Implicit motor imagery in people with a history of back pain, current back pain, both, or neither.

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Left/right limb judgements are dependent, at least in part, on the cortical proprioceptive map - the representation of our body within the brain that is used for the precise planning and execution of movements. In people with chronic limb pain, performance reaction times and accuracy on left/right judgements of the corresponding painful limb are decreased. It is yet unknown whether this dependency on the cortical proprioceptive map is extended to the low back. We used implicit motor imagery to investigate this relationship. We predicted that people with either a history of or current back pain would perform worse than people who had no back pain, but people with both current back pain and a history of back pain would perform worse than anyone else.

HYPOTHESIS

People with either a history of or current back pain will perform worse than people who have no back pain, but people with both current back pain and a history of back pain will perform worse than anyone else.

DESIGN

Cross-sectional study involving a convenience sample of participants recruited on-line.

PARTICIPANTS

One-thousand and eight participants (684 F; 37 ± 13 years) were recruited.

PROTOCOL

A bank of images was constructed that comprised 40 randomly oriented photographs of people's backs. This was considered a 'batch'.

Consenting participants completed a questionnaire that included demographic data and questions about their physical activity levels and health, as well as current and previous back pain symptoms they may have experienced.

They then completed three batches: two identical 'vanilla' batches, comprised of simple bodies against a plain backdrop, and one 'contextual' batch incorporating every day activities. Only data from the second vanilla batch was analysed.

RESULTS

Response Time and Accuracy:

Neither the RT nor accuracy data were normally distributed, so they were log transformed. The mean response time (RT) for all participants was 1675ms ± 610ms. The median accuracy was 96.7% ± 4.5%. Regardless of pain status, all participants performed better on the control images than they did on the back images .

The effect of age, gender and handedness on RT and Accuracy:

Reaction time was not affected by age, gender, or leggedness ($p = 0.290$) in healthy participants. Neither was accuracy affected by age, gender, or leggedness ($p = 0.775$) in the same group of people.

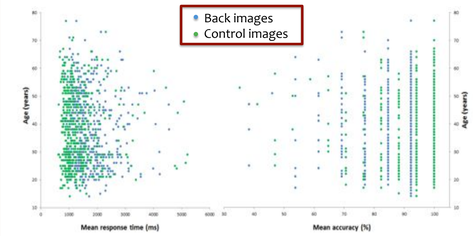
The effect of image rotation on RT and Accuracy:

The magnitude of rotation of images was negatively related with performance (main effect on RT: $F(3,515) = 592.7$, $p < 0.001$; main effect on accuracy: $F(3,515) = 90.4$, $p < 0.001$). Participants were fastest at responding to images with no rotation (0°), next fastest to those rotated to +90°, then those at -90°, and slowest to those at 180° ($p < 0.001$ for all). The accuracy of responses to images at 0°, +90° and -90° were all statistically similar ($p = 1.000$). Participants were less accurate at responding to images orientated to 180° than they were to images at any other orientation ($p < 0.001$).

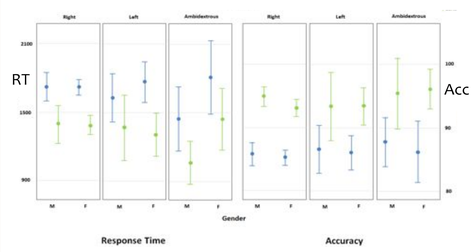
Testing the hypothesis – back pain status and motor imagery:

No characteristics of low back pain had an effect on response time (no main effect of current LBP: $p = 0.958$; no main effect of history of LBP: $p = 0.149$).

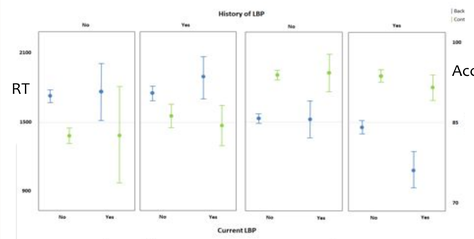
Participants with current LBP were less accurate than those without current LBP (main effect of current LBP: $F(1,1003) = 4.905$, $p = 0.027$). Participants with a history of low back pain were less accurate than those without a history of LBP (main effect of history of LBP: $F(1,1003) = 9.966$, $p = 0.002$). The critical result, however, was that those with both a history of LBP AND current LBP were much less accurate than all others (current x history interaction $p < 0.001$).



The relation between age and mean response time (on left), and between age and mean accuracy (on right) for each participant. Green dots denote data for control images. Blue dots denote data for back images.



Mean and 95% CI (error bars) RT (panels on left) and accuracy (panels on right), for male (M) and female (F) participants who rated themselves as right legged, left legged, or ambidextrous. Data for back images are shown in blue. Data for control images are shown in green.



Mean (circles) and 95% CI (error bars) RT and accuracy for those with current back pain (bottom categories), a history of back pain (top categories), neither or both.

Left/right trunk rotation judgements seem to obey the principles established for left/right hand or foot judgements – RT and accuracy are worse when more mental movement is required to move to the position shown in the picture. Critically, reaction time is no different when one has back pain, or a history of back pain, but accuracy is much worse when one has both a history of back pain and a current episode. This result implies, although it does not prove, that the cortical proprioceptive map is disrupted during an episode of back pain in those with a history of back pain.