Impairment of motion perception in chronic low back pain patients

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Disclosure

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Background + Purpose of the Study

– **Pain matrix**: cortical brain network involved in chronic pain

– **Mirror neuron system**: brain network involved in:
  1) **execution** of a person’s action
  2) during the visual **recognition** of the same motor action performed by others

– Anatomic overlap between both networks $\Rightarrow$ Both systems functionally linked ???

– Does chronic pain affect the perception of visually presented actions that would be painful for the observer to perform ?
  example of chronic low back pain (CLBP)

– Is this effect **specific for the painful body region** ?
  $\Rightarrow$ Patients with chronic shoulder pain (CSP) added as comparison group
Methods

- Experimentally controlled study
  - 16 CLBP patients (without shoulder pain)
  - 9 CSP patients (without back pain)
  - 14 healthy controls

- Videos of 2 different movements were recorded with 2 healthy actors.

- Based on these videos, computer-animated point-light animations were constructed that were presented to the subjects.
Methods

1) **Trunk rotation movement (TRM)**
   - typical stress for CLBP patients
   - box with 3 different weights
     (5, 10, 15 kg)
   - lifting from the floor on his left side, twisting his trunk and placing it down on the floor on his right side

2) **Manual transfer movement (MTM)**
   - typical stress for CSP patients
   - actor sitting on a bench with his back supported, taking a dumbbell (0, 3.5 or 7 kg) from the floor on his right side, moving it over his head, passing it to his left hand and placing it on the floor to his left side.
Methods

- Each subject had to estimate the lifted weight on a 0 to 20 kg scale in a total of 120 randomized sequences: 60xTRM + 60xMTM
  - 20 sequences per weight (3 different weights)
- No information about the weights
- No information about the number of different presented weights
- No feedback
- Linear regression analyses + ANOVA (to compare presented + estimated weights)
Results

– Healthy controls: able to clearly differentiate between the presented weights for TRM and MTM
Results

- CLBP patients were **impaired** to differentiate the weights for **TRM**
- CLBP patients could **well** differentiate weights during **MTM**
Results

- CSP patients were impaired to differentiate weights for MTM
- CSP patients could well differentiate weights during TRM
The ability to differentiate weights differed significantly between CLBP patients and healthy controls for TRM, not for MTM.
Results

– The ability to differentiate weights differed significantly between CSP patients and healthy controls for MTM, not for TRM.

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Conclusions

- CLBP leads to limitations not only of the patient’s own back movements, but also of the patient’s perception of back movements of other persons, not of shoulder movements!

- This effect seems to be specific for the painful region

- This may lead to: misjudgements / misinterpretations / fear avoidance

- Chronic pain functionally changes cortical networks, that are involved in action recognition!

- New results may be used to develop new therapeutic strategies focusing on relearning to correctly assess one’s environment and on reactivation of these cortical networks!

- Judgement of weight is of potential diagnostic value (cortical involvement in different kinds of pain syndromes may be measured)!