BJA Education, 24(9): 326–334 (2024)

doi: 10.1016/j.bjae.2024.05.004
Advance Access Publication Date: 2 July 2024

Revalidation FOR ANAESTHETISTS RCA Revalidation matrix
Matrix codes: D01, 2E03, 3E00

Quantitative sensory testing: a practical guide and clinical applications

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Keywords: neurophysiology; pain; pain measurement; pain thresholds

Learning objectives

By reading this article, you should be able to:

- Discuss the feasibility, use and limitations of quantitative sensory testing (QST) in clinical practice.
- Specify the role of QST in research.
- Perform QST in your own clinical practice after watching the training video and practising the protocol on healthy subjects.

Key points

- QST evaluates sensory processing in patients.
- QST measures thresholds and levels of tolerance to a variety of standardised thermal and mechanical stimuli.
- Conventional electrophysiology tests large, myelinated fibres, whereas QST assesses the entire somatosensory system, including small nerve fibres.
- QST-based phenotyping supports prognostic research and evaluation of the efficacy of treatment in subgroups of patients.
- In clinical practice, QST is used to diagnose small fibre neuropathies and monitor sensory deficits in other pain conditions over time.

Pain is a complex phenomenon with biological, social and psychological elements. The management of pain, especially chronic pain is challenging because of the large interpatient variability in response to analgesics, which results in high numbers needed to treat individual conditions. This variability in treatment response is likely to result from the heterogenous pathophysiological processes involved in the transition from acute pain to a chronic state (pain 'chronification'). Peripheral and central sensitisation processes and reduced activity of central pain inhibitory pathways enhance nociception and influence the clinical phenotype. The variability in clinical phenotype is greater between patients than between different diagnostic categories, although disorder-specific profiles are also present.[1] Clinical pain phenotyping is therefore an important step to unravel whether the nature and intensity of the pain are modulated by peripheral and central processes. Pain treatments may be more effective when customised to measurable clinical phenotypes rather than being based on the diagnosis.[2]

Quantitative sensory testing (QST) is a promising tool for pain phenotyping. QST represents a panel of clinical psychophysical tests that quantify somatosensory function by assessing the patient's sensory thresholds and tolerance of nerve fibres in skin or muscle tissue to a variety of standardised stimuli.[3]

Several studies have confirmed the usefulness of QST in research, for diagnosing, assessing and monitoring

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Accepted: 26 May 2024

somatosensory deficits. The Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) and the Special Interest Group on Neuropathic Pain (NeuPSIG) consensus both recommend using QST for sensory profiling, to enhance treatment outcomes and improve the design of clinical trials.[2,4]

However, QST has not yet been widely accepted into clinical practice. One of the reasons is that QST requires trained personnel to obtain high-quality data. Clinicians often do not know how to perform QST, interpret the results and are unaware of the usefulness of testing.

This review outlines the clinical and research applications of QST, discusses the current evidence of its use, and includes training videos. These should enable clinicians to develop the knowledge and skills necessary for integrating QST into both clinical care and research.

The concept of QST

Quantitative sensory testing encompasses several psychophysical tests to assess the function of the somatosensory nervous system; the part of the sensory system concerned with vital (pain, temperature) and gnostic sensibility (fine touch, vibration and proprioception). By assessing these sensory qualities individually, QST provides insight into the function of large, myelinated Aβ, thinly myelinated Aδ and small unmyelinated C fibres and their corresponding central pathways. Quantitative sensory testing can quantify the severity of positive (e.g. hyperalgesia, allodynia) and negative phenomena (e.g. hypoaesthesia and hypoalgesia) (Figure 1).[5]

Quantitative sensory testing can be classified into two main categories: static and dynamic. In static QST, thresholds are assessed to determine the presence of hyper- or hypoalgesia. Dynamic QST focuses on the central mechanisms of pain processing by agitating the somatosensory system in a manner that exposes the specific mechanism of pain processing under assessment.[6]

Quantitative sensory testing includes many modalities to investigate different aspects of sensory and pain perception. This has resulted in a plethora of published protocols but only a few have been standardised. Many studies use the German Research Network on Neuropathic Pain (DFNS) testing protocol because of its high standardisation and reliability. This protocol consists of seven standardised tests measuring 13 variables that assess the functioning of somatosensory nerve fibres which are necessary for sensing pain, warmth and cold.[3,7]

Before examination, the examiner and patient together determine the test site: the area where the most pain is felt, or where the most profound deficits based on standard examination are detected. Test site responses are compared with those of an unaffected control site, typically defined as the contralateral asymptomatic site. When bilateral symptoms or generalised sensory deficits are suspected, QST results are best interpreted when compared with published reference data specific for the body region tested. In the absence of normative reference data, it is suggested to use a control area in another body region than the affected region (e.g. hand *vs* foot).[4] During the examination, the patient lies on an examination table. The skin of both the test area and the control area is exposed to cold, warmth, touch with thin hairs (Von Frey monofilaments), calibrated pins, vibrations from a graded tuning fork and pressure at different intensities using a pressure algometer (Figure 2). The patient is asked to rate the intensity of the stimuli according to standardised instructions.

It is essential to standardise all aspects when conducting QST. Therefore, stimuli are applied in prespecified intensity, duration, interstimulus interval and order. The accompanying videos show how the stimuli can be applied using standardised instructions based on the DFNS protocol (Figs 1–8 online videos).

Supplementary video related to this article can be found at https://doi.org/10.1016/j.bjae.2024.05.004

The design of the DFNS QST protocol includes comprehensive tests that represent measures of all relevant submodalities of the somatosensory system (Table 1). A complete somatosensory profile can be obtained within 1 h.[7]

After completing QST, data are entered into a spreadsheet or analysis software, which then automatically generates a

Pain terms and definitions

Hypoaesthesia	*Decreased sensitivity to stimulation.*
Hypoalgesia	*Diminished pain in response to a normally painful stimulus.*
Hyperaesthesia	*Increased sensitivity to stimulation.*
Hyperalgesia	*Increased pain from a stimulus that normally provokes pain.*
Allodynia	*Pain caused by a stimulus that does not normally provoke pain.*
'Wind-up' (temporal pain summation)	*Frequency-dependent increase in pain to a stimulus that normally provokes mild pain.*

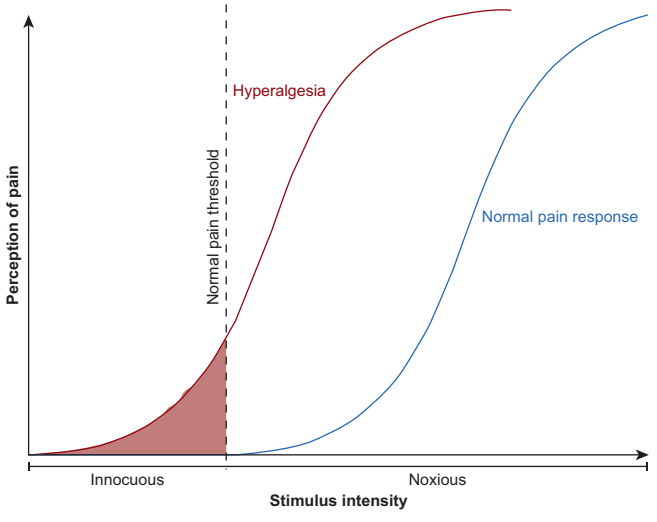

Fig 1 Pain terms and definitions.

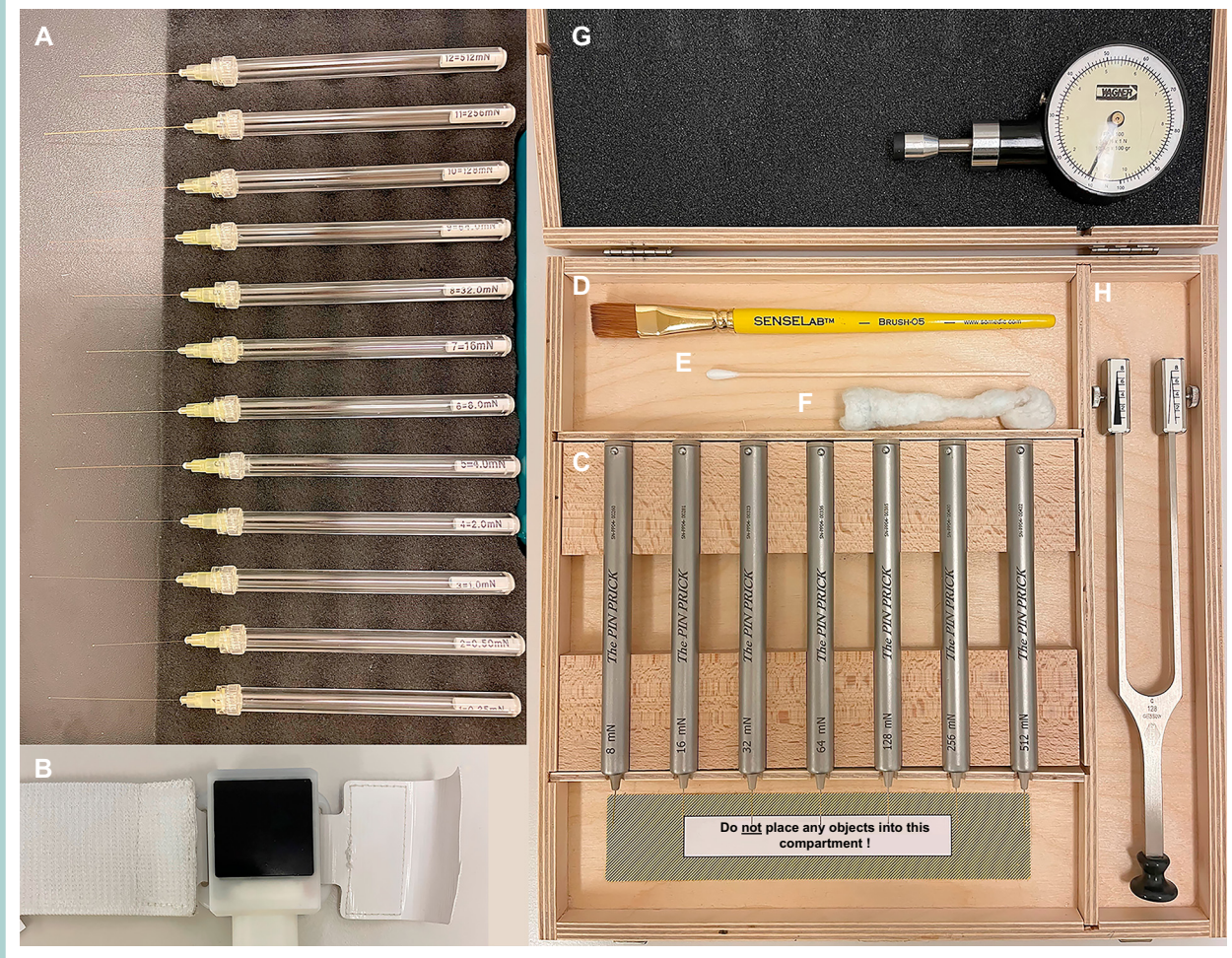

Fig 2 Quantitative sensory testing devices used in the German Research Network on Neuropathic Pain (DFNS) protocol. (A) von Frey filament 0.25–512 mN, (B) thermode for thermal sensory analyser (TSA, Medoc, Ramat Yishay, Israel) (or the modular sensory analyser, MSA, Somedic, Sösdala, Sweden), (C) pinprick mechanical stimulators 8–512 mN, (D) brush, (E) Q-tip, (F) cotton wool, (G) pressure algometer, (H) Rydel-Seiffer graded tuning fork 64 Hz, 8/8 scale.

summary report comparing the test and control area. To enable the investigator to interpret and compare a patient's QST results with healthy controls, the results for each individual variable are converted to Z-values using an age-, sex- and location-matched reference database. To date, reference data have been published for the face (cheek), hand dorsum, foot dorsum, trunk and back for adult males and females aged 20–70 yrs.[8] Z-values above zero imply a gain of function, indicating increased sensitivity in the patient compared with healthy controls. Conversely, Z-values below zero indicate loss of function referring to decreased sensitivity in the patient. A clinically relevant gain or loss of function is considered when the Z-value exceeds +1.96 or decreases below −1.96, respectively.[7,8]

Relation with standard nerve conduction studies

Quantitative sensory testing is often compared with conventional electrophysiology for testing somatosensory nervous system function such as nerve conduction testing and somatosensory-evoked potentials techniques, but there are important differences.

Conventional electrophysiology measures loss of function in large myelinated (Aβ) nerve fibres, but not in small or unmyelinated (Aδ, C) fibres. Electrophysiology tests do not require the patient to participate actively, whereas QST relies on the active engagement of the subject so that the entire somatosensory system, from receptor to the cortex, can be assessed. However, QST lacks the ability to pinpoint the location site or level of the dysfunction along the neuraxis, which is possible with electrophysiology techniques.[4,9]

Quantitative sensory testing should, therefore, be considered an important addition to neurophysiologic testing rather than a substitute.

Applicability of QST

Quantitative sensory testing has primarily been used for research purposes such as investigations of pain mechanisms, development of somatosensory profiles and diagnosing sensory neuropathies. Its integration into clinical practice is not as common, but there has been significant advancement in clinical QST research over the past decades (Supplementary Fig. S1, Table 2). Investigators have applied

Table 1 Quantitative sensory testing measures, the modalities tested and the equipment used in the standardised DFNS protocol. *When cooling stimuli during the thermal sensory limen (TSL) are mistaken as heating stimuli.

Test and abbreviations used		Somatosensory modality tested	Equipment used	Notes on measurement
Thermal tests	Cold detection threshold (CDT) Warm detection threshold (WDT) Cold pain threshold (CPT) Heat pain threshold (HPT)	C and Aδ fibres	Thermal sensory testing device with thermode and stop button.	Mean threshold temperature of three consecutive measurements.
	Thermal sensory limen (TSL)	Thermodiscriminative function for alternating cold and warm stimuli Number of paradoxical heat sensations*		
Mechanical detection threshold (MDT)		Aβ fibre function	Von Frey filaments that exert forces between 0.25 and 512 mN.	Geometric mean of five series of ascending and descending stimulus intensities.
Mechanical pain threshold (MPT)		Aδ-mediated hyper- or hypoalgesia	Weighted pinprick stimulators that exert forces between 8 and 512 mN.	Geometric mean of five series of ascending and descending stimulus intensities.
Stimulus-response functions	Mechanical pain sensitivity (MPS)	Aδ-mediated sensitivity to sharp stimuli Measure of central sensitisation	Weighted pinprick stimulators that exert forces between 8 and 512 mN applied in a balanced order, five times each.	
	Dynamic mechanical allodynia (ALL)	Aβ fibre-mediated pain sensitivity to stroking light touch. Measure of central sensitisation.	Cotton wisp (~3 mN) Cotton wool tip (~100 mN) Brush (~200–400 mN) Each applied five times with a single stroke of 1–2 cm in length.	
Wind up ratio (WUR)		Temporal pain summation Measure of central sensitisation	Pinprick stimulus (128 mN for the face, and 256 mN for the body) in trains of five single stimuli and 10 repetitive stimuli.	Mean pain ratings of trains divided by the mean pain rating to stimuli.
Vibration detection threshold (VDT)		Aβ fibre function	Rydel-Seiffer 64 Hz tuning fork with 8/8 scale on bony prominence in three series of descending stimulus intensity.	
Pressure pain threshold (PPT)		Deep pain sensitivity, most probably mediated by muscle C and Aδ fibres	Pressure gauge device, exerting pressure up to 20 kg cm^{-2}/~200 N cm^{-2}/~2000 kPa in three series of ascending stimulus intensity.	

Table 2 Overview of important studies on quantitative sensory testing (QST). CPM, conditioned pain modulation; DFNS, German Research Network on Neuropathic Pain; NeuPSIG, Neuropathic Pain Special Interest Group of the International Association for the Study of Pain; PPT, pressure pain threshold; TPS, temporal summation of pain.

Authors	Focus	Findings
Fields and colleagues (1998)[10]	Phenotyping in postherpetic neuralgia	Described the irritable nociceptor and non-irritable nociceptor phenotypes
Rolke and colleagues (2006)[3,7]	Standardisation of QST protocols	Developed standardised QST protocol for clinical use, establishing normative data.
Arendt-Nielsen and colleagues (2009)[6]	Critical review on the experimental and clinical applications of QST	Described the background for QST in pain assessment, diagnosis and management.
Magerl and colleagues (2010)[8]	Reference data for QST	Defined reference data stratified for test site, sex and age for a standardised QST protocol and described how to compare groups of patients with the reference database.
Maier and colleagues (2010)[15]	QST-assessed somatosensory abnormalities in different neuropathic pain syndromes	Identified that QST profiles with different combinations of loss and gain are shared across neuropathic pain syndromes.
Backonja and colleagues (2013)[4]	NeuPSIG consensus on the value of QST in neurological and pain disorders	Recommended QST for screening for small and large fibre neuropathies, monitoring of somatosensory deficits and evoked pain, allodynia and hyperalgesia.
European Medicines Agency (2016)[16]	Guideline on the clinical development of medicinal products for pain treatment	Recommended QST for standardised evaluation of stimulus-evoked pain in efficacy studies in chronic pain.
Baron and colleagues (2017)[17]	QST-based phenotyping	Identified three QST-based phenotypes.
Sangesland and colleagues (2017)[18]	Systematic review on the association between preoperative QST and clinical pain outcomes after surgery	Concluded that preoperative QST is variably associated with acute or chronic pain after surgery. Some 19/30 studies demonstrated an association between preoperative QST and postoperative pain. Thermal heat pain above the pain threshold, TPS and CPM showed the most consistent association with acute or chronic pain after surgery.
Van Helmond and colleagues (2020)[19]	Systematic review on the relationship of preoperative QST measures to chronic postsurgical pain development	Concluded that preoperative QST is variably associated with chronic postsurgical pain. Some 14/24 studies in all surgery subtypes found a relationship between preoperative QST and chronic postsurgical pain. PPT, CPM, TPS were among the most frequently associated QST measures.
Braun and colleagues (2021)[20]	Overview of the relevance of different QST modalities in predicting acute and chronic postsurgical pain	Summarised that central QST methods such as TPS and CPM show the most promising predictive potential. Best correlation found in orthopaedic surgery.
Petersen and colleagues (2021)[21]	Systematic review on the predictive value of QST for chronic postsurgical pain and analgesic effects	Found that 17/25 studies demonstrated an association between preoperative QST and chronic postsurgical pain. Dynamic QST variables TSP and CPM were most frequently associated with chronic postsurgical pain and analgesic effects.
Reimer and colleagues (2021)[22]	Review on bedside QST in precision pain medicine	Presented recently developed sensory bedside tools and testing protocols.
Edwards and colleagues 2016 and 2023[2,23]	Evidence-based recommendations for QST-based phenotyping in clinical trials of chronic pain treatments.	Recommended the DFNS QST battery for QST phenotyping in phase II and III trials. Consider 'Bedside' QST protocols in multisite trials as alternative to the DFNS battery.

QST for screening, diagnosing and monitoring sensory deficits and pain-related phenomena in various pain conditions. Most studies were performed in patients with sensory neuropathies, particularly diabetic or small fibre neuropathy and postherpetic neuralgia.[4,10] Quantitative sensory testing has also proved to be useful for identification of central sensitisation in chronic musculoskeletal pain, including knee osteoarthritis and low back pain.[11] In a systematic review and meta-analysis, patients with osteoarthritis had lower pressure pain thresholds (PPTs) not only in the affected joint, but also at remote sites not directly affected by osteoarthritis compared with healthy controls, which is suggestive of spreading sensitisation.[12] Also, QST variables such as PPT, temporal summation of pain (TSP) and conditioned pain modulation (CPM) have been shown to be important predictors of treatment outcomes, especially after joint

replacement.[13] However, in low back pain, no significant associations were found between QST responses and pain status at follow-up.[14] This may be explained by the complex and multifactorial nature of its pathophysiology, including the impact of psychological factors on pain-related outcomes.

A recent exploratory study emphasises the importance of taking a multimodal approach by showing that 29.3% of follow-up pain scores were predicted by the combination of pain catastrophising, anxiety scores and TSP in patients with knee osteoarthritis.[24] Identifying such prognostically unfavourable phenotypes would presumably improve the prognosis of pain outcomes.[23]

QST-based phenotyping

Almost 30 yrs ago, the first attempt was made to describe patterns of sensory symptoms and deficits in pain patients (i.e. pain phenotypes).[10] In postherpetic neuralgia, two main phenotypes were distinguished: the irritable nociceptor and the non-irritable nociceptor or deafferentation phenotype. The irritable nociceptor phenotype is characterised by minimal sensory loss as a result of hyperactivity of anatomically intact unmyelinated cutaneous nociceptors. In contrast, the non-irritable nociceptor phenotype is characterised by impaired pain and temperature sensation in combination with mechanical allodynia as a result of small fibre deafferentation.[10]

As a prerequisite for QST-based phenotyping, systematic profiling sensory abnormalities in 1236 patients with various neuropathic pain syndromes revealed that patterns of somatosensory abnormalities differed across pain syndromes.[15]

A cluster analysis by Baron and colleagues performed in >900 patients with neuropathic pain identified three QST-assessed phenotypes:

(i) 'sensory loss', indicating loss of small and large fibres function together with paradoxical heat sensations;
(ii) 'thermal hyperalgesia', characterised by preserved sensory function with thermal hyperalgesia and mild dynamic mechanical allodynia; and
(iii) 'mechanical hyperalgesia', the presence of small fibre loss with mechanical hyperalgesia and allodynia.[17]

The clinical relevance of these phenotypes has been supported by studies showing that subgroups of patients with distinct sensory phenotype respond differently to certain treatments. Classification based on somatosensory phenotype has demonstrated improved treatment response within specific subgroups of patients. For example, the antiepileptic drug oxcarbazepine provided significant pain relief in patients with an irritable nociceptor phenotype (phenotype 2), whereas in the non-irritable nociceptor phenotype there was no effect.[25] Patients with painful HIV-neuropathy with sensitivity to pinprick stimuli have better pain relief with pregabalin.[26]

As a result of these encouraging results, the European Medicines Agency (EMA) and recent IMMPACT guidelines recommend QST-based phenotyping as stratification approach for pain studies.[2,16] This will facilitate the identification of subgroups that respond to treatment and therefore personalised care. Indeed, a proof-of-concept randomised clinical trial in patients with diabetic peripheral neuropathy demonstrated a meaningful improvement in pain after treatment with a novel transient receptor potential ankyrin 1 (TRPA1) antagonist in a subgroup of patients with persevered small nerve fibre function as defined by QST.[27]

There is currently no scientific consensus on the use of QST-based phenotyping in clinical practice. The predictive value of QST for treatment efficacy is still limited to specific pain diagnoses and not generalisable to all patients with chronic pain. The limitations of QST may also be explained by the fact that most of the positive findings involving QST-assessed phenotypes have been identified retrospectively, via *post hoc* analysis. Only a few studies have been prospectively designed to test the responsiveness of QST-based phenotypes to disease-modifying interventions. Moreover, the diversity in QST methods, patients and applied treatments makes it difficult to draw conclusions about which patient phenotypes are most likely to respond to a specific intervention. Treatment effects identified by sensory phenotype therefore need to be interpreted with caution. Despite this, QST-based phenotyping should be refined rather than discarded, as it currently is the most promising stratification tool.

QST in the perioperative setting

A substantial number of studies have assessed the ability of QST to predict acute and chronic postsurgical pain (CPSP). Pain is an almost ubiquitous consequence of surgery which represents challenges to both patients and their physicians. Difficulties with managing postsurgical pain have contributed to delayed recovery from surgery, increased risk of cardiopulmonary and thromboembolic events and a significantly elevated risk of developing chronic pain.[20]

Sensory testing with QST can potentially allow early identification of patients at risk for developing severe acute postsurgical pain or CPSP.

The predictive value of perioperative QST for postsurgical pain has been extensively studied in a broad range of surgical settings. Previous systematic reviews have summarised the predictive efficacy of QST for either acute postsurgical pain or CPSP.[18,19,21]

Acute postsurgical pain

The latest review of predicting postsurgical pain based on QST found that 13 out of 23 individual studies showed an association between a preoperative QST variable and acute pain after surgery.[18] Of all variables tested, QST variables related to central pain mechanisms such as TSP and CPM more frequently demonstrated an association with postsurgical pain intensity compared with variables assessing detection or pain thresholds. However, there was no consistent association between any of these preoperative QST variables and postsurgical pain intensity.

Chronic postsurgical pain

As preoperative QST variables seem to predict acute postsurgical pain, a well-known risk factor for CPSP, it has been suggested that preoperative QST may also be useful to predict CPSP. In two recent systematic reviews, preoperative QST was predictive for CPSP in 17/25 (68%)[21] and 14/24 (58%)[19] of all studies in all types of surgery. Although no single preoperative QST variable was consistent enough, pressure pain thresholds and dynamic QST were the most predictive of CPSP, with TSP and CPM being the most consistent variables.

It should be noted that most research has been conducted in the patients undergoing orthopaedic surgery: a group likely to have experienced pain for a substantial time before surgery. Ongoing peripheral nociceptive input may have caused

preoperative central sensitisation, which may explain the predictive value of TPS and CPM for CPSP in these patients.[19]

In summary, multiple studies have found associations, albeit inconsistently, between QST and postsurgical pain. Recent systematic reviews do not yet support the use of preoperative QST to identify patients at risk for acute or chronic pain after surgery. Despite the current lack of clinical usefulness, future research efforts should focus on the assessment of central pain mechanisms including TPS and CPM, as these variables show the most promising associations with pain after surgery.

Bedside QST

Simplified, less labour-intensive, inexpensive and time-efficient alternatives that can supplement clinical assessment are needed.

To reduce costs associated with QST equipment, various instruments have been developed and investigated as 'bedside assessment tools'. These range from practical tools, such as metal coins warmed up in the examiner's pocket, to fully customised handheld devices to measure single pain modalities. In addition, clinically available equipment such as a tuning fork and a brush have been integrated into bedside testing protocols. These bedside QST protocols have been designed based on the DFNS or other established laboratory QST batteries as reference.[22]

Among the DFNS bedside QST protocols, the clinical sensory bedside test and the Kiel bedside test are easy-to-use tests with poor to excellent agreement compared with the respective laboratory-based QST measures.[28,29] The Kiel bedside test, for example, involves the use of readily available equipment such as a 10-ml syringe as a bedside algometer, and two metal pieces along with a refrigerator and a milk heater for thermal assessment. Furthermore, the Kiel bedside test enables assignment to predefined QST-based phenotypes. Testing can be performed quickly (in <15 min) by a trained clinician. Adequate training is essential as the examiner's training status affects the accuracy of the bedside-QST.[28,29]

Another important aspect to address when implementing QST in a clinical setting is reducing the number of measurements required while minimising the effect of errors. Traditionally, measurements are repeated three to five times, and the mean value is used to compensate for potential outliers. However, Müller and colleagues found that limiting the number of records to one did not lead to relevant measurement errors.[30]

Bedside QST has both advantages and limitations. Bedside alternatives for cold detection threshold, mechanical detection threshold and PPT mimic laboratory QST very closely, whereas for others, a reliable bedside version has yet to be found.[22,28] The advantage of the laboratory QST protocol and equipment remains the higher level of standardisation. Therefore, bedside QST and laboratory QST are currently not interchangeable.

Current application of QST in clinical practice

Quantitative sensory testing has been optimised to detect distal polyneuropathies and is integrated into the diagnostic work-up of small fibre neuropathies. In a clinical setting, QST is recommended for screening, quantifying and monitoring of the extent of sensory deficits over time as an aid for diagnostic work-up of small fibre neuropathies and neuropathic pain.[4,31] If screening suggests the presence of deficits or alterations in evoked pain processing, further tests can be carried out to provide supportive evidence for the working diagnosis. These may include skin punch biopsy to assess intraepidermal nerve fibre density or conventional electrophysiology to evaluate fibre function.[4,31] Considering the wealth of research and promising results, it is quite surprising that QST has not been integrated in daily clinical practice yet.

Controversies

Although QST offers a systematic approach to assess somatosensory function, controversies surround its application, interpretation and broader implications. These include the variability in QST methodologies and the generalisability to pain modalities other than small fibre neuropathy and neuropathic pain. Quantitative sensory testing performed according to the DFNS protocol is standardised but consists predominantly of cutaneous stimulus modalities customised for patients with neuropathic pain. The role of QST in profiling inflammatory, musculoskeletal, or visceral pain conditions has not been elucidated.

Although QST provides information about the functional status of the somatosensory system as a whole, this technique cannot localise the exact source of dysfunction along the neuroaxis.

Another general issue is that it assesses the response to evoked pain rather than spontaneous pain. To date, the clinical correlation between evoked and spontaneous pain is not well understood; hence, the clinical value of evoked pain testing in patients reporting spontaneous pain is unknown.[32]

From a clinical perspective, there are some practical issues to be considered. Quantitative sensory testing is resource-intensive with a large impact on research budgets and healthcare facilities. For reliable and reproducible results, QST requires expensive equipment, well-trained testers and substantial time commitment for both testers and patients. Testing times of at least 1 h may lead to discomfort and fatigue for the patient. This discomfort may subconsciously influence the patient's response to a stimulus. As QST depends on the patient's participation, it is susceptible to bias related to attention, motivation, cognitive functioning, psychiatric comorbidity and feigning.[4] Therefore, NeuPSIG discourages the use of QST in patients with language or communication difficulties, clinically relevant cognitive deficits and motor slowing, based on clinical judgement.[4]

The resource-intensive nature, the need for specialised training, time commitments, variability in results all hinder the widespread adoption of QST as a routine tool. Researchers and clinicians must weigh these challenges against the potential benefits when deciding whether to incorporate QST into their studies or clinical practices. Efforts to address these limitations by the development of bedside QST protocols may contribute to the refinement and broader applicability of sensory testing in the future.

Conclusions and future perspectives

In summary, QST is a series of standardised psychophysical tests that assess the patient's somatosensory nervous system

function, and has an established role in diagnosis of small fibre neuropathies. In research, QST investigates sensory deficits, pain-related thresholds and phenomena, identifying pain phenotypes such as sensory loss, thermal hyperalgesia, and mechanical hyperalgesia. These QST-based phenotypes may aid clinical decision-making by identifying central sensitisation in patients at risk for postsurgical pain, and predicting pain treatment efficacy.

The future use of QST requires refinement of the technique to enhance clinical applicability, and integration with other diagnostic tests to personalise pain management strategies.

Despite its potential, there has been limited acceptance of QST by clinicians because of a lack of information and the complexity associated with mastering the technique.

We recommend healthcare providers should watch the training videos accompanying this article, gain familiarity and practice on healthy subjects before applying QST in research or clinical practice.

Acknowledgements

The authors wish to thank Edwin de Raaij, Sabrine Klerx, Harriet Wittink and Henri Kiers from the Hogeschool Utrecht for their commitment in producing the QST training video. A special appreciation goes to Pier Wouda for his contribution as voice-over, video editor and technical expert behind this project. We also want to thank Matthijs Kant for participating in the video and Karina de Roos-Baron for proofreading the script of the QST training video.

Declaration of interests

The authors declare that they have no conflicts of interest.

MCQs

The associated MCQs (to support CME/CPD activity) will be accessible at www.bjaed.org/cme/home by subscribers to *BJA Education*.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.bjae.2024.05.004.

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