

## Value of quantitative sensory testing in neurological and pain disorders: NeuPSIG consensus

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### ABSTRACT

Quantitative sensory testing (QST) is a psychophysical method used to quantify somatosensory function in response to controlled stimuli in healthy subjects and patients. Although QST shares similarities with the quantitative assessment of hearing or vision, which is extensively used in clinical practice and research, it has not gained a large acceptance among clinicians for many reasons, and in significant part because of the lack of information about standards for performing QST, its potential utility, and interpretation of results.

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A consensus meeting was convened by the Neuropathic Pain Special Interest Group of the International Association for the Study of Pain (NeuPSIG) to formulate recommendations for conducting QST in clinical practice and research. Research studies have confirmed the utility of QST for the assessment and monitoring of somatosensory deficits, particularly in diabetic and small fiber neuropathies; the assessment of evoked pains (mechanical and thermal allodynia or hyperalgesia); and the diagnosis of sensory neuropathies. Promising applications include the assessment of evoked pains in large-scale clinical trials and the study of conditioned pain modulation. In clinical practice, we recommend the use of QST for screening for small and large fiber neuropathies; monitoring of somatosensory deficits; and monitoring of evoked pains, allodynia, and hyperalgesia. QST is not recommended as a stand-alone test for the diagnosis of neuropathic pain. For the conduct of QST in healthy subjects and in patients, we recommend use of predefined standardized stimuli and instructions, validated algorithms of testing, and reference values corrected for anatomical site, age, and gender. Interpretation of results should always take into account the clinical context, and patients with language and cognitive difficulties, anxiety, or litigation should not be considered eligible for QST. When appropriate standards, as discussed here, are applied, QST can provide important and unique information about the functional status of somatosensory system, which would be complementary to already existing clinical methods.

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## 1. Introduction

Quantitative sensory testing (QST) is a psychophysical method used to quantify somatosensory function in healthy subjects and patients. It is based on measurements of responses to calibrated, graded innocuous or noxious stimuli (generally mechanical or thermal) and represents, in most respects, an extension of the routine bedside clinical examination of the somatosensory system. QST has been used for decades in the research setting, particularly for diagnosing, assessing, and monitoring sensory neuropathies [10,21,32,36,99,110] and pain disorders [25,52,55,65,77,81,102,110]. Several pioneering studies have been performed specifically in the pain field [43,54,72,95,111].

In contrast to conventional neurophysiological techniques and other psychophysical sensory tests, such as audiometry, visual acuity, and visual field assessment, QST has not gained large acceptance in clinical practice. This is despite the existence of published guidelines and recommendations for the diagnosis and follow-up of sensory abnormalities in diabetic neuropathy using QST [23,59,99] and for the assessment of neuropathic pain [25,52]. However, in Germany, thermal or mechanical QST is regularly used in clinical practice. On the basis of a preliminary survey of the participants of the present consensus meeting on QST (26 respondents), 42% of the participants declared using QST for clinical purposes, particularly for quantification of deficit or pains in neurological conditions, and for diagnosis of polyneuropathy. The major obstacles precluding the wide use of QST in clinical practice have been the lack of harmonization of the standards of QST and interpretation of its results, and the lack of expert consensus about the utility of QST as a clinical and research method of investigation of the somatosensory system. In particular, the additional value of QST compared to that obtained from the bedside clinical sensory examination or from electrophysiological assessment of the somatosensory system has not been clarified. These reasons may account for the lack of reimbursement of QST, particularly in United States.

In this context, a consensus meeting was convened by the Neuropathic Pain Special Interest Group (NeuPSIG) of the International Association for the Study of Pain ([www.neupsig.org](http://www.neupsig.org)) to identify the critical issues related to the definition of QST, its utility, standardization of procedures for conducting QST, and interpretation of results. This article is a result of that meeting. Our objectives were to address the following questions:

- (1) Is QST suitable for the assessment and monitoring of somatosensory deficits and of pain-related phenomena (ie, hyperalgesia, allodynia, hypoalgesia)?

- (2) Is QST suitable as a diagnostic tool compared to other investigations of the somatosensory system?
- (3) How should QST be best performed and its results interpreted?

The technology of QST has been discussed at length in previously published reviews [21,31,65,93,107] and will be not be discussed in detail here (Appendix A).

## 2. Consensus procedure

The NeuPSIG consensus meeting was held in Hamburg, Germany, on September 25, 2011, and included an international group of 25 participants selected on the basis of their established research expertise, clinical experience, or both in conducting QST. An attempt was made to include broad representation of various disciplines and expertise (neurology, neurophysiology, pain and palliative medicine, anesthesiology, primary care, rehabilitation medicine, diabetology, odontology, rheumatology) while limiting the size of the meeting to promote effective and productive discussions. To facilitate the development of consensus recommendations, a survey was initially conducted among all participants, which yielded identification of the most important issues in standards in conducting the QST. Relevant background literature regarding data and reviews on QST were distributed and analyzed before the meeting and served as the basis for recommendations [21,25,32–34,99,110]. Participants then made written contributions to the draft document before the meeting, which, in addition to the minutes of the meeting, served as the source document for the preparation of this article.

The relevant data from literature related to our 3 objectives were reviewed, and we provided consensus statements regarding the role of QST in clinical practice. The specificity and sensitivity of QST regarding neurological and pain disorders were presented when available, but this was not feasible for the majority of those disorders. Consequently, this article cannot adapt the usual structure of diagnostic recommendations in clinical practice; rather, it presents best standards according to available evidence.

## 3. Brief overview of methodology and type of information obtained

QST comprises a set of psychophysical tests that assess the functional status of specific somatic sensory modalities. These are subserved in the peripheral nervous system by nerve fibers of various sizes and by central pathways. This is achieved by applying specific calibrated stimuli and recording the subjects response.

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