

# Central sensitization and musculoskeletal shoulder pain

Door Kevin Kuppens (MSc)





# Prevalence & incidence

- 3rd most common cause of musculoskeletal consultation in primary care
- Lifetime prevalence up to 67% & Point prevalence 7 to 26%



40% still has shoulder complaints after 1 year

80% of the total economic cost for shoulder pain



# (Shoulder) pain

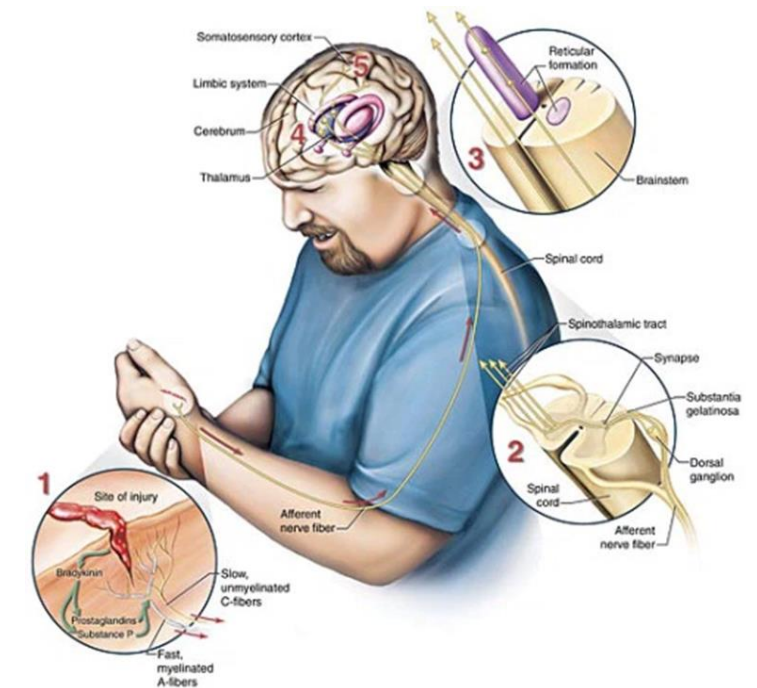


Fig. 1

## Descartian 'dualist' philosophy

- Intensity of pain directly related to the amount of associated tissue damage
- One distinct pathway

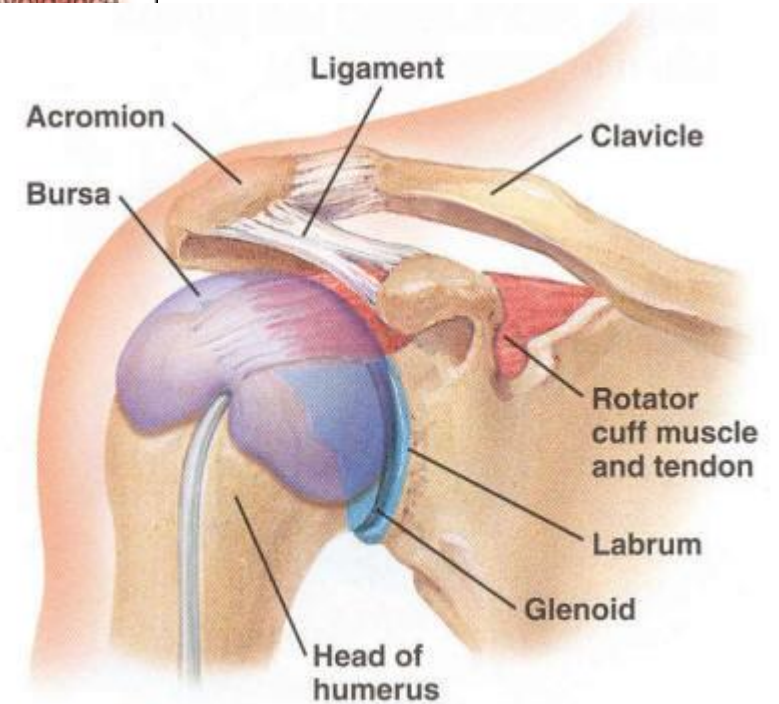
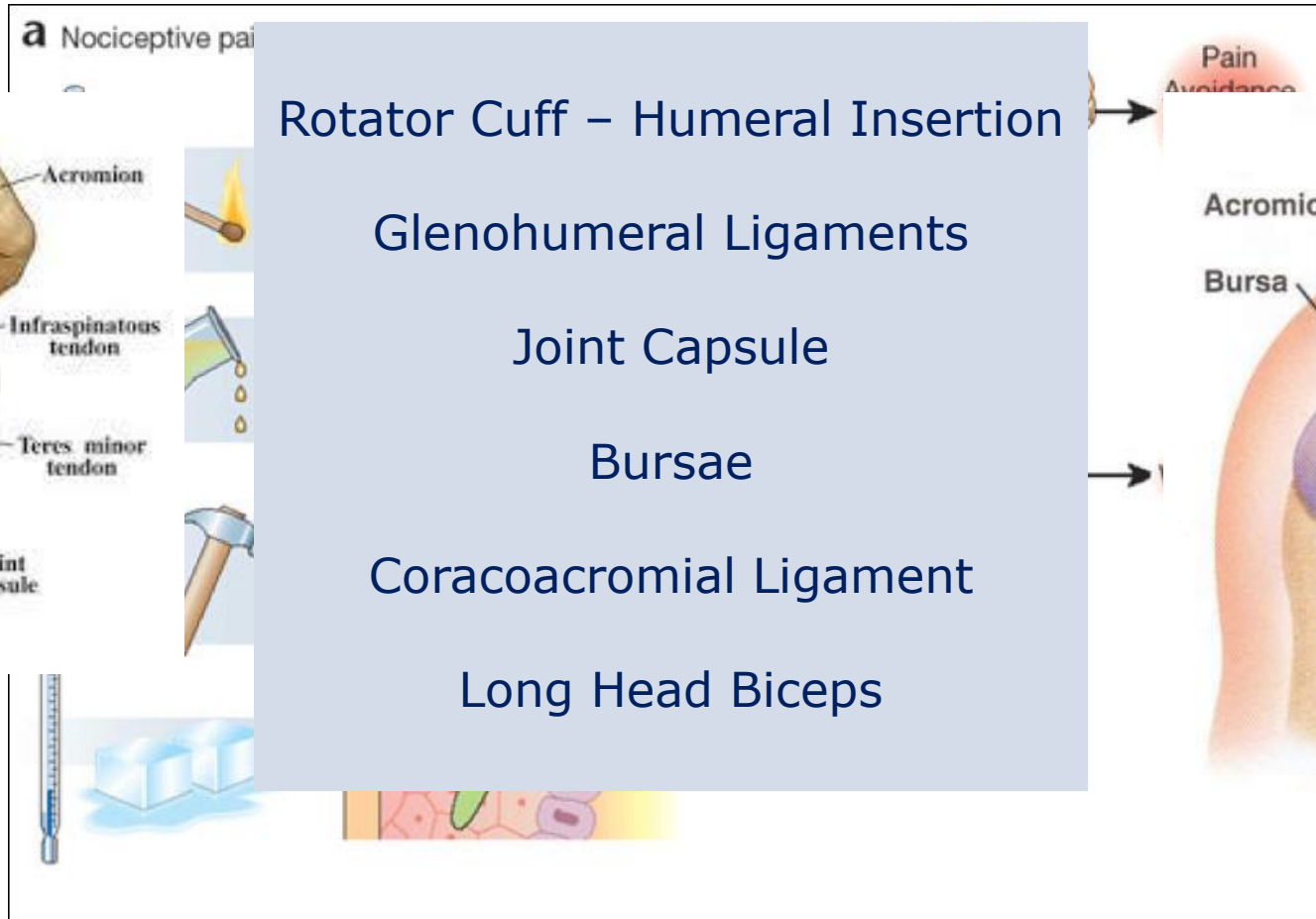
Advances in knowledge on pain processing ...







# Nociception

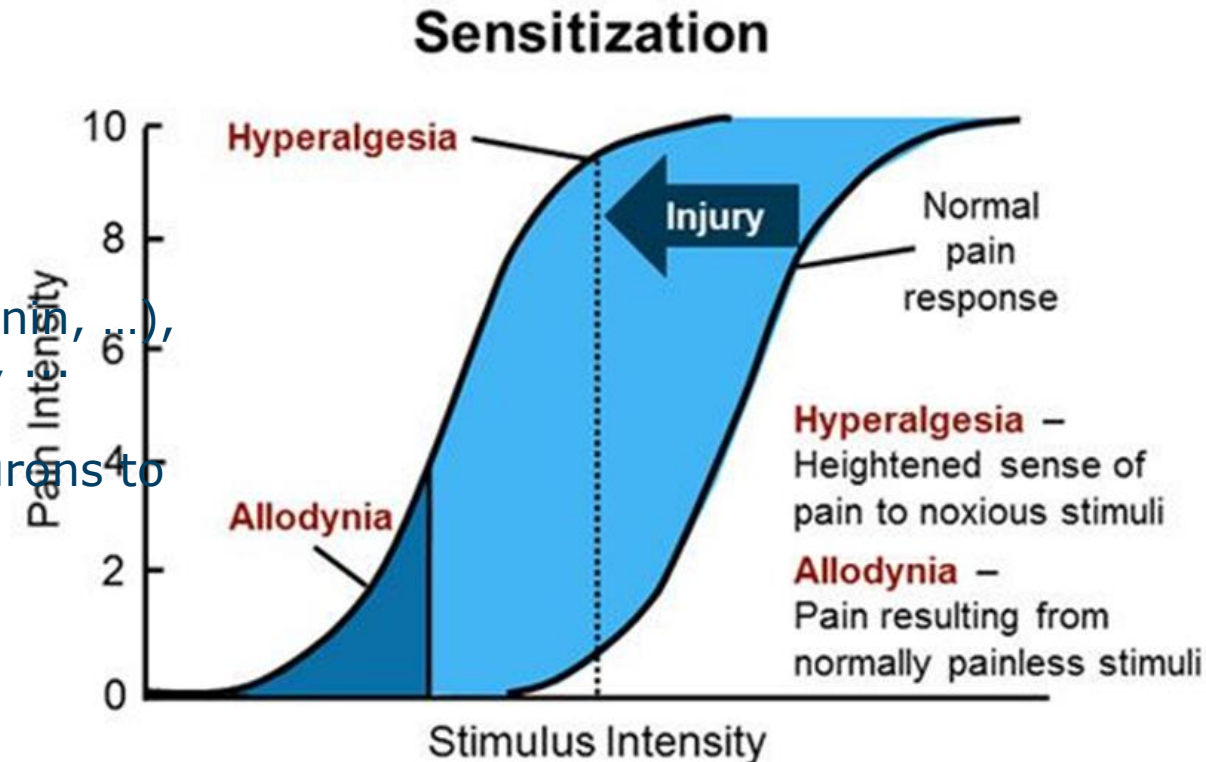




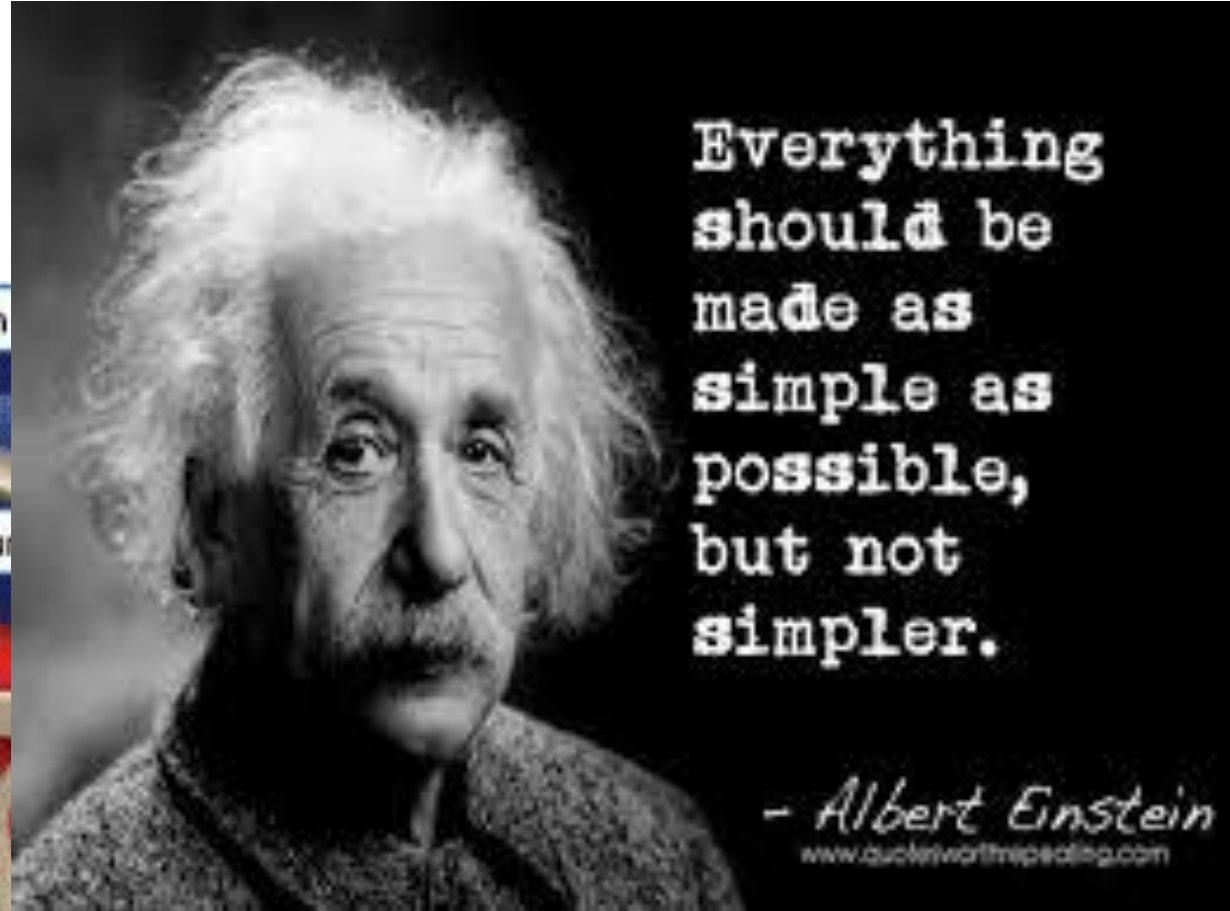
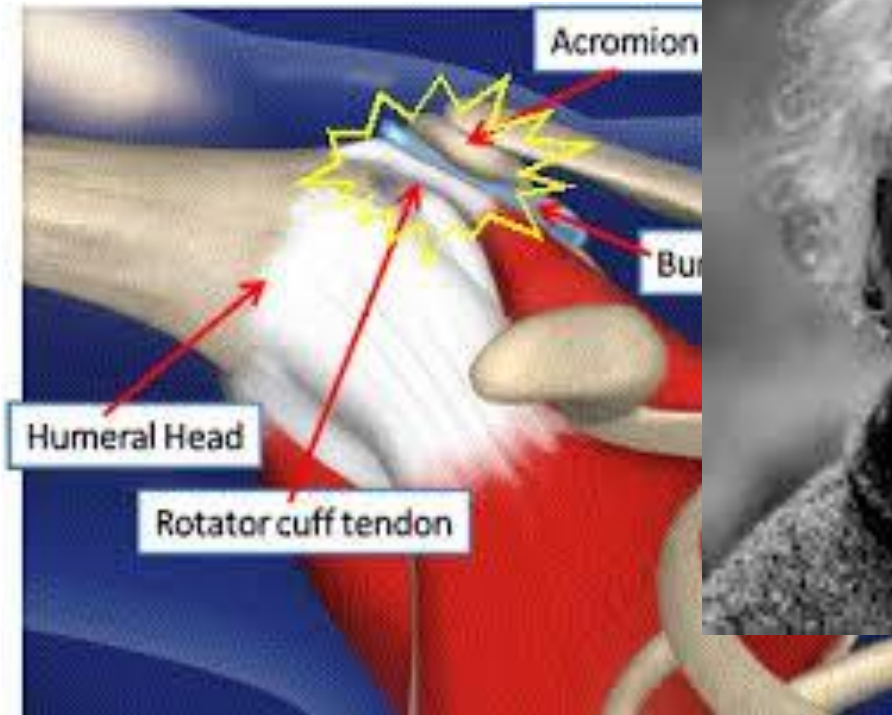
# Peripheral Sensitization

- Tissue injury (Nociception)
  - Inflammatory mediators (histamine, bradykinin, ...), Cytokines (interleukins, TNF, ...), Glutamate, ...
  - Increased responsiveness of nociceptive neurons to their normal input
  - Protective and adaptive action

= Primary hyperalgesia & Allodynia



**Unpredictable and disproportionate pattern of pain provocation in response to mechanical testing**





# Central sensitization

- “An amplification of neural signalling within the CNS that elicits pain hypersensitivity” (Woolf, 2011)
- “Increased responsiveness of nociceptive neurons in the central nervous system to their normal or subthreshold afferent input” (Merskey and Bogduk 1994)







# Central sensitization

## *Secondary hyperalgesia*

- Hyperalgesia outside the original zone of injury
- Sensitization of dorsal horn neurons
  - explaining increased sensitivity to stimuli not only in the anatomical region of primary nociception, but also in segmentally related regions outside the primary zone of nociception.

**These alterations in the central nervous system further contribute to the poor reliability and validity of shoulder testing in clinical practice**





## If the nervous system **fails to reset**

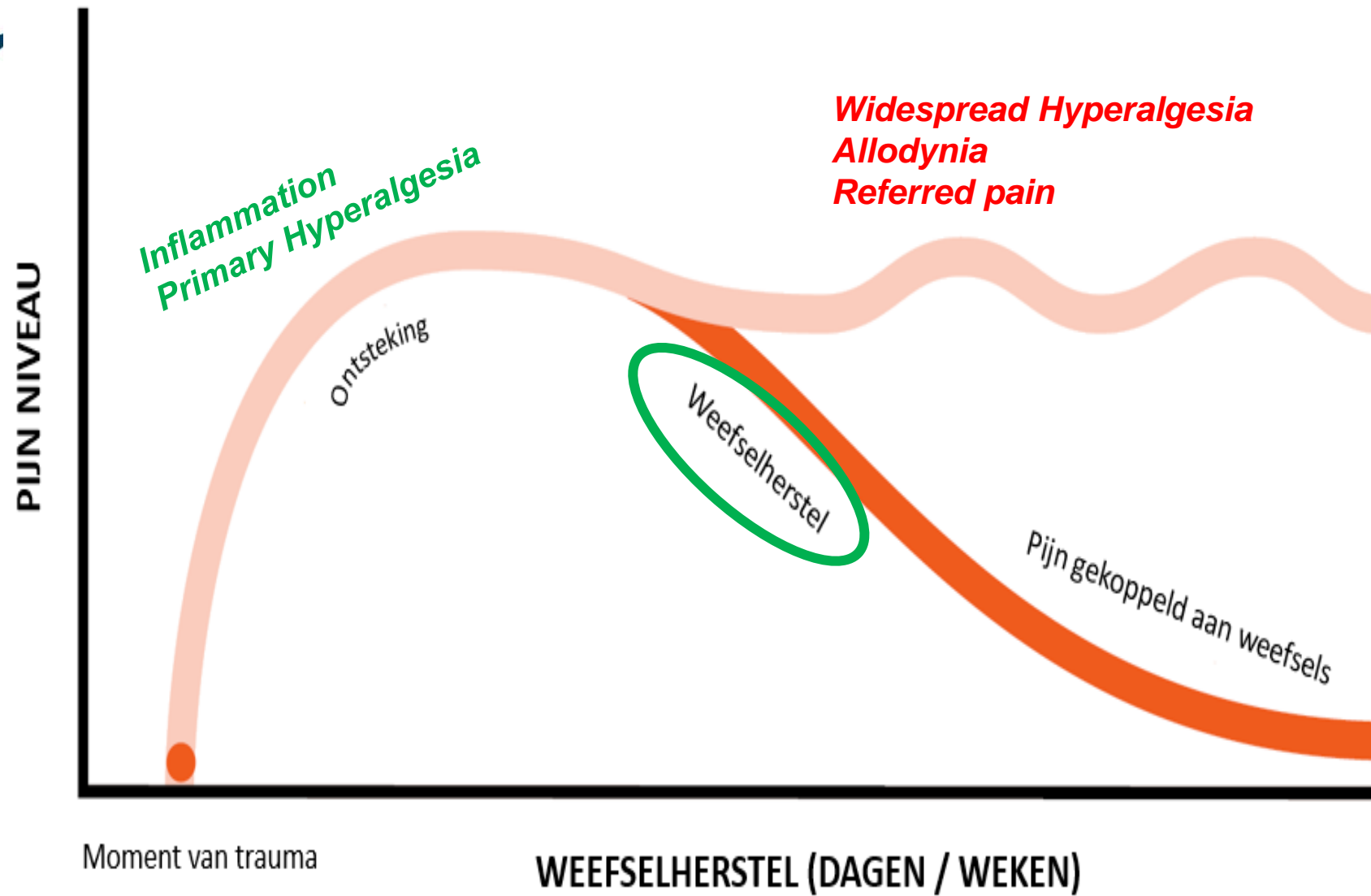
- ongoing (secondary) hyperalgesia
- spreads to segmentally unrelated areas, resulting in widespread central sensitization

**Emotions**  
**Fear / Anxiety**  
**Perceptions**  
**Cognitions**  
...

**Central sensitization is no longer restricted to the dorsal horn neurons, but also manifests itself in the brain and descending nociceptive system**



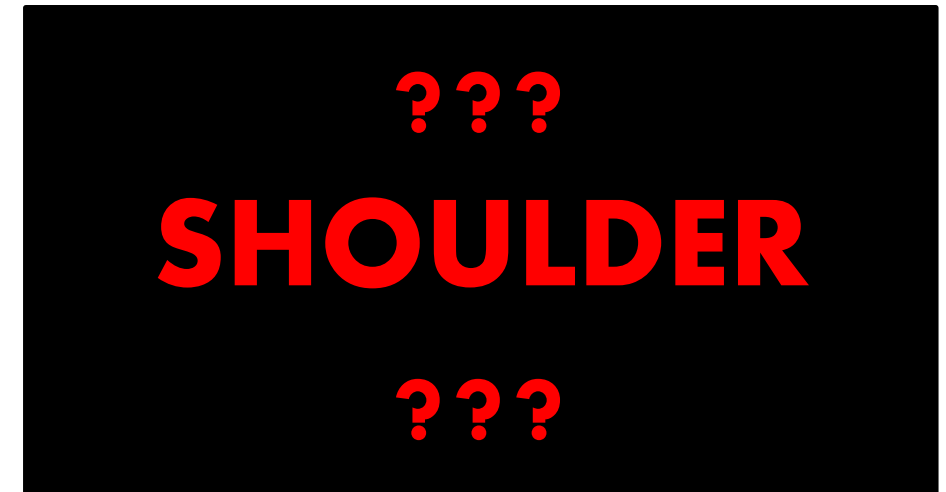
- I've inherited weak shoulders so I'm limited in what I can do...
  - Wrong beliefs & attitudes
- The last time I cleaned the windows it resulted in a painful shoulder ...
  - Wrong beliefs ~ pain memory
- Pt: Same problem other side?
- T: Both sides grey





# Medical diagnoses associated with central sensitization

- ***Fibromyalgia***
- ***Chronic fatigue syndrome***
- ***Chronic whiplash associated disorders***
- **Irritable bowel syndrome**
- Chronic low back pain
- Temporomandibular dysfunction
- Myofascial pain syndromes
- Osteoarthritis
- Rheumatoid arthritis
- Headache
- Tennis elbow



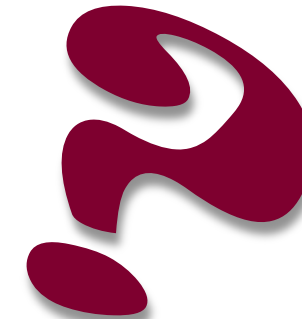




## The role of central sensitization in shoulder pain: A systematic literature review

Marc N. Sanchis, PT<sup>a</sup>, Enrique Lluch, PT<sup>b,c,d,e,\*</sup>, Jo Nijs, PT, PhD<sup>c,d,e</sup>, Filip Struyf, PT, PhD<sup>c,f</sup>, Maija Kangasperko, PT<sup>a</sup>

- The CNS becomes **hypersensitive in a subgroup** of patients with unilateral shoulder pain
- **Central Sensitization may play a role** in the frequent pain complaints reported by these patients
- Some shoulder pain patients have altered central pain mechanisms **contributing (or even dominating)** to the patients clinical picture





- 8 / 10 included papers: key role for CS in unilateral shoulder pain



### *Clinical Manifestations:*

- Referred pain
- Hyperalgesia
- More active and latent MTrPs
- Lower PPTs local and remote



### *- Quantitative Sensory Testing*

- 4 / 10 : Local AND Widespread hyperalgesia
- Suprathreshold Heat Pain Respons elevated (bilateral)

### *- Psychosocial Manifestations:*

- Pain related fear ~ Experimental Pain Sensitivity
- Pain catastrophizing (+ depression) ~ Clinical Pain Intensity



- Worse outcome after surgical decompression (chronic SIS)
  - Widespread hyperalgesia before surgery
  - Referred pain before surgery

(Gwilym et al, 2011)

- Pre VS Post-surgical assessments in SHPR = predictive of surgical outcome (SIS)

(Valencia et al, 2014)

- Widespread hyperalgesia (QST) ~ higher pain perception

(Hidalgo-Lozano et al, 2010; Gwilym et al, 2011; Valencia et al, 2012 & 2013)



## Limited to those specific patient populations examined with unilateral shoulder pain

- Patients **waiting for arthroscopic** subacromial decompression (Glilym et al.)
- Participants were considered eligible for this study if they were **scheduled for arthroscopic** surgery (Coronado et al.)
- Twelve patients with **strictly** unilateral shoulder impingement (Hidalgo-Lozano et al.)
- **No current complaints** of neck, elbow, hand, low back, hip, knee, or ankle pain for more than the previous 3 months (Valencia et al.)





## *Description of patients with painful shoulder syndrome*

### ➤ Imaging

- 66,2 % Tendinosis
- 26,9 % Arthropathy
- 18,5 % Bursitis
- 22,3 % Normal

### ➤ Reference diagnosis

- 75,4 % Rotator cuff syndrome
- 8,7 % Unspecified Lesion
- 6,3 % Frozen Shoulder
- 6,3 % Cervicalgia
- 2,4 % Instability
- 0,8 % Arthrosis





1. Lateral Epicondylitis (10/16)
2. **Shoulder Tendinopathy (4/16)**
3. Patellar Tendinopathy (2/16)

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BILL VICENZINO, PhD, MSc, Grad Dip Sports Phty, BPhy<sup>2</sup> • C. PAUL VAN WILGEN, PhD, MSc, PT<sup>3,5</sup>

## Evidence of Nervous System Sensitization in Commonly Presenting and Persistent Painful Tendinopathies: A Systematic Review

- **Decreased mechanical pain thresholds were reported in all studies**
- **Greater mechanical hyperalgesia at sites distal to the participants' reported site of tendon pain**
  - **Lateral epicondylitis**
  - **shoulder impingement syndrome.**



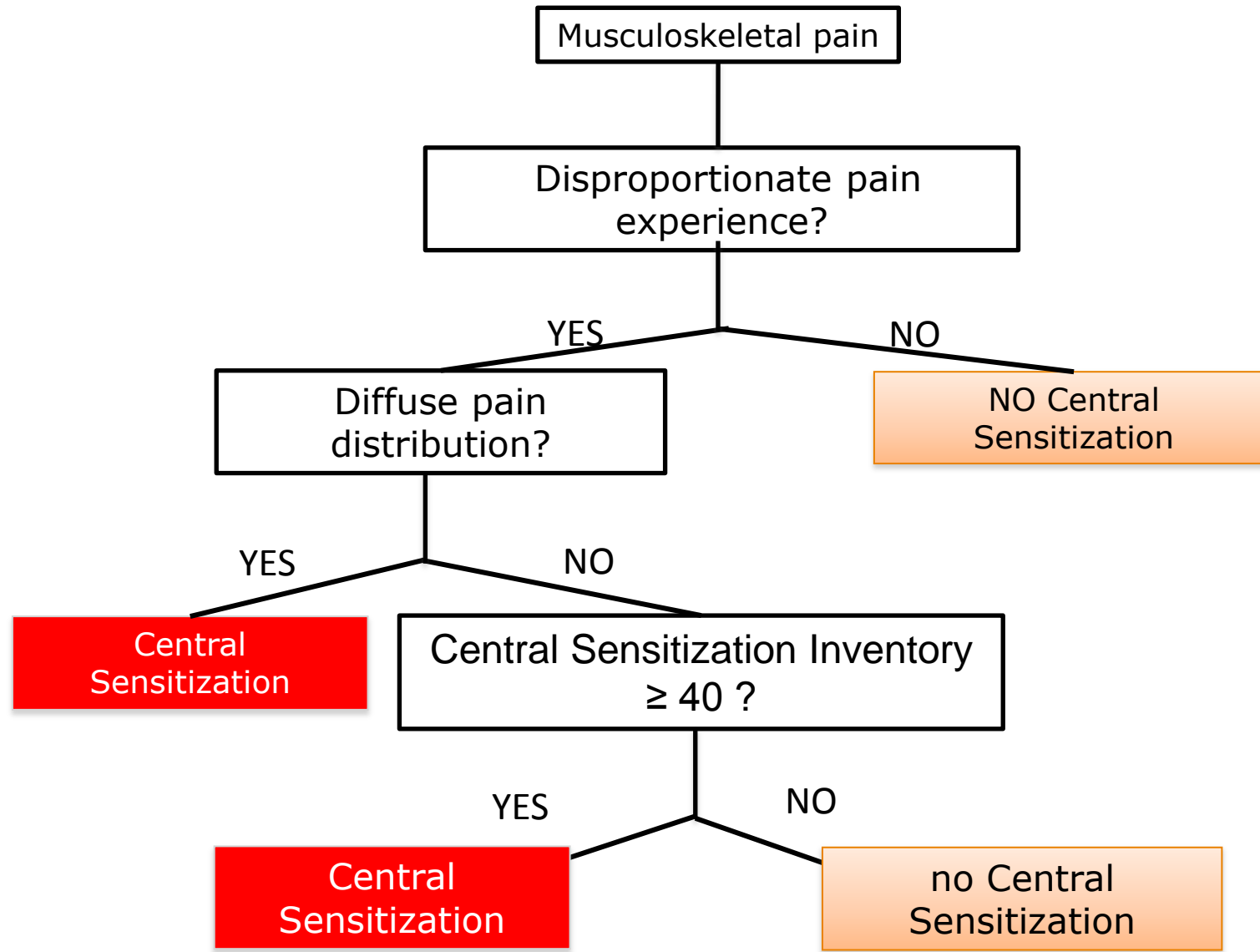
# ASSESSMENT: How To Recognise Central Sensitization Pain

Pain Physician 2014; 17:447-457 • ISSN 1533-3159

## Epidemiology

### **Applying Modern Pain Neuroscience in Clinical Practice: Criteria for the Classification of Central Sensitization Pain**

Jo Nijs, PhD<sup>1,2</sup>, Rafael Torres-Cueco, MSc<sup>3</sup>, C. Paul van Wilgen, PhD<sup>4</sup>, Enrique Lluch Gírbés, MSc<sup>3</sup>, Filip Struyf, PhD<sup>1,5</sup>, Nathalie Roussel, PhD<sup>1,5</sup>, Jessica Van Oosterwijck, PhD<sup>1,6</sup>, Liesbeth Daenen, PhD<sup>1,7</sup>, Kevin Kuppens, MSc<sup>1,5,7</sup>, Luc Vanderweeën, MSc<sup>1,8</sup>, Linda Hermans, MSc<sup>6</sup>, David Beckwée, MSc<sup>1</sup>, Lennard Voogt, PhD<sup>1,9</sup>, Jacqui Clark, MSc<sup>10</sup>, Niamh Moloney, PhD<sup>1,11</sup>, and Mira Meeus, PhD<sup>6,7</sup>

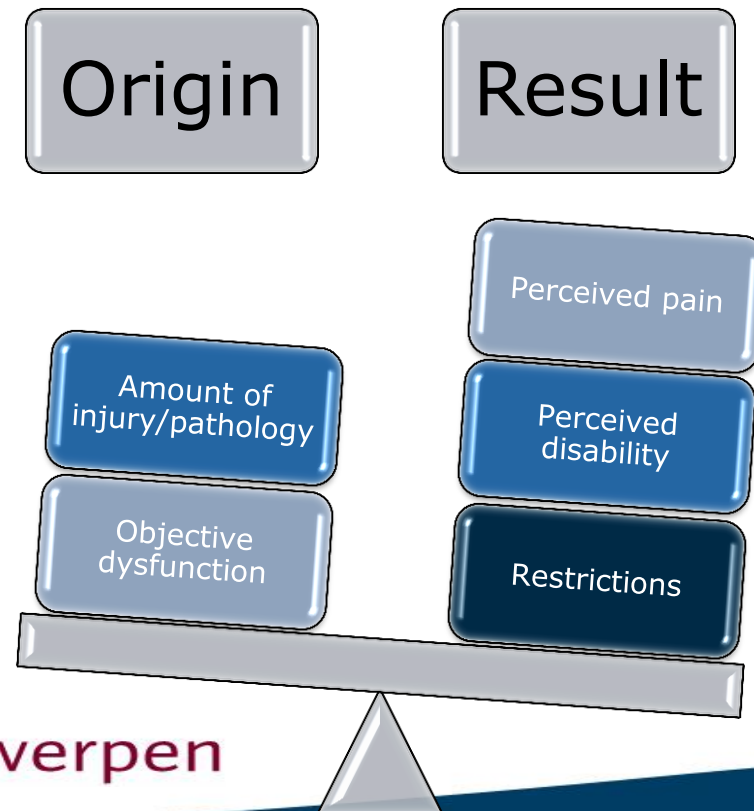


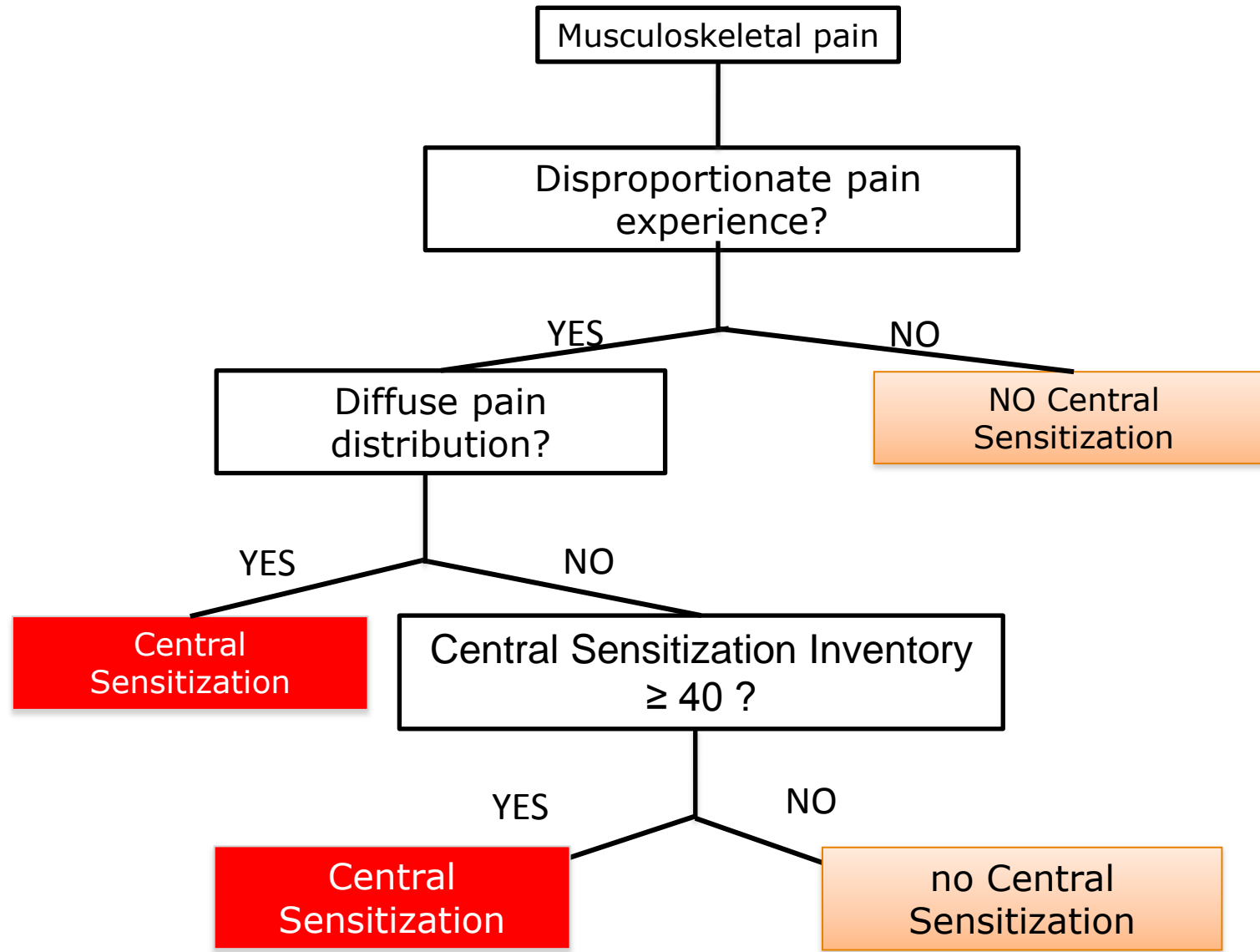




## Criterion1: Disproportionate pain?

- **Severity of pain and related disability**  
disproportionate to the nature and extent of injury  
or pathology



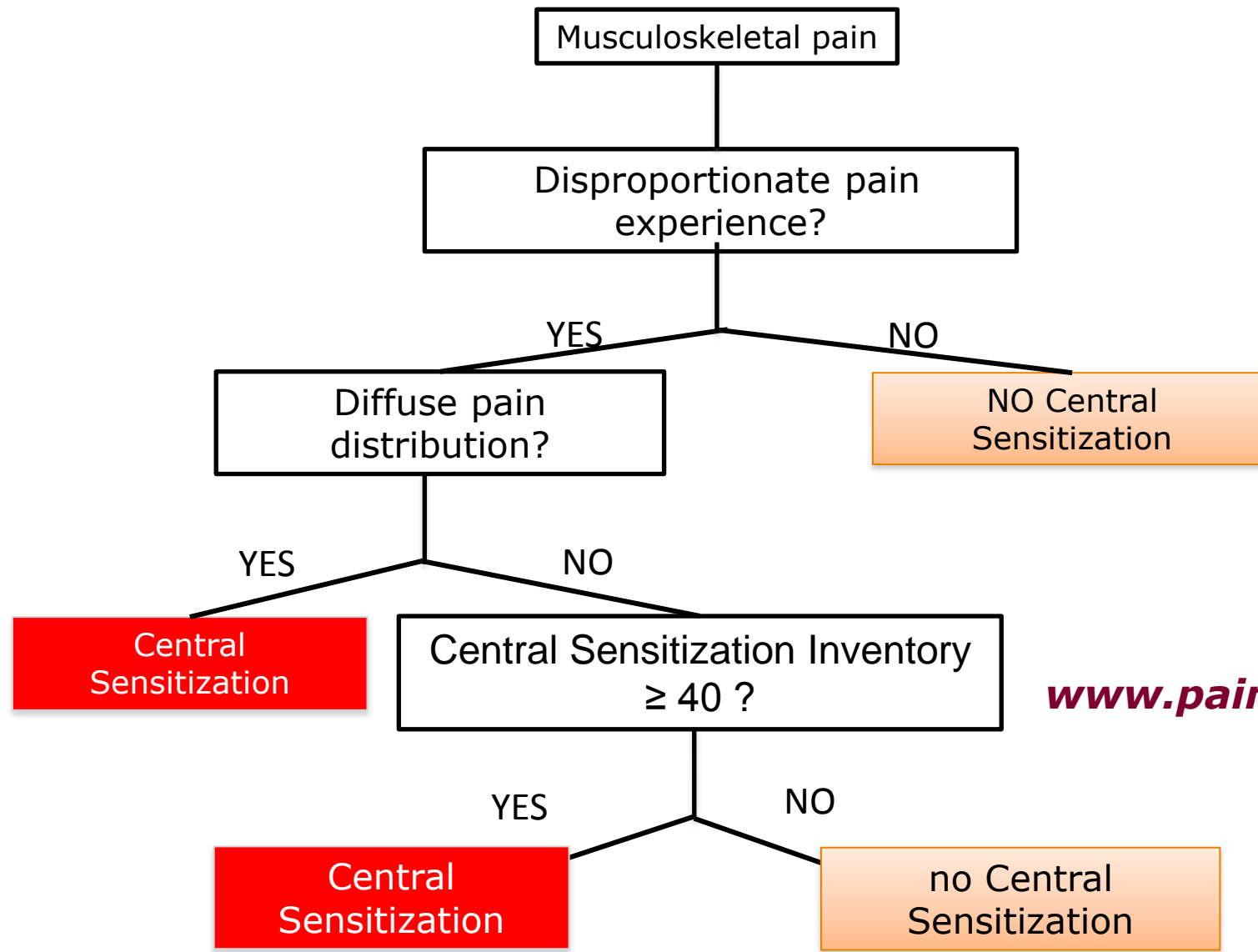




## Criterion 2: Diffuse pain distribution?

One of the following options:

- Large pain area with a non-segmental distribution
- Pain varying in (anatomical) location
- Widespread pain
- Bilateral pain / mirror pain (i.e. symmetrical pain pattern)
- Hemilateral pain



[www.paininmotion.be](http://www.paininmotion.be)





## Criterion 3: Hypersensitivity of non-musculoskeletal senses?

- Smell
- Light
- Sound
- Touch
- Drugs
- Cold / heat





# Additional signs and symptoms

- Abnormal therapeutic response
- Abnormal pain timeline
- Sleeping difficulties
- Memory- and concentration difficulties
- Fatigue
- Muscle weakness
- Phantom swelling
- Impaired tactile localization
- Dyskinaesthesia



- TOP – DOWN APPROACH
- BOTTOM - UP APPROACH



# TREATMENT OPTIONS





PAIN IN MOTION



 @KevinKinecoach

[www.paininmotion.be](http://www.paininmotion.be)

GRACIAS  
ARIGATO  
SHUKURIA  
GOZAIMASHITA  
EFCHARISTO  
JUSPAXAR  
DANKSCHEEN  
TASHAKKUR ATU  
SUKSAMA  
EKHMET  
GRAZIE  
MEHRBANI  
PALDIES  
BOLZIN  
MERCY  
THANK  
YOU  
BIYAN  
SHUKRIA  
TINGKI



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