pain scales

1 | INTRODUCTION

Dentin hypersensitivity (DH) is a common dental condition in adults. It is a complex pain condition that is difficult to manage because of the challenges associated with accurately diagnosing it. Once a diagnosis is made, it can be treated with a range of at-home and in-office treatment modalities, including desensitizing agents, such as dentifrices, mouthwashes, chewing gums, dentinal sealants, varnishes, resin sealers, glass ionomers, dentin adhesives, and lasers, as well as invasive procedures such as direct restorations and surgical corrections for gingival recession.[1] Central to the success of treatment is a reduction in the impact and experience of pain.

Assessment of pain for DH helps in diagnosis by providing a better understanding of patients' symptomatology and deciding the

BOX 1 The IASP definition of pain.[10]

Pain

An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage.

Notes

- Pain is always a personal experience that is influenced to varying degrees by biological, psychological, and social factors.
- Pain and nociception are different phenomena. Pain cannot be inferred solely from activity in sensory neurons.
- Through their life experiences, individuals learn the concept of pain.
- A person's report of an experience as pain should be respected.*
- Although pain usually serves an adaptive role, it may have adverse effects on function and social and psychological well-being.
- Verbal description is only one of several behaviors to express pain; inability to communicate does not negate the possibility that a human or a non-human animal experiences pain.

Etymology:

Middle English, from Anglo-French peine (pain, suffering), from Latin poena (penalty, punishment), in turn from Greek poinē (payment, penalty, recompense).

*The Declaration of Montréal, a document developed during the First International Pain Summit on September 3, 2010, states that "Access to pain management is a fundamental human right."

course of the condition, degree of severity, the usage of therapeutic aids, and the social, economic, and work-related consequences.[2]

An important challenge in DH pain assessment is the methodological suitability of pain assessment tools in terms of their reliability, validity, and reproducibility.[3,4] Validity refers to the capacity of a tool to measure the chosen quantity and is further categorized into content validity (the adequacy of measuring the quantity, considering all the parameters that could be important for the patient and the assessor), criterion-related validity (the ability to correctly indicate the real clinical condition of the patients with the results), construct validity (the inclusion of all the variables involved in the study of the quantity), discriminatory validity (the capacity to find clinically relevant differences among patients), and convergent validity (the degree of correlation between the tool's measures and other clinical measures). Reliability means that the tool's results will be repeatable in terms of changing symptomatology, passing of time, and altering environment, and reproducibility indicates the stability of the results if the assessment is repeated. Another key feature of pain measurement tools is sensitivity, which refers to the probability of reporting a clinically significant change over time.[2]

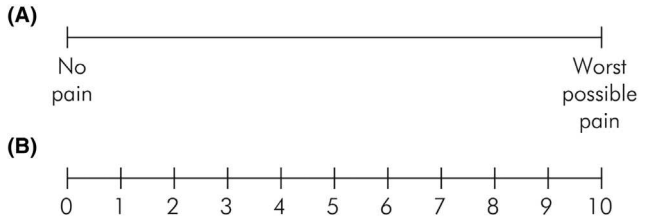

FIGURE 1 (A) Visual analog scale, and (B) Numerical rating scale.[8]

Methodologies for measurement instruments are derived from conceptual frameworks or models of disease and illness, typically leading to specific techniques for measuring pain. The most commonly used definition of dentin hypersensitivity follows a 'biomedical' model of pain where it is characterized as a "short sharp pain arising from exposed dentine most commonly at the tooth cervical area in response to stimuli (typically thermal, evaporative, tactile, osmotic or chemical), but which cannot be ascribed to any other dental defects, diseases or restorative treatments."[5]

The specific clinical assessment techniques that follow from this approach involve applying specific, measurable stimuli such as tactile, cold, and evaporative air stimuli, which are described as physiological and easily controlled. The aim behind these techniques is to provoke a response and then quantify the pain, often in terms of either a stimulus intensity required to elicit pain (stimulus-based assessment or pain threshold) or subjective pain severity ratings (response-based assessment).[6]

The Schiff Cold Air Sensitivity Scale (SCASS) is a pain measurement scale developed exclusively for DH and described as a stimulus-based assessment to measure pain. It is better described as a behavioral scale because it is based on observed behavior in response to a stimulus beyond a certain threshold. An important feature of this scale is that it is behaviorally based. The dentist (or another assessor present) rates the response of the patient to the stimulus as 0 for 'no response to air stimulus'; 1 for 'response to air stimulus but no request for discontinuation of the stimulus'; 2 for 'response to air stimulus and requests discontinuation or moves from the stimulus'; 3 for 'response to air stimulus, considers stimulus to be painful, and requests discontinuation'.[7]

The second type of scale used in research for dentin hypersensitivity includes subjective pain severity rating scales. These include visual analog scale (VAS), verbal rating scales (VRS), and numerical rating scales (NRS).[6] In VAS scales, a patient typically quantifies the pain they experience by placing a perpendicular mark on a 10 cm or 100 mm line labeled from 'no pain' to 'worst pain imaginable'. Similar to the VAS, NRS is an 11-point scale that grades pain usually from 0 to 10, where 0 represents 'no pain' and 10 represents 'worst pain possible'.[8] (Figure 1).

These pain severity rating scales are unidimensional assessment tools that were developed to measure acute pain. They primarily measure pain intensity, which is only one aspect of pain.[9] The definition and measurement of DH limit the scientific conception of dentin hypersensitivity to nociception, in contrast to recognizing the

diversity and complexity of patients' pain experiences. Nociception refers to nervous system activity occurring in response to a noxious stimulus.[10] In this approach, the pain experienced in dentin hypersensitivity is best understood by the biomedical framework and treated as acute and episodic.

A point of debate in this field is that there have been two quite different models for understanding dentin hypersensitivity: the biomedical and the biopsychosocial model. These models mark different ideas about the underlying condition; one characterizes the underlying pain as acute, the other as chronic. Recently, the International Classification of Orofacial Pain (ICOP) published a definition for pain of hypersensitivity that included (in addition to the existing description) 'causation is plausible based on anatomical, functional and/or temporal association,' indicating the multidimensional nature and chronicity of the condition.[11] This shift from the biomedical model to incorporate multiple dimensions and the chronic nature of dentin hypersensitivity experience is best described as being derived from the biopsychosocial framework first developed by Engel.[12] Views of pain informed by this perspective typically characterize pain in much broader terms. Here, pain can be experienced without direct evidence of tissue damage and is typically measured over a period of several months. The biopsychosocial model considers the psychological and social factors associated with pain to achieve a more comprehensive understanding and management of both the condition (as related to the traditional biomedical model) and illness across time and circumstance. The main psychological factors associated with pain disorders include anxiety, catastrophizing, depression, physical symptom reporting, and fear-avoidance. The main social factors include access to medical care, stigma, and support from family and friends.[11]

The earlier definition of pain has also been revised to be valid for both acute and chronic pain, and to account for the varied factors associated with pain. The International Association of Pain (IASP) designed the new definition to be inclusive by considering the influence of biological, psychological, and social factors[10] (Box 1).

A fundamental implication of this definition for the pain experienced in dentin hypersensitivity is that such a pain cannot solely be inferred through nociception.

When assessing chronic pain disorders from a biopsychosocial approach, measurement tools rely on the qualitative aspects of pain and its impact on daily functional capability. In this case, multidimensional pain assessment instruments are used to give an in-depth view of the patients' pain experience.[9] For example, one way to measure the impact of pain in this way is through condition-specific quality of life measures.

The use of both unidimensional pain scales, including visual analog scales (VAS), numerical rating scales (NRS), along with multidimensional assessment using specific quality of life (QoL) measures, including the oral health impact profile (OHIP) and the dentin hypersensitivity experience questionnaire (DHEQ), has been recommended to compensate for the limitations of an approach solely focused on nociception to allow for incorporation of patients' personal experiences.[13] However, no studies report what pain assessment tools are being used in DH research and whether they evaluate the multidimensional and chronic nature of the condition. There is a significant gap in the existing literature about the theoretical justification for the selection of pain scales and their methodological suitability for measuring responses in DH.

Research has been conducted on the suitability of pain scales, focusing on the reliability, consistency, clinical validity, and reproducibility of the pain assessment tools. For VAS, research has raised important questions about the reproducibility of such measures.[3] Beyond questions about the reproducibility of the pain scales, there are also concerns about VAS being a unidimensional assessment and being unable to distinguish between the sensory, intensity, and affective (unpleasantness) aspects of pain, and the limitation of the scales in capturing the full range of the pain experience.[3,4,14] Likewise, as stated in the IASP definition of pain, not all patients who might be in pain can fully respond to the verbal description required to fill in a VAS or an NRS, an important reason why behavioral scales such as the SCASS may remain useful in the assessment of DH.[10]

In this review, we are focused on the consistency of use of pain scales and the consideration given to theoretical justification and methodological suitability for their use in experimental and epidemiological studies on dentin hypersensitivity. This review aims to identify the most commonly used pain scales in DH studies and the rationale given for their use.

2 | METHODS

This study followed a scoping review methodology to map the literature surrounding the use of pain measurement scales in dentin hypersensitivity research. The review was based on the enhanced framework from Levac et al.,[15] including the stages defined by Arksey and O'Malley[16] and expanded by Grant and Booth.[17] The methodology followed the PRISMA guidelines[18] and those associated with the Joanna Briggs Institute.[19]

2.1 | Search strategy

An electronic search of the literature was conducted using the following databases: PubMed (Medline), Web of Science, Scopus and CINAHL. A combination of MeSH terms and relevant keywords was used to search: ((dentin$ or tooth or teeth or cement$ or root) adj3 (sensitiv$ or hypersensitiv$ or hyper-sensitiv$)) adj3 ("pain measurement" or "pain indicator$" or "pain scale$"). Unpublished studies were not considered, including studies on pre-publishing servers.

2.2 | Eligibility criteria for selection

The inclusion/exclusion criteria of this review were designed to include a broad selection of study types that use pain measurement scales in assessing dentin hypersensitivity (DH).

2.2.1 | Inclusion criteria

Types of participants

- Individuals aged 18 years and/or older who experienced DH.

Types of intervention

- Clinically assessed for DH and measured using a pain scale.
- A rationale or reference is provided for the selection of the use of the pain scale.

Types of study designs

- Any study design, including randomized controlled trials (RCTs), clinical studies, and observational studies.
- English language only: This was a decision based on the resources and time available for the review.
- Full text available.

2.2.2 | Exclusion criteria

- Studies not on the subject of DH.
- Studies with self-reported DH or clinically assessed without using pain measurement scales.
- Studies not primarily on the subject of DH (assessment of DH secondary to other conditions like Molar-Incisor Hypomineralisation or Fluorosis).
- Studies on the evaluation or validation of diagnostic instruments and methodological studies assessing responsiveness for DH.
- Secondary research/review.

2.3 | Screening process and data extraction

Full-text articles from the search were screened by two independent reviewers (CG and BJG). Titles and abstracts screening was foregone so as not to miss out on the studies that used pain scales for assessment but failed to mention it in the title/abstract. For quality assurance, 10% of the articles were screened independently, and agreement was checked at this point. The inclusion/exclusion criteria were discussed and revised. After screening for eligibility, the articles were recorded independently by each reviewer. Discrepancies between reviewers were subsequently resolved through discussion to reach consensus. The agreement between reviewers was assessed using the kappa statistic. Data regarding the general characteristics of the studies were extracted (authors, source, year of publication, country, sample size and study design). Data to identify the use of pain scales was also extracted and synthesized as outlined below:

1. What pain scales were used to clinically measure or assess DH in the studies?
2. What reference was reported for the selection of the pain scale?

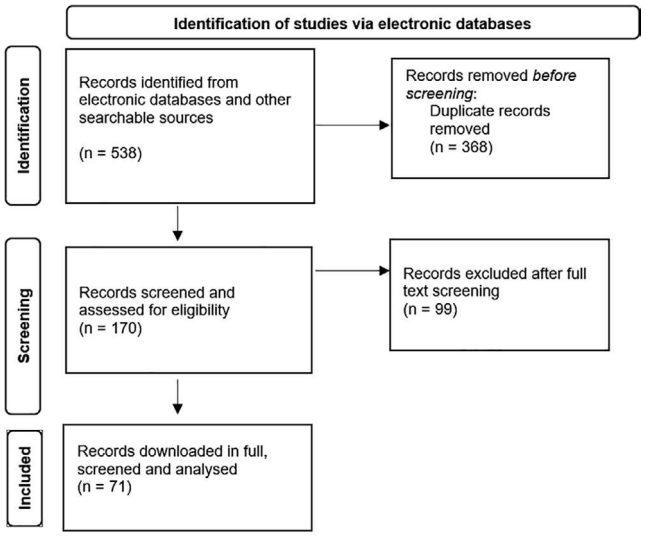

FIGURE 2 Flowchart for selection of studies.

2.4 | Data synthesis

Data from the studies were recorded, and outcome-specific information (the pain scale used and reference for selection of the pain scale) reported by the studies was summarized with descriptive statistics generated using IBM SPSS Statistics (Version 29.0.2.0).

3 | RESULTS

3.1 | Search

The search resulted in 538 potentially relevant articles, of which 368 were duplicates. 170 articles were reviewed for full-text screening, and 71 studies met the inclusion criteria and were deemed eligible for inclusion in the review (Figure 2). Studies were included if the researchers used at least one pain scale with a reference. Studies were also included if more than one pain scale was used and a reference was provided for at least one of them. The principal reasons for exclusion at the full text screening stage are summarized in Table 1. The most common reason for exclusion was no reference or rationale given for the use of a pain scale in the assessment of DH. The calculated kappa coefficient for agreement for study inclusion between two independent reviewers at full-text eligibility screening was 0.71 (95% CI 0.60–0.82), representing substantial agreement between the reviewers.

3.2 | Types of studies

The most common study design was the randomized clinical study, with 42.3% ($n = 30$) of the 71 included studies following this design. A majority of these studies compared the efficacy of one or more treatment options.[20–22] Randomized clinical studies were followed by a randomized controlled trial design, which was reported to be

TABLE 1 Reasons for full-text exclusion.

Reason	Number of articles (total = 99)
No reference for pain scales	65
Full text unavailable	10
Assessment of DH secondary to other conditions like fluorosis, molar-incisor hypomineralisation	6
Methodological or validation studies assessing responsiveness in DH	5
No use of a pain scale	3
Population <18 years of age	3
Inclusion/exclusion criteria were not specified	2
Studies not in English	2
Self-reported DH	2
Secondary research/review	1

TABLE 2 Types of studies.

	All articles ($n = 71$)	
Type of study	Frequency	%
Randomized clinical study	30	42.3
Randomized controlled trial	28	39.4
Clinical study	10	14.1
Cross-sectional study	2	2.8
Controlled clinical study	1	1.4

TABLE 3 Pain scales used in DH.

	All articles ($n = 71$)	
Pain scale	Frequency	%
VAS	30	42.3
SCASS	13	18.3
SCASS and VAS	18	25.4
DIS	2	2.8
VRS	1	1.4
SCASS and DIS	1	1.4
SCASS and VRS	1	1.4
SCASS and NRS	1	1.4
Sensitivity score (modified VAS)	1	1.4
Uchida pain scale	1	1.4
Likert scale	1	1.4
Seattle scale and VAS	1	1.4

39.4% ($n = 28$) of the included studies. These studies mainly evaluated the effectiveness of desensitizing agents.[23–25] Clinical studies accounted for 14.1% ($n = 10$) of all studies. Overall, the 3 study types (randomized clinical study, randomized controlled trial and clinical study) were used for the same objective of assessing the effectiveness of different desensitizing agents, but tended to use slightly different methodologies and study designs.[26–28] The cross-sectional study design assessing the prevalence of DH was found to only account for 2.8% ($n = 2$) of all studies (Table 2).

TABLE 4 Reference given for use of pain scales.

Reference for pain scale	Frequency
DIS	All articles ($n = 3$), Articles with no reference ($n = 0$)
Chen et al., 1994	1
Heaton et al., 2013	1
Polderman and Frencken, 2007	1
VRS	All articles ($n = 2$), Articles with no reference ($n = 1$)
Holland et al., 1997	1
Uchida pain scale	All articles ($n = 1$)
Uchida et al., 1980	1
Seattle scale	All articles ($n = 1$)
Heaton et al., 2013	1
Sensitivity score (modified VAS)	All articles ($n = 1$)
Chu and Lo, 2014	1

3.3 | Commonly used pain scales

The most frequently used pain scale was the VAS, including both the 0 to 10 cm and the 0 to 100 mm types (42.3%, $n = 30$), with the SCASS ranking second (18.3%, $n = 13$). A combination of the SCASS and VAS was the third most common method of DH assessment (25.4%, $n = 18$) (see Table 3, Figure 3). A total of 9 different pain scales were found to be employed for the included studies, that is, SCASS, VAS, DIS, VRS, NRS, Sensitivity score (modified VAS), Uchida pain scale, Likert scale and Seattle scale (Figure 4, Table 4).

3.4 | Use of pain scales and quality of life (QoL) measures

Out of all the studies included in the review, only 5.6% ($n = 4$) used a quality-of-life measure in combination with unidimensional pain scales.

3.5 | Rationale for the use of pain scales

3.5.1 | VAS

VAS accounted for 67.6% ($n = 48$) of the included studies, with 42.3% ($n = 30$) of studies using only VAS and 25.4% ($n = 18$) of studies using VAS along with another pain scale. Of the studies using the VAS and one more pain scale, 12.7% ($n = 9$) reported no reference for using these. The most commonly reported reference being that of Price

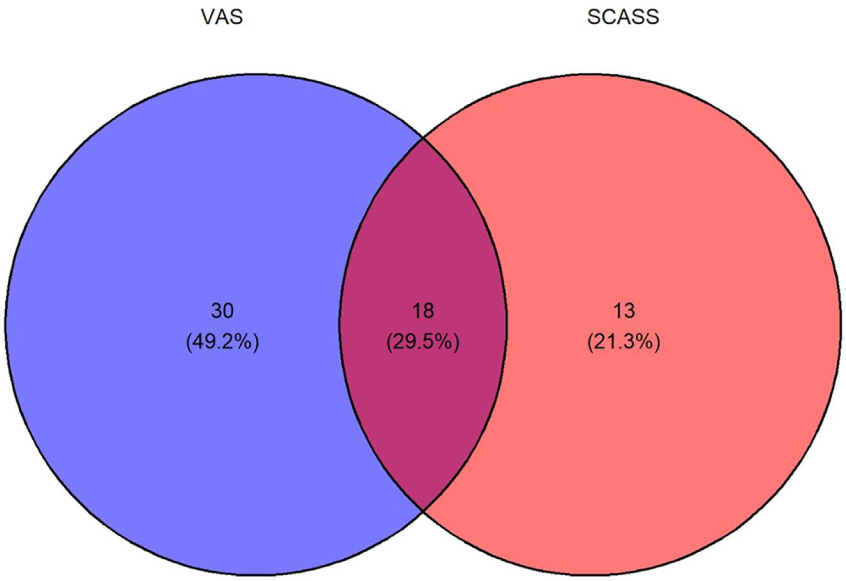

FIGURE 3 Most frequently used pain scales in DH assessment.

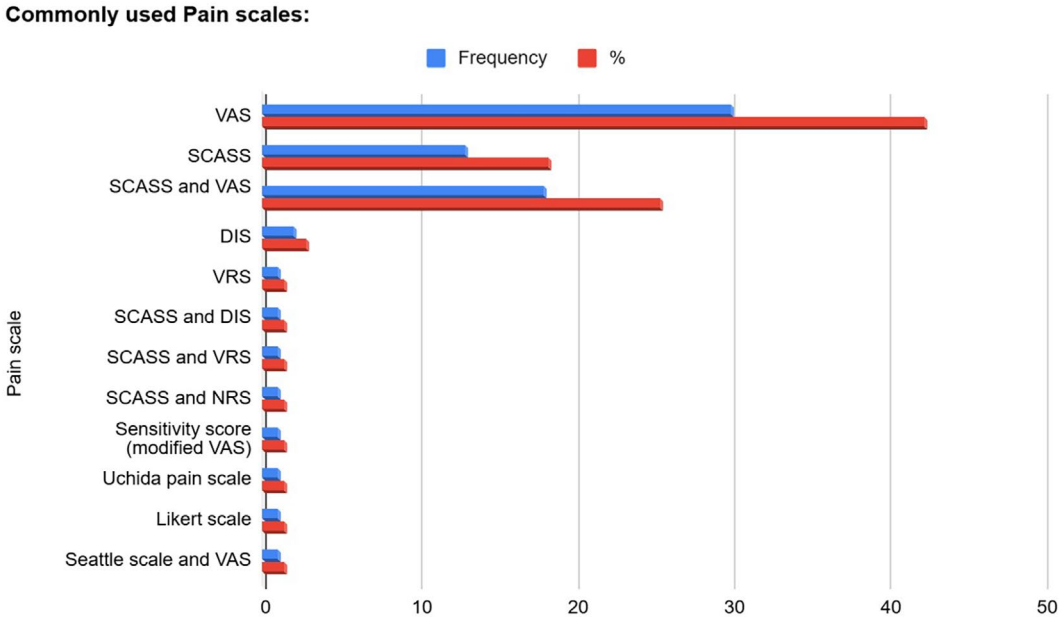

FIGURE 4 Pain scales in the assessment of DH.

et al.[29] (10.4%, $n=5$) (Table 5). Wide variation was found in the supporting references given, with 26 different references used for 39 studies.

Out of all the references for VAS, 14.6% ($n=7$) were similar clinical studies that had used VAS but were not studies that had evaluated or recommended the use of VAS.

3.5.2 | SCASS

Of the total studies, 47.9% ($n=34$) included the SCASS, with 18.3% ($n=13$) studies only using the SCASS and 29.6% ($n=21$) with SCASS in addition to another pain scale. The most commonly reported reference was Schiff et al.[7] (73.5%, $n=25$).

Unlike VAS, there was minimal variation in relation to the source for the SCASS (Table 6).

For the SCASS, 88.2% ($n=30$) of the references were clinical studies that had used the SCASS for assessment of DH without validating its use.

Overall, there was significant variability across studies in how pain scales are used. For example, in some studies, there are comparisons between different treatments (up to 5 different desensitizing agents),[30–32] some studies have control groups,[33–35] some have placebo/no treatment,[20,36,37] some have neither,[38–40] some mention the change or reduction in pain assessed.[41–43] There is little or no sustained discussion of pain scale methodology, conceptualization or theoretical relevance.

TABLE 5 Reference given for use of VAS.

VAS	All articles ($n = 48$), Articles with no reference ($n = 9$)	
Reference for pain scale	Frequency	%
Price et al., 1983	5	10.4
Huskisson, 1974	3	6.3
Gillam and Newman, 1993	3	6.3
Wewers and Lowe, 1990	3	6.3
Holland et al., 1997	2	4.2
Rocha et al., 2020	2	4.2
Ide et al., 2001	2	4.2
Hawker et al., 2011	1	2.1
Clark et al., 2005	1	2.1
Heaton et al., 2013	1	2.1
Gillam et al., 1997	1	2.1
Hayes, 1921	1	2.1
Huskisson, 1983	1	2.1
Huskisson, 1987	1	2.1
McGrath, 1986	1	2.1
Martínez-Ricarte et al., 2008	1	2.1
Tarbet et al., 1979	1	2.1
Jensen et al., 2003	1	2.1
Clark and Troullos, 1990	1	2.1
West et al., 2005	1	2.1
Pamir et al., 2007	1	2.1
Hirsiger et al., 2019	1	2.1
Dantas et al., 2016	1	2.1
Askari and Yazdani, 2019	1	2.1
Shetty et al., 2017	1	2.1
Kielbassa et al., 1997	1	2.1

TABLE 6 Reference given for use of the SCASS.

SCASS	All articles ($n = 34$), Articles with no reference ($n = 1$)	
Reference for pain scale	Frequency	%
Schiff et al., 1994	25	73.5
Rocha et al., 2020	3	8.8
Schiff et al., 2009	2	5.9
Schiff et al., 2005	1	2.9
Schiff et al., 2006	1	2.9
Hirsiger et al., 2019	1	2.9

4 | DISCUSSION

Pain measurement scales are commonly used in assessing the pain of dentin hypersensitivity, and authors have made different and sometimes contradictory recommendations for their selection.[3,6,8,14] To our knowledge, there are no reviews that focus on the consistency in the use of pain scales. This review aimed to identify the commonly used pain scales in DH research and examine the consideration given to their theoretical justification and methodological suitability.

The study shows that pain assessment scales are rarely used in epidemiological studies that seek to estimate the prevalence of DH compared to experimental studies that seek to assess the effectiveness of desensitizing agents. The bulk of research into DH that uses VAS and/or SCASS scales is intervention studies or clinical trials. There is, therefore, a paucity of research on the methodological challenges associated with the use of pain scales in diagnosing and measuring changes in dentin hypersensitivity. This leaves fundamental questions unanswered, for example, when and which pain scales should be used for conducting clinically relevant DH research?

Studies that assessed the effectiveness of desensitizing agents measured and reported whether there was a statistically significant reduction in pain intensity. This focus on reducing pain aligns with pain management techniques for chronic conditions, where the goal is to reduce pain to the extent that it minimally impacts an individual's well-being. It might be a useful clinical practice for dentists and patients to discuss and agree on treatment goals that focus on managing pain to tolerable levels before initiating treatment. Defining objective standards of pain reduction would then help assess treatment success or failure. Chronic pain management strategies suggest that a reduction of pain intensity by 30%–50% and an overall improvement in quality of life is a successful outcome. Exploring and identifying clinically relevant reductions in pain scale assessment that are considered significant for patients is required to define successful DH treatment criteria.[44,45] This remains an important gap in the literature on DH.

The most commonly used pain scales in experimental studies are VAS (42.3%), which includes randomized controlled trials, randomized clinical studies without control groups, and clinical studies without randomization and control groups. This demonstrates the prevalence of unidimensional scales in DH assessment. A VAS is a scale that quantifies pain intensity, which forms the sensory component of pain.[2,9] The sensory component refers to the reception and transport pathways of stimuli to the central nervous system (CNS). When assessing oro-facial acute pain conditions, such as apical periodontitis or an abscess, unidimensional scales are preferred.[2] Accordingly, the use of VAS in DH pain assessment characterizes the pain as acute and nociceptive, following the FDI definition of the condition.[5] This cements the view that research into dentin hypersensitivity follows a largely biomedical model.

Additionally, VAS are reporting pain intensity, which is dependent on a patient's willingness and capability to report their pain. Patients with learning disabilities, cognitive impairment, dementia, or with whom dentists cannot communicate are unable to communicate their pain verbally, are potentially unintentionally disadvantaged and excluded from DH research.[9,10] The suitability of the methodological approach of VAS for DH pain has been evaluated in terms of reproducibility and construct validity.[3,4] Heaton et al.[4] have studied the

inadequacy of VAS in understanding the multidimensional nature of the pain and its limitations in assessing the low-intensity pain experienced in DH. This study evaluated the scale's construct validity and reported that it fails to account for variables, including duration, tolerability, and the underlying description of pain. These variables are important to assess for a comprehensive evaluation of pain. The in-depth characterization of pain in the IASP highlights the sensory and emotional-experiential components of pain assessment. It is recommended that the assessment of factors, including pain intensity, quality, and localization, be included in assessing orofacial pain, pain behavior, quality of life, alongside the psychological-related factors for the emotional-experiential component.[2,10] These factors have not yet been evaluated in relation to DH pain, restricting the overall multidimensional understanding of the condition.

Ide et al.[3] reported limited subject-based reproducibility of VAS when used for the measurement of dentin hypersensitivity and its implications for designing or assessing the outcome of clinical trials for treatments. Even though this research exists, authors rarely consider this problem when using VAS for assessment in clinical studies; only 7% of studies included in this review cite it. The citation of several different supporting references for the selection of VAS indicates a lack of consensus over the methodological suitability of pain scales, along with little or no debate about what would be appropriate and why.

Followed by VAS, SCASS was found to be the second most common pain assessment tool (18.3%). The SCASS is a behavioral measure assessing pain thresholds for patients. The pain threshold is assessed by a dentist or an examiner, with the drawback of neglecting patients' personal experience of the pain. Based on the definition of hypersensitivity by ICOP, this would be considered an incomplete and unidimensional view of DH pain.[11] It has been observed that pain tolerance and thresholds are influenced by age and gender. Sensitivity to low-intensity pain has been shown to decline, and consequently, the pain threshold increases with aging.[46,47] Whether the assessment of pain threshold in DH is similarly affected by such factors has never been explored. There is also limited evidence for the methodological suitability of SCASS, which assessed the accuracy of this scale for dentin hypersensitivity.

Rocha et al.[8] reported high specificity and sensitivity for the SCASS as a pain measurement scale and recommended its use. However, this study is scarcely cited in the literature (3%), indicating minimal methodological engagement by researchers when selecting pain scales. There is a lack of research that evaluates the suitability of SCASS in terms of validity, reliability, and reproducibility. The SCASS, because it is behaviorally based, may, however, have an important feature that should not be ignored: measuring pain inclusively. Behavioral scales are designed for use in nonverbal patients in order to assess pain using physical responses. Such scales have been used and validated for patients under sedation, with decreased levels of consciousness, endotracheal intubation, and mechanical ventilation.[48] The methodological suitability of SCASS as a behavioral scale has not been studied yet and requires further research.

A significant minority of clinical studies (25.4%) used both SCASS and VAS in their assessment. This could be seen as an attempt to be more inclusive and might conform better to the revised standard definition of pain adopted by the IASP.[10] This review observed a variety in the selection of pain intensity scales (VAS, DIS, NRS, VRS, Likert scale, Uchida pain scale, and Seattle scale). The heterogeneity in the way pain is assessed suggests the lack of universalized recommendations and methodological agreement.

The suggestion to quantify DH pain by evaluating the individual's subjective response to a constant stimulus (VAS) was first made in 1990.[49] Recently, DH has been described as a chronic condition explained through the use of the biopsychosocial model. This characterizes DH pain primarily through the prolonged and repetitive nature of the pain being experienced. The biopsychosocial model recognizes the physiological, psychological, and environmental factors influencing patients' experiences. Something that the current use of unidimensional scales is incapable of measuring.[13] Limited studies (5.6%) have included quality of life (QoL) measures along with unidimensional pain scales to assess the different factors associated with pain. In light of these findings, the tools used to assess pain in DH need to be updated to account for changes in the theoretical understanding of the condition.

AUTHOR CONTRIBUTIONS

All listed authors have contributed to the manuscript substantially and have agreed to the final submitted version.

FUNDING INFORMATION

This study was self-funded by the authors and their institutions.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest related to this review.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

C. Gupta https://orcid.org/0009-0008-6964-3721
B. J. Gibson https://orcid.org/0000-0003-1413-4950

REFERENCES

1. de Oliveira da Rosa WL, Lund RG, Piva E, da Silva AF. The effectiveness of current dentin desensitizing agents used to treat dental hypersensitivity: a systematic review. *Quintessence Int*. 2013;44(7):777-784.
2. Scribante A, Pellegrini M, Pulicari F, Ghizzoni M, Modugno FP, Spadari F. Pain assessment in oral medicine through its different dimensions: a comprehensive review. *Dent J*. 2023;11(11):246.
3. Ide M, Wilson RF, Ashley FP. The reproducibility of methods of assessment for cervical dentine hypersensitivity. *J Clin Periodontol*. 2001;28(1):16-22.
4. Heaton LJ, Barlow AP, Coldwell SE. Development of labeled magnitude scales for the assessment of pain of dentin hypersensitivity. *J Orofac Pain*. 2013;27(1):72-81.

5. FDI General Assembly. *Dentine Hypersensitivity*; 2009. Accessed September 25, 2025. https://www.fdiworlddental.org/dentin-hypersensitivity
6. Gernhardt CR. How valid and applicable are current diagnostic criteria and assessment methods for dentin hypersensitivity? An overview. *Clin Oral Investig*. 2013;17(suppl. 1):31-40.
7. Schiff T, Dotson M, Cohen S, De Vizio W, McCool J, Volpe A. Efficacy of a dentifrice containing potassium nitrate, soluble pyrophosphate, PVM/MA copolymer, and sodium fluoride on dentinal hypersensitivity: a twelve-week clinical study. *J Clin Dent*. 1994;5:87-92.
8. Rocha MOC, Cruz AAFC, Santos DO, Douglas-de-Oliveira DW, Flecha OD, Gonçalves PF. Sensitivity and specificity of assessment scales of dentin hypersensitivity—an accuracy study. *Braz Oral Res*. 2020;34:e043.
9. Duarte NM, Garcia-Pedraza JA, Santos ME. Pain overview: classification, conceptual framework, and assessment. *ATHENA Research Book, Volume 1*. University of Maribor Press; 2022:295.
10. Raja SN, Carr DB, Cohen M, et al. The revised International Association for the Study of Pain definition of pain: concepts, challenges, and compromises. *Pain*. 2020;161(9):1976-1982.
11. Benoliel R, May A, Svensson P, et al. International classification of orofacial pain (ICOP). *Cephalalgia*. 2020;40(2):129-221.
12. Engel GL. The need for a new medical model: a challenge for biomedicine. *Science*. 1977;196(4286):129-136.
13. Idon PI, Sotunde OA, Ogundare TO. Beyond the relief of pain: dentin hypersensitivity and oral health-related quality of life. *Front Dent*. 2019;16(5):325.
14. Gillam DG, Newman HN. Assessment of pain in cervical dentinal sensitivity studies: a review. *J Clin Periodontol*. 1993;20(6):383-394.
15. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implement Sci*. 2010;5(1):69.
16. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol*. 2005;8(1):19-32.
17. Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Inf Libr J*. 2009;26(2):91-108.
18. Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169(7):467-473.
19. Peters MDJ, Godfrey C, McInerney P, Munn Z, Tricco AC, Khalil H. Scoping reviews. In: Aromataris E, Lockwood C, Porritt K, Pilla B, Jordan Z, eds. *JBI Manual for Evidence Synthesis*. JBI; 2024. doi:10.46658/JBIMES-24-09. https://synthesismanual.jbi.global
20. Pradeep AR, Agarwal E, Naik SB, Bajaj P, Kalra N. Comparison of efficacy of three commercially available dentifrices on dentinal hypersensitivity: a randomized clinical trial. *Aust Dent J*. 2012;57(4):429-434.
21. Shah M, Jat SA, Aziz M. Comparison of the effect of propolis and gluma desensitizer on the management of dentin hypersensitivity: a randomized controlled trial. *J Pak Med Assoc*. 2024;74(5):843-847. doi:10.4073/jpma.9458
22. Hamlin D, Mateo LR, Dibart S, Delgado E, Zhang YP, DeVizio W. Comparative efficacy of two treatment regimens combining in-office and at-home programs for dentin hypersensitivity relief: a 24-week clinical study. *Am J Dent*. 2012;25(3):146-152.
23. Mazur M, Jedliński M, Ndokaj A, et al. Long-term effectiveness of treating dentin hypersensitivity with Bifluorid 10 and Futurabond U: a split-mouth randomized double-blind clinical trial. *J Clin Med*. 2021;10(10):2085.
24. Neuhaus KW, Milleman JL, Milleman KR, et al. Effectiveness of a calcium sodium phosphosilicate containing prophylaxis paste in reducing dentine hypersensitivity immediately and 4 weeks after a single application: a double-blind randomized controlled trial. *J Clin Periodontol*. 2013;40(4):349-357.
25. Pepelassi E, Rahiotis C, Peponi E, Kakaboura A, Vrotsos I. Effectiveness of an in-office arginine-calcium carbonate paste on dentine hypersensitivity in periodontitis patients: a double-blind, randomized controlled trial. *J Clin Periodontol*. 2015;42(1):37-45.
26. Ghassemi A, Hooper W, Winston AE, Sowinski J, Bowman J, Sharma N. Effectiveness of a baking soda toothpaste delivering calcium and phosphate in reducing dentinal hypersensitivity. *J Clin Dent*. 2009;20(5):203-210.
27. Azarpazhooh A, Limeback H, Lawrence HP, Fillery ED. Evaluating the effect of an ozone delivery system on the reversal of dentin hypersensitivity: a randomized, double-blinded clinical trial. *J Endodont*. 2009;35(1):1-9.
28. Kielbassa AM, Attin T, Hellwig E, Schade-Brittinger C. In vivo study on the effectiveness of a lacquer containing CaF2/NaF in treating dentine hypersensitivity. *Clin Oral Investig*. 1997;1(2):95-99.
29. Price DD, McGrath PA, Rafii A, Buckingham B. The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. *Pain*. 1983;17(1):45-56.
30. Ayan G, Misilli T, Buldur M. Home-use agents in the treatment of dentin hypersensitivity: clinical effectiveness evaluation with different measurement methods. *Clin Oral Investig*. 2025;29(1):63. doi:10.1007/s00784-025-06155-1
31. Fu Y, Sufi F, Wang N, Young S, Feng X. An exploratory randomised study to evaluate the efficacy of an experimental occlusion-based dentifrice in the relief of dentin hypersensitivity. *Oral Health Prev Dent*. 2019;17(2):163-169.
32. Erdemir U, Yildiz E, Kilic I, Yucel T, Ozel S. The efficacy of three desensitizing agents used to treat dentin hypersensitivity. *J Am Dent Assoc*. 2010;141(3):285-296.
33. Acharya AB, Surve SM, Thakur SL. A clinical study of the effect of calcium sodium phosphosilicate on dentin hypersensitivity. *J Clin Exp Dent*. 2013;5(1):e18.
34. Tao D, Ling MR, Feng XP, et al. Efficacy of an anhydrous stannous fluoride toothpaste for relief of dentine hypersensitivity: a randomized clinical study. *J Clin Periodontol*. 2020;47(8):962-969.
35. Rai JJ, Chaturvedi S, Gokhale ST, et al. Effectiveness of a single chair side application of NovaMin® [calcium sodium phosphosilicate] in the treatment of dentine hypersensitivity following ultrasonic scaling—a randomized controlled trial. *Materials*. 2023;16(4):1329.
36. Rogo E, Hodges K, Herzog A. Dentinal sensitivity: a natural mineral dietary supplement study. *Int J Dent Hyg*. 2006;4(3):122-128.
37. Narongdej T, Sakoolnamarka R, Boonroung T. The effectiveness of a calcium sodium phosphosilicate desensitizer in reducing cervical dentin hypersensitivity. *J Am Dent Assoc*. 2010;141(8):995-999.
38. Uğur-Aydın Z, Kılınç H, Akbaş Y, Usta SN. Evaluation of the effect of different desensitizers on pulpal blood flow after full crown preparation using laser doppler flowmetry: a randomized clinical trial. *Odontology*. 2024;112(1):272-278.
39. Prati C, Cervellati F, Sanasi V, Montebugnoli L. Treatment of cervical dentin hypersensitivity with resin adhesives: 4-week evaluation. *Am J Dent*. 2001;14(6):378-382.
40. Orsini G, Procaccini M, Manzoli L, et al. A 3-day randomized clinical trial to investigate the desensitizing properties of three dentifrices. *J Periodontol*. 2013;84(11):e65-e73.
41. Litkowski L, Greenspan DC. A clinical study of the effect of calcium sodium phosphosilicate on dentin hypersensitivity—proof of principle. *J Clin Dent*. 2010;21(3):77.
42. Bahal P, He T, Zou Y, et al. A randomised controlled trial to investigate the efficacy of an oxalate strip for the management of dentine hypersensitivity pain. *J Dent*. 2019;86:95-101.
43. West N, Newcombe RG, Hughes N, et al. A 3-day randomised clinical study investigating the efficacy of two toothpastes, designed to occlude dentine tubules, for the treatment of dentine hypersensitivity. *J Dent*. 2013;41(2):187-194.

44. Cohen SP, Vase L, Hooten WM. Chronic pain: an update on burden, best practices, and new advances. *Lancet*. 2021;397(10289):2082-2097.
45. Mills S, Torrance N, Smith BH. Identification and management of chronic pain in primary care: a review. *Curr Psychiatry Rep*. 2016;18(2):22.
46. Lautenbacher S, Peters JH, Heesen M, Scheel J, Kunz M. Age changes in pain perception: a systematic-review and meta-analysis of age effects on pain and tolerance thresholds. *Neurosci Biobehav Rev*. 2017;75:104-113.
47. Failla MD, Beach PA, Atalla S, et al. Gender differences in pain threshold, unpleasantness, and descending pain modulatory activation across the adult life span: a cross sectional study. *J Pain*. 2024;25(4):1059-1069.
48. Gomarverdi S, Sedighie L, Seifrabiei MA, Nikooseresht M. Comparison of two pain scales: behavioral pain scale and critical-care pain observation tool during invasive and noninvasive procedures in intensive care unit-admitted patients. *Iran J Nurs Midwifery Res*. 2019;24(2):151-155.
49. Clark GE, Troullos ES. Designing hypersensitivity clinical studies. *Dent Clin N Am*. 1990;34(3):531-544.

How to cite this article: Gupta C, Barber M, Boissonade F, Flannigan N, Wong N, Gibson BJ. The use of pain scales in scientific studies on dentin hypersensitivity: A scoping study. *Periodontology 2000*. 2026;00:1-10. doi:10.1111/prd.70043