MOTOR IMAGERY & SHOULDER PAIN:
Establishing a normative data set for the left/right shoulder judgement task

J. D. Breckenridge[AB], **J. H. McAuley**[C], **L. Moseley**[D], **D. Butler**[E], **H. Stewart**[E], **K. A. Ginn**[A]

[A]Univ. of Sydney, Sydney, Australia, [B]The Clinical Research Institute, Sydney, Australia, [C]Univ. of NSW, NeuroSci. Res. Australia, Sydney, Australia, [D]Univ. of South Australia, Sansom Inst. for Hlth.Res., Adelaide, Australia,[E]Neuro Orthopaedic Inst., Adelaide, Australia

Introduction

The left/right judgment task (LRJT) is regarded as an implicit measure of motor imagery. It has been used to investigate painful conditions such as complex regional pain syndrome[1] (CRPS) and chronic upper limb pain. The LRJT is also the first stage of a graded motor imagery program that is used to treat CRPS[2]. More recently, this line of research has extended to chronic lower limb pain[3], back[4] and neck pain[5].

A shoulder specific LRJT has not yet been developed to investigate shoulder problems. A critical first step before investigating shoulder problems using the LRJT is to develop a normative data set to which clinical groups can be compared and which may provide a platform for pursuing new treatment options for people with chronic shoulder pain.

Aim

The aim of this project was to develop a shoulder version of the LRJT. In particular a normal population dataset, including test accuracy and response times, for an online version of the LRJT specifically for shoulders.

Methods

1917 participants were recruited worldwide – through social media, pain science and physiotherapy websites, physiotherapy clinics, and a network of health professionals interested in shoulder function – over a twelve month period between 1st November 2012/2013. (see figure 1). All questionnaire items and tasks were completed by 1413 (74%) participants.

Participants sat at a computer to undertake the online LRJT. They first viewed a set of familiarisation images. This was followed by a set of whole upper limb images to represent the shoulder in a variety of standardised postures, see figure 2. This set consisted of 40 images randomly displayed on the computer screen in rotations of 0°, +90°, -90° and 180°. The participants were required to identify whether the displayed image was of either the left or the right side, as fast and as accurately as possible. Primary outcomes were mean response times (RT) in milliseconds and accuracy of responses as a percentage.

Figure 1. gender and hand dominance

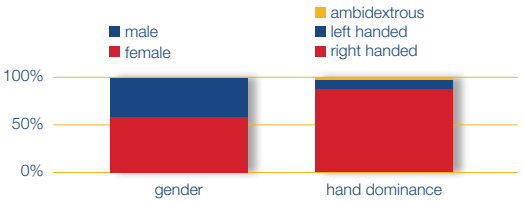


Figure 2. shoulder

Results

The mean (SD) response time for the shoulder LRJT was 1795ms (1011).

Mean (SD) accuracy for the shoulder LRJT was 94.2% (8.7).

There was an effect of image rotation on RTs for the task. (See figure 3.) RTs were slowest for images that were the most rotated; 2401ms at 180°. RTs were quickest for images at 0° rotation 1434ms ($p<0.01$). This compared to 1667ms for images that were rotated +90°, and 1681ms for images rotated at -90°.

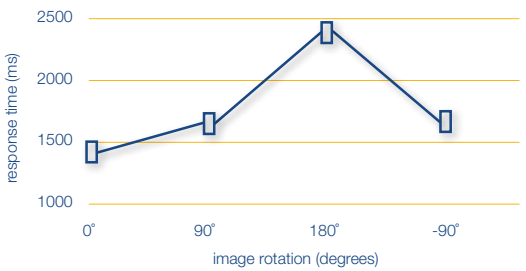
Similarly, there was an effect of image rotation on accuracy for the task. Participants made more errors for the images that were most rotated; accuracy was 87.9% at 180°. Participants made the least errors for images that were not rotated; accuracy was 97.3% at 0° ($p<0.01$). Accuracy scores were 95.7% at +90°, 95.6% at -90°.

Mean RT was affected by hand dominance; right hand dominant participants were 215ms faster than left hand hand dominant participants ($p=0.029$).

Likewise accuracy was affected by hand dominance, right hand dominant participants scored 94.5% compared to left hand dominant participants who scored 92.4% ($p=0.014$).

There was no effect of gender on RT nor accuracy.

Figure 3. effect of image rotation on response time



Conclusion

We modified the LRJT by the inclusion of shoulder joint images. In doing so we demonstrated that the shoulder LRJT appears to obey the principles that have been established for previous versions of the task[6,7] – RTs increase along with rotation of images, and accuracy of the task declines as rotation increases. This implies that participants use a motor imagery strategy to complete the task[8,9]. The online recruitment strategy allowed us to obtain a large sample that would be sensitive to effects of gender, which were not detected.

Finally, the online protocol yields valid and complete data, providing a platform for further investigation of motor imagery in a shoulder pain population.

REFERENCES:
1. **Moseley GL.** *Why do people with chronic regional pain syndrome take longer to recognise their affected hand?* Neurology 2004;62:2182-2186. 2. **Moseley G.** *Graded motor imagery is effective for long-standing complex regional pain syndrome: A randomised control trial.* Pain 2004;10:219-224. 3. **Stanton TR** et al.. *Spatially defined disruption of motor imagery performance in people with osteoarthritis.* Rheumatology 2012;51:1455-1464. 4. **Bray H & Moseley GL.** *Disrupted working body schema of the trunk in people with back pain.* British Journal of Sports Medicine 2011;45:168-173. 5. **Wallwork S** et al.. *Left/right neck rotation judgments are affected by age, gender, handedness and image rotation.* Manual Therapy 2013;18:225-230. 6. **Coslett HB** et al.. *Mental motor imagery indexes pain: The hand laterality task.* European Journal of Pain 2010;14: 1007-1013. 7. **Bowering KJ** et al.. *Motor imagery in people with a history of back pain, current back pain, both, or neither.* The Clinical Journal of Pain; 2014 (Publish ahead of print):DOI:10.1097/AJP.066 8. **Parsons LM.** *Imagined spatial transformations of one's hands and feet.* Cognitive Psychology. 1987;19:178-241. 9. **Schwoebel J** et al.. *Pain and the body schema. Evidence for peripheral effects on mental representations of movement.* Brain 2001;124:2098-2104.

15th World Congress on Pain, Buenos Aires 2014. Poster number: PH-115

Contact: jbre9517@uni.sydney.edu.au