MYSpace: Disrupted processing of self in CRPS

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Representations or 'neurotags'
Related tags share neurones

Pain in the arm
Related tags share neurones

Pain in the arm, blood flow to arm
Related tags share neurones

Pain in the arm, blood flow to arm, location of arm
Pain in the arm, blood flow to arm, location of arm, it is MY arm
Criteria 1: Sufficient *excitement* of member brain cells so as to activate the network

Criteria 2: Sufficient *inhibition* of non-member brain cells
Co-lateral and intracortical inhibition

Primary somatosensory cortex (S1)

Inhibitory intracortical neurons

Thalamus

Tactile input
Electrical response

"Representation of the thumb"
Normal

Electrical response

"Representation of the pinky"
The brain integrates coordinates in three frames of reference – somatotopic and spatial.
S1

Thalamus
Acuity: Which speaker made the noise?

Acuity: Which finger was closest to the light?
Temporal order judgements

Stimuli delivered to both sides at various intervals

Which occurred first?
Control: left has to be before right to think they are the same

Van Damme, Gallace, Spence & Moseley 2009 Brain Res 1253; 100-6
Disrupting ‘agreement’ between somatotopic and spatial frames reduces intensity.

Gallace et al. 2011 PAIN
The effect involves later processing not the transmission of information to S1.
The concept of a cortical body matrix

1. Premotor
2. Insula/operculum
3. Intraparietal
4. S1 & S2
5. Posterior parietal
6. Insula

Disrupted ‘neurotags’ – facilitation & disinhibition.
FACILITATION

Noxious input upregulated via:

• Dorsal horn sensitisation
• Reduced efficacy of antinociceptive mechanisms (DLPFC, PAG)
• Reduced efficacy of attentional mechanisms (ACC etc)
• Cognitive styles (information processing biases)
• Sensitisation of cortical pain tag
Beliefs
Knowledge, logic
Other sensory cues
Social context
Anticipated consequences
Family
media
previous history
culture
GP
work
physiotherapist
education
activity self-efficacy
access
exposure

Pain
Beliefs
Knowledge, logic
Other sensory cues
Social context
Anticipated consequences
Family
Media
Previous history
Culture
GP
Work
Physiotherapist
Education
Activity self-efficacy
Access
Exposure

Pain

Relay 2: The thalamus

Relay 1: The dorsal horn

Danger

It’s not that dangerous
Beliefs
Knowledge, logic
Other sensory cues
Social context
Anticipated consequences
Family
media
previous history
culture
GP
work
physiotherapist
education
activity self-efficacy
access
exposure

Relay 2: The thalamus

Relay 1: The dorsal horn

Danger

It’s MORE dangerous than that!
Unaffected side vs affected side

Maihofner et al 2003 Neurology 61 1707-15
Disinhibition in motor system
DISINHIBITION in the motor system

M1 neurons

These are the ones you want to fire

Movement
DISINHIBITION in the motor system

These are the ones you want to fire

M1 neurons

Neurons in ‘pain matrix’

Pain

Movement
dysfunction