The left/right judgement task in people with & without shoulder pain

Summary
- Subjects with shoulder pain are both slower and less accurate than control participants at the shoulder LRJT.

Background
- Pain has been linked to functional changes in the cortex of the brain,\(^1,^2\)\(^3\)\(^4\) referred to as maladaptive neuroplastic changes.\(^5\)\(^6\) Alterations to the working body schema\(^7\) (the representation of the body in the brain) are a commonly observed neuroplastic change.
- The left/right judgement task (LRJT) measures the ability to recognise left from right body images and requires an intact working body schema.\(^7\) Poor performance implies an alteration to the working body schema.
- In chronic pain conditions of the upper limb and back alterations in response time and accuracy of the LRJT have been reported.\(^2,^7\)
- No research investigating LRJT in patients with chronic painful shoulder dysfunction has been published.
- Investigation of the shoulder LRJT in a shoulder pain population is warranted.

Purpose
- The aim of this pilot project was to compare the accuracy and response times for the shoulder LRJT in asymptomatic controls and patients with current shoulder pain.

Design and setting
- Experimental, cross-sectional design.

Participants
- Thirty participants with current shoulder pain were recruited consecutively through a physiotherapy private practice (20 females, 10 males, mean age 54 years).
- A convenience sample of thirty control participants with no history of shoulder pain were also recruited (20 females, 10 males, mean age 35 years).

Methods
- Participants sat comfortably at a desk.
- A set of 32 cards were placed face down in the participant – 16 right sided images and 16 identical left sided images.
- Each card consisted of a photographic image of an upper limb which included the shoulder.
- The upper limb images included simple neutral postures to near end ranges of shoulder rotation and elevation, as well as hand behind back and neck.
- The cards were thoroughly shuffled so that the images were viewed in random order. Subjects were instructed to view the top card, determine if it was a left or right image and place it on a left or right pile. Then repeat for all cards.
- Subjects were instructed to perform the test as quickly and accurately as possible.
- One-way analysis of variance was used to compare both total mean response time and accuracy for the task, between symptomatic and asymptomatic participants.
- Total response time for the task was divided by the number of images viewed to give the mean response time per image.
- Mean accuracy of the task for images of the painful limb – in participants with shoulder pain, was compared to mean accuracy all limbs.

Results
- Mean response time for participants with shoulder pain was 4.3 seconds per image (95%CI, 3.8 - 4.9 seconds).
- Compared to 2.7 seconds per image for control participants (95%CI, 2.5 - 2.9 seconds).\(^8\)\(^9\) \(F_{1,58} = 31.38, P < 0.001\).
- Mean accuracy of participants with shoulder pain was 78% (95%CI, 72 - 83%).
- Compared to 95% accuracy for control participants (95%CI, 92 - 97%).\(^9\)\(^10\) \(F_{1,58} = 31.38, P < 0.001\).

Discussion
- In this pilot study we demonstrated that subjects with shoulder pain are both slower and less accurate than normal healthy participants without shoulder pain at the shoulder LRJT.
- We demonstrated that upper limb images, when used for the LRJT, were able to detect a difference in participants with shoulder pain.
- Together these results imply maladaptive cortical changes associated with shoulder pain.
- We also demonstrated that the method of testing the LRJT was acceptable to participants with shoulder pain and controls.
- This data provides good evidence for further exploring the shoulder LRJT in a larger, more robust study.
- This was a small pilot study using a convenience sample based in the clinic. In doing so the mean age of shoulder pain participants was greater than the control group and this may have affected the outcome. A larger study matching shoulder pain and pain-free subjects for age is needed to control for this variable.
- There was no control task. It may be that people with shoulder pain are generally worse at left/right judgements. A further study should include images of other body parts as a control task.
- This data provides some evidence for the use of the shoulder LRJT in people with shoulder pain.

\(^1\) Maihofner CMD, Handwerker HOMDP, Neundorfer BMD, Birklein FMD. Patterns of cortical plasticity?
\(^2\) Flor H, Nikolajsen L, Staehelin Jensen T. Phantom limb pain: a case of maladaptive CNS reorganization?
\(^3\) Moseley GL. Why do people with complex regional pain syndrome take longer to recognize identical left sided images?
\(^5\) Schwoebel J, Friedman R, Duda N, Coslett HB. Pain and the body schema: evidence for an intact body schema method of testing the LRJT was used to compare both total mean response time and accuracy for the task, between symptomatic and asymptomatic participants.
\(^6\) Flor H, Nikolajsen L, Staehelin Jensen T. Phantom limb pain: a case of maladaptive CNS reorganization?
\(^7\) Moseley GL. Why do people with complex regional pain syndrome take longer to recognize identical left sided images?
\(^8\) Flor H, Nikolajsen L, Staehelin Jensen T. Phantom limb pain: a case of maladaptive CNS reorganization?
\(^9\) Moseley GL. Why do people with complex regional pain syndrome take longer to recognize identical left sided images?
\(^10\) Moseley GL. Why do people with complex regional pain syndrome take longer to recognize identical left sided images?