Central Hypersensitivity in Whiplash

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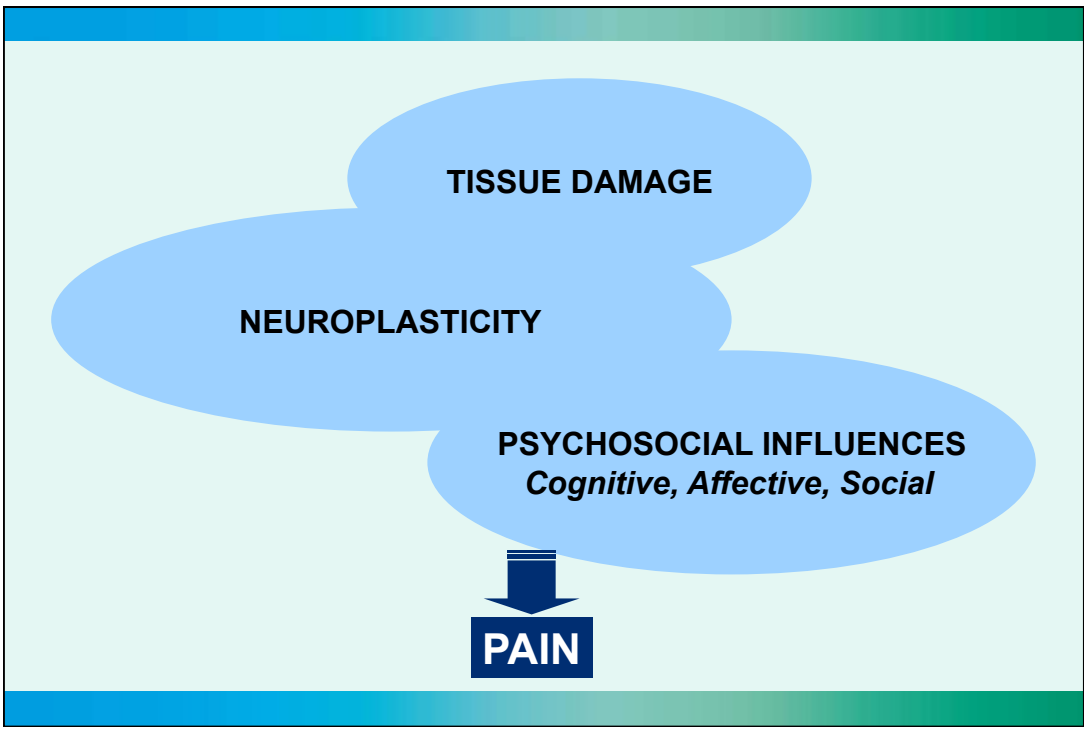
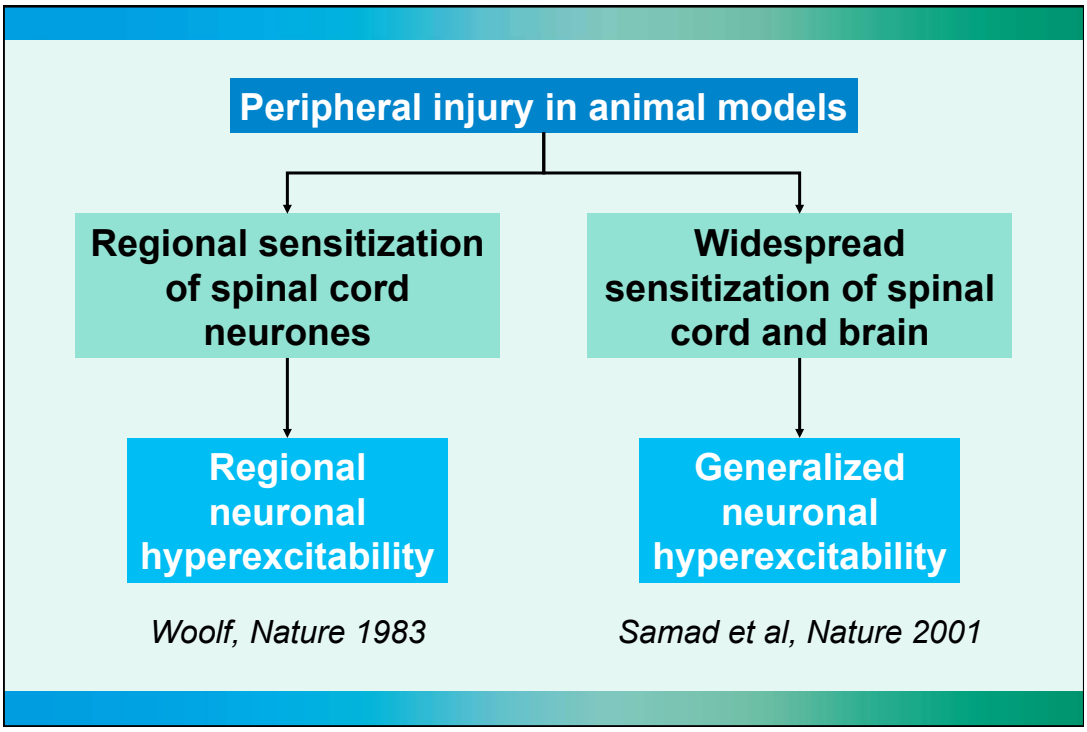




Topics

Central Hypersensitivity:

- Assessment methods
- Evidence
- Clinical relevance
- Incidence
- Prognostic value
- Perspectives

Measurement of pain sensitivity - Psychophysical

Input

– Mechanical, thermal, electrical, chemical, etc.

Response

- Pain thresholds
  - – Detection, tolerance
- Stimulus response
  - – VAS, NRS
- Tolerance time
- Area of hyperalgesia

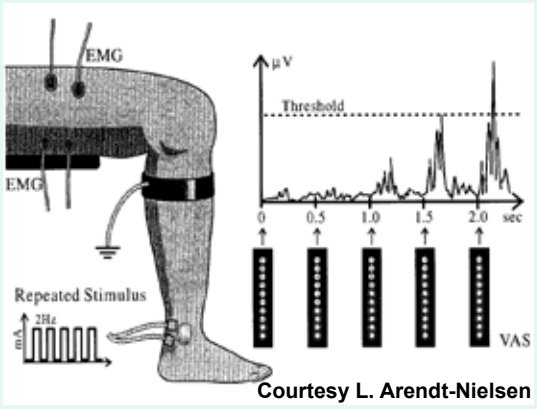
Measurement of pain sensitivity - Electrophysiological

Input

- Mechanical, thermal, electrical, chemical, etc.

Response

- Lower limb reflex
  - – Single stimulus
  - – Repeated stimulus
  - – Receptive fields
- EEG
  - – Latency, amplitude
  - – Cortical mapping

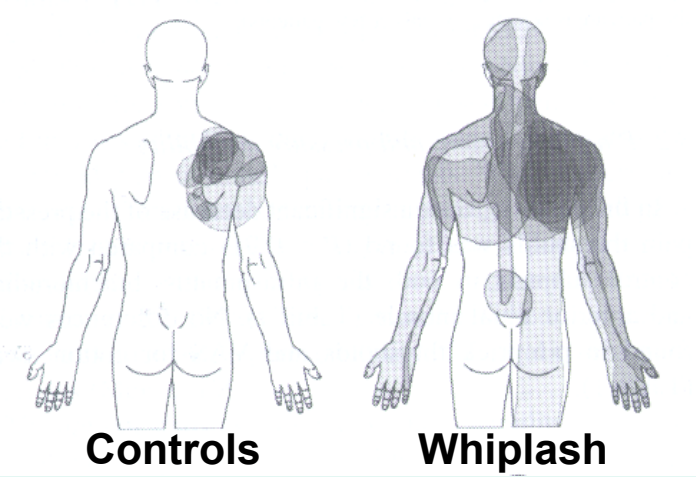


Courtesy L. Arendt-Nielsen

Why to measure pain sensitivity?

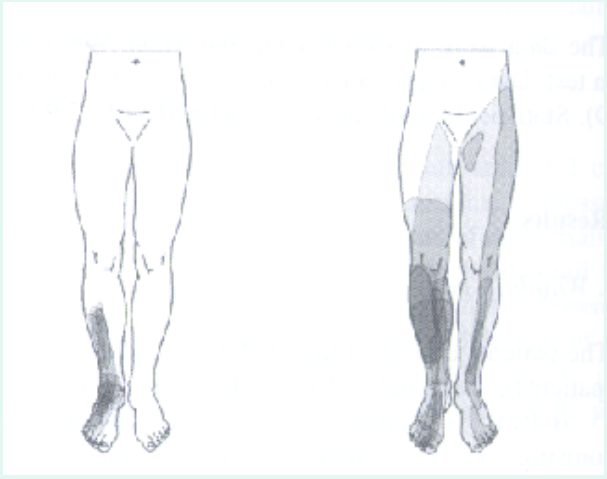
- Provide patient with a model for pain
- Estimate the prognosis ?
- Guide decision-making for interventions ?
- Indications for centrally-modulating treatments ?

Evidence for central hypersensitivity



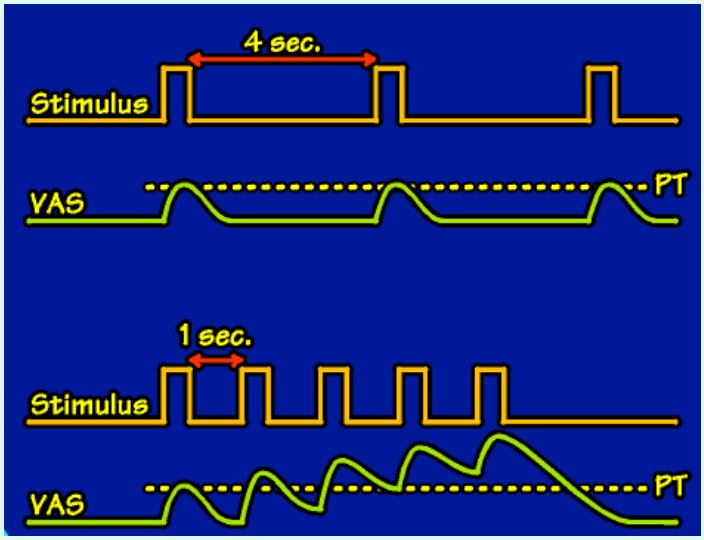
Koelbaek et al, Pain 1999

Controls **Whiplash**



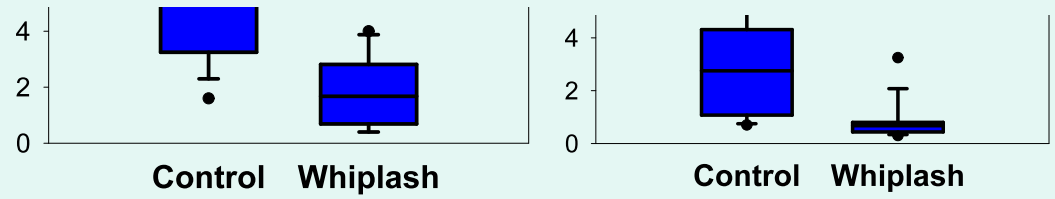
Koelbaek et al, Pain 1999

Temporal Summation



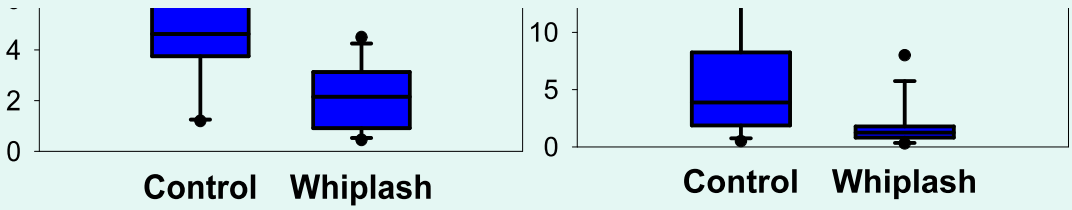
Courtesy Lars Arendt-Nielsen

Measurements at the Neck



Curatolo et al, Clin J Pain 2001

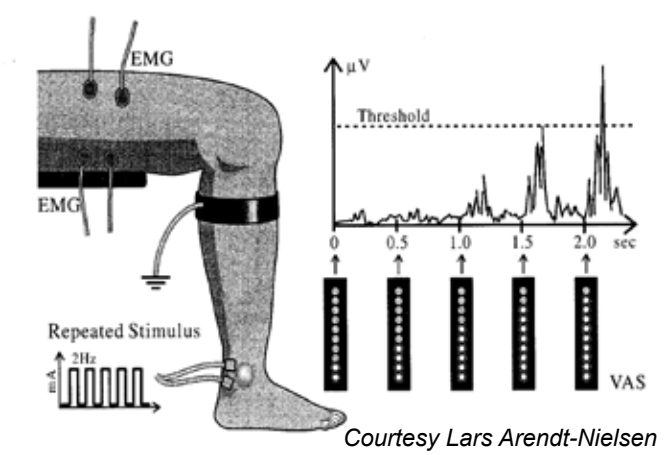
Measurements at the Leg



Curatolo et al, Clin J Pain 2001

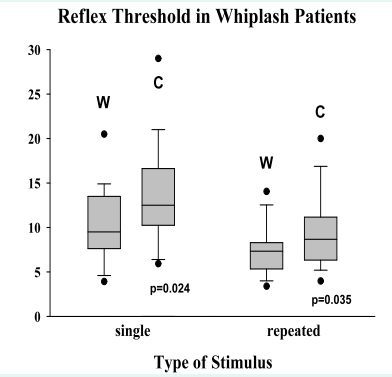
Objective Evidence for Central Hypersensitivity

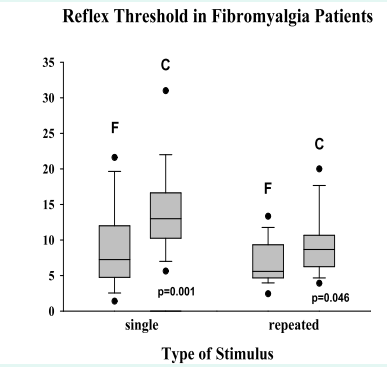
Banic et al, Pain 2004



Courtesy Lars Arendt-Nielsen

Results

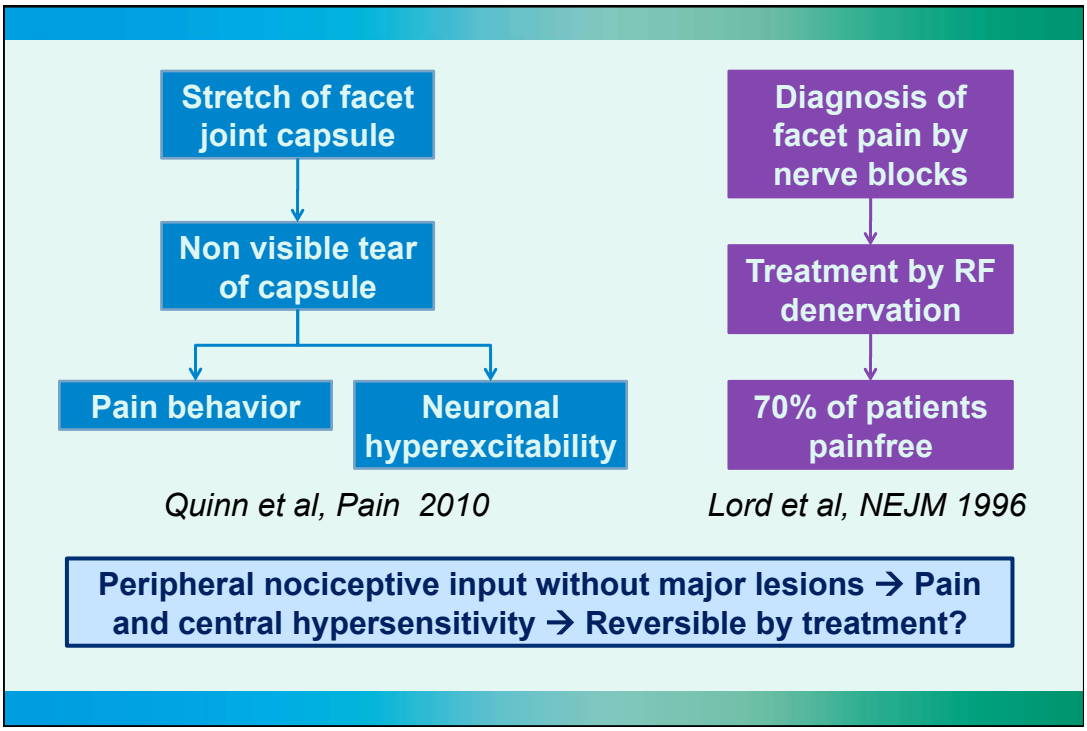




W: Whiplash - C: Control

F: Fibromyalgia - C: Control

Banic et al, Pain 2004



Pathophysiology: Conclusions

Whipash patients display:

- **Enlarged pain areas and facilitated temporal summation:**
  - **after cutaneous and muscular stimulation**
  - **at neck and lower limb**
- **Widespread spinal cord hyperexcitability**

The presence of major lesions is not an essential condition for the induction of pain and hypersensitivity

Hypersensitivity may depend on the presence of a peripheral nociceptive input, at least for some conditions

Clinical consequences of central hypersensitivity

- **Pain after minimal ongoing nociceptive input and after innocuous stimulation**
  - ⇒ **Amplification of pain**
  - ⇒ **Activity- and load-dependent pain → Disability**
- **Enlarged pain areas**
  - ⇒ **Tendency to widespread pain**
  - ⇒ **Difficult identification of source of pain → Difficult target of treatment**

Is pain sensitivity affected by psychological factors?

- No influence of psychological factors on spinal cord excitability in painfree subjects and whiplash patients

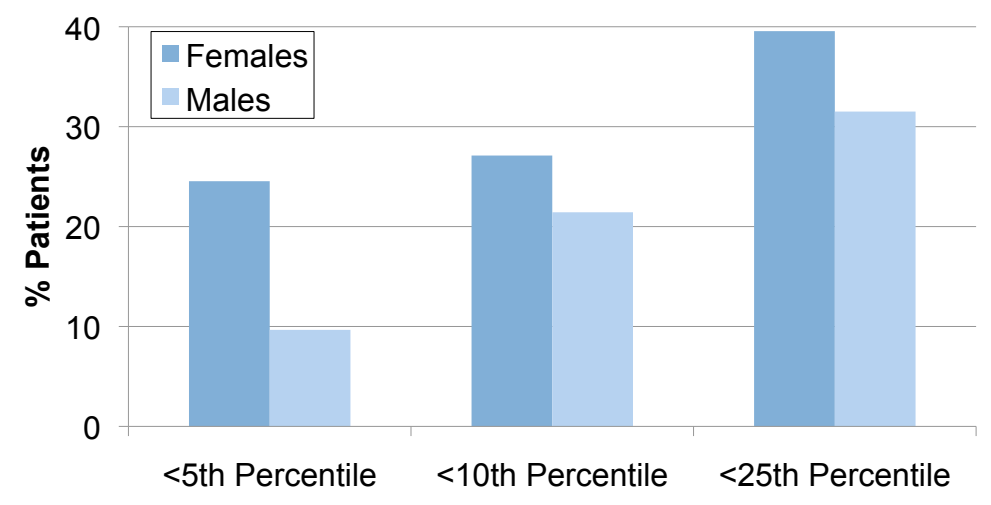
  Neziri et al, EJP 2010; Sterling et al, Clin J Pain 2008
- No influence of depression, anxiety and catastrophyzing on pressure, thermal and electrical pain sensitivity in painfree subjects

  Neziri et al, EJP in press
- Modest and inconstistent correlations of psychological factors with pain thresholds in patients

  Sterling et al, Pain 2005 and Clin J Pain 2008

Psychological factors are not the main determinants of sensory hypersensitivity

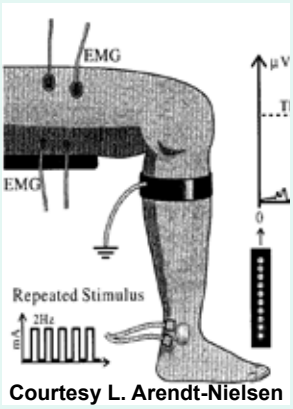
Prevalence of widespread hypersensitivity



Schliessbach et al, unpublished

Prognostic value of central hypersensitivity

Spinal cord hyperexcitability



Courtesy L. Arendt-Nielsen

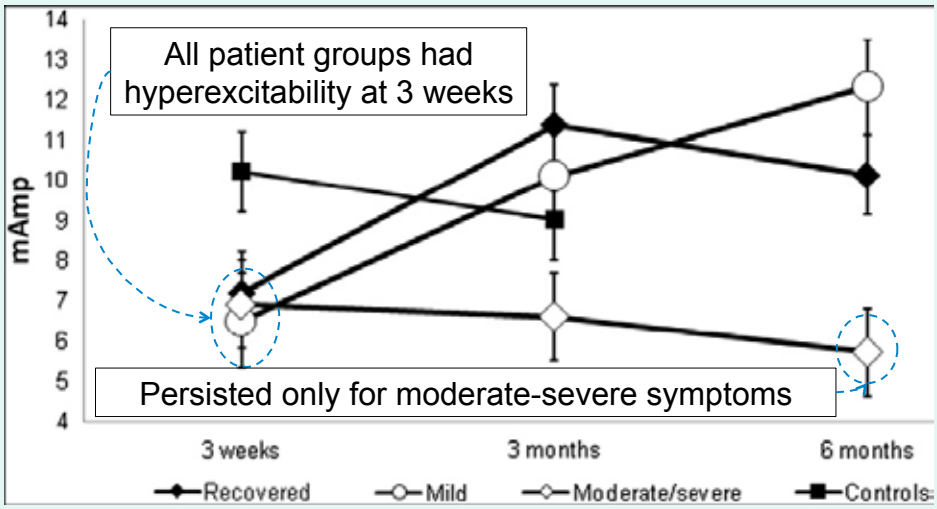
Sensory hyperexcitability

Groups based on NDI at 6 months:

1. Recovered
2. Mild symptoms
3. Moderate/severe symptoms
4. Healthy controls

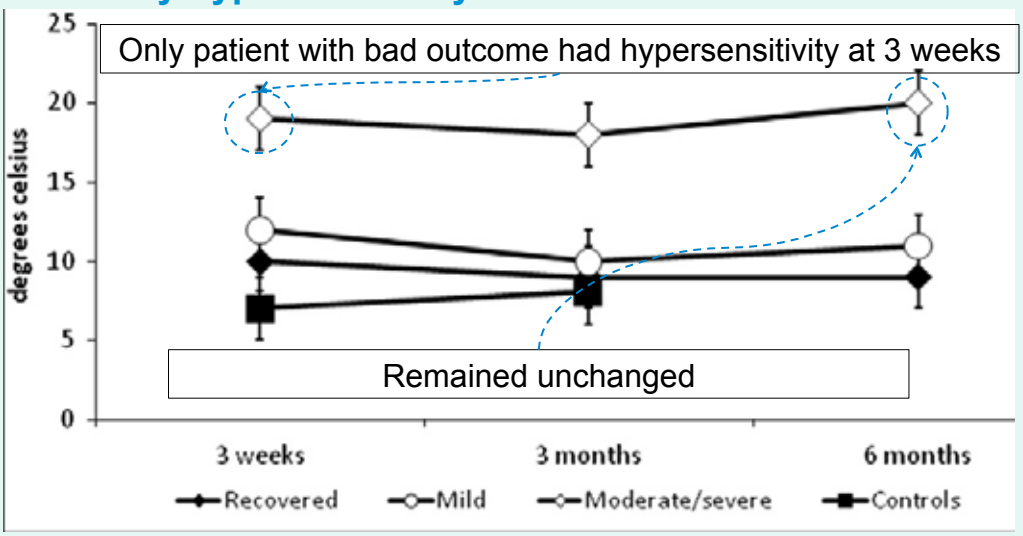
Sterling et al, Pain 2010

Spinal cord hyperexcitability



Sterling et al, Pain 2010

Sensory hypersensitivity to cold



Sterling et al, Pain 2010

Implications

- **Spinal cord hypersensitivity may reflect the clinical course of pain**
  - **May be strongly related to an ongoing peripheral nociceptive input**
- **Generalized sensory hypersensitivity may have a negative prognostic value**
  - **Induction of plastic changes → Higher likelihood of poor outcome**

Take-home messages

Central hypersensitivity:

- **Is likely clinically relevant**
- **Can explain part of the discrepancy between lesion and symptoms**
- **Is prevalent in chronic pain patients**
- **May have negative prognostic value**

Central hypersensitivity can be measured individually

- **Main current aim: to better explain patient's symptoms**
- **Possibly also to guide therapeutic decisions**

Research Agenda

- Development and validation of diagnostic tools for clinical use
- Investigation of prognostic value
- Linking altered pain modulation with treatments
- Development of specific and clinically applicable therapies for central hypersensitivity