The flexibility of body representations in osteoarthritis.

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There is increasing evidence that the way we perceive our body can be manipulated via simple bodily illusions, and illusions that alter the perceived size of a painful body part have been found to alleviate pain in a number of chronic pain conditions¹,². Recent research suggests that illusory stretching or shrinking of the painful hand might also have pain relieving benefits in osteoarthritis³, although as yet little is known about the neural mechanisms underlying this analgesic effect.

We assessed perceptions of hand size in osteoarthritis patients and healthy age-matched controls with no illusion, and after illusory stretching and shrinking. The aim of this research was to assess whether osteoarthritis sufferers have faulty mental representations of the painful body part, and whether these can be modulated by illusory resizing of that body part. This would be evidenced by a significant difference in hand size estimations between groups in the no illusion condition, and a significant group x illusion interaction.

METHODS

Participants
- 12 osteoarthritis patients with hand/wrist pain (mean age: 60.1; 4 male) and 12 healthy controls (mean age: 56.9; 6 male)

MIRAGE multisensory illusions system
- System allows participants to view live video images of their hands in same spatial location and from same perspective as if viewing their real hands.
- Video image of hand is lengthened or shortened while experimenter simultaneously pulls/pushes on participant's hand, creating the strong illusion that the hand is really being stretched or shrunk.

Outcome measures
- Hand size estimations: Snapshot image of participant's hand was increased or decreased in size along y-axis.
- Participant stated when image was ‘too big’ or ‘too small’ to be their real hand in adaptive staircase procedure.
- Average of ascending and descending run gave final hand size estimates.

RESULTS

Three illusory conditions (No illusion, Stretch, Shrink) were applied in random order to each participant. Condition order was counterbalanced amongst participants.

1) No Illusion
Participants view the un-manipulated image of their hand for 1 minute.

2) Stretch
Participants view hand stretched lengthways outwards from point in centre of proximal phalanx of middle finger while experimenter pulls gently on hand.

3) Shrink
Participants view hand shrink inwards from same point while experimenter pushes gently on hand.

Participant instructions following each condition: Here is a snapshot image of your hand presented at a random size. Please tell us when the image looks ‘too big’ or ‘too small’ to be your real hand.

- A 2 (Patient, Control) x 3 (No illusion, Stretch, Shrink) mixed ANOVA was used to analyse hand size estimations.
- Planned comparisons were used to compare hand size estimations between groups for each illusory condition.

STATS

Outlier data removed. Mean ± SEM. No significant difference in hand size estimations between groups for the stretch (p = .84) or shrink condition (p = .68), but significantly smaller hand size estimations in the no illusion condition for patients compared to controls (p<.05).

Our hypotheses were supported – patients with osteoarthritis have a faulty representation of the size of their painful hand that is smaller than those of healthy controls, and hand size perceptions can be modulated in both osteoarthritis patients and controls through illusory hand resizing.

The findings suggest that the experience of pain in osteoarthritis may arise from a faulty perception of the painful body part that is common across a variety of chronic pain conditions. The analgesic benefits of the illusion could be explained by altering perceived size to experimentally restore a more accurate representation of the painful body part.