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Moving in an environment of induced sensory-motor incongruence does not influence pain sensitivity in healthy volunteers: A randomised within-subject cross-over experiment

Benedict M. Wand
University of Notre Dame Australia, benedict.wand@nd.edu.au

Lareina Szpak
University of Notre Dame Australia

Pamela George
University of Notre Dame Australia, pam.george@nd.edu.au

Max Bulsara
University of Notre Dame Australia, max.bulsara@nd.edu.au

Neil E. O'Connell

See next page for additional authors

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Authors

Benedict M. Wand, Lareina Szpak, Pamela George, Max Bulsara, Neil E. O'Connell, and G Lorimer Moseley

MOVING IN AN ENVIRONMENT OF INDUCED SENSORY-MOTOR INCONGRUENCE DOES NOT INFLUENCE PAIN SENSITIVITY IN HEALTHY VOLUNTEERS: A RANDOMISED WITHIN-SUBJECT CROSS-OVER EXPERIMENT.

Benedict M Wand[1], Lareina Szpak[1], Pamela George[1], Max Bulsara [2], Neil E O'Connell[3], G Lorimer Moseley[4]

[1] School of Physiotherapy, University of Notre Dame, Fremantle, Australia
[2] Institute for Health and Rehabilitation Research, University of Notre Dame, Fremantle, Australia
[3] Centre for Research in Rehabilitation, Brunel University, London, UK
[4] The Sansom Institute for Health Research, University of South Australia, Adelaide, Australia

Introduction

A mismatch between the brain's motor control and sensory systems has been suggested as one mechanism whereby maladaptive neuroplastic changes contribute to the experience of chronic pain [1].

Several studies have investigated this hypothesis by artificially inducing a state of sensory-motor incongruence using mirrors[2-4].

The data to date appear to suggest that creating an environment of sensori-motor incongruence induces various sensory changes and feeling of peculiarity, however the effect on pain is less clear.

Aim

The aim of this study was to test the hypothesis that healthy participants would demonstrate reduced pain thresholds and report greater intensity of pain in a condition of induced sensory motor incongruence compared to conditions that did not promote incongruence.

Methods

A randomised within-subject 2 x 2 factorial cross-over design experiment with 35 healthy participants.

Participants undertook movements of the upper limbs under four conditions with a randomised, counterbalanced order.

Pressure pain threshold (PPT) over the elbow of the non dominant arm was measured using a standardised protocol at baseline and immediately following each condition.

The conditions were:

A. synchronous upper limb movements, with normal visualisation of the non dominant arm.
B. asynchronous upper limb movements, with normal visualisation of the non dominant arm
C. synchronous upper limb movements, with a mirror positioned between the two arms, where subjects attended to the reflection of their dominant arm in the mirror, which appears in the peripersonal space of the non dominant arm.
D. asynchronous upper limb movements, with a mirror positioned between the two arms, where subjects attended to the reflection of their dominant arm in the mirror, which appears in the peripersonal space of the non dominant arm. This was the condition of maximal sensory-motor incongruence.

Participants were asked to rate pain intensity specifically at the site of testing on completion of the PPT testing.

A regression based generalised linear mixed model (GLMM) was used to quantify the relationship between the dependent variables, condition and order, which were treated as independent fixed-effects variables (within-subject factors), as well as baseline PPTs.

The null hypothesis was that the difference in mean PPT for each condition was not significant. Bonferroni correction was used for post hoc comparisons.

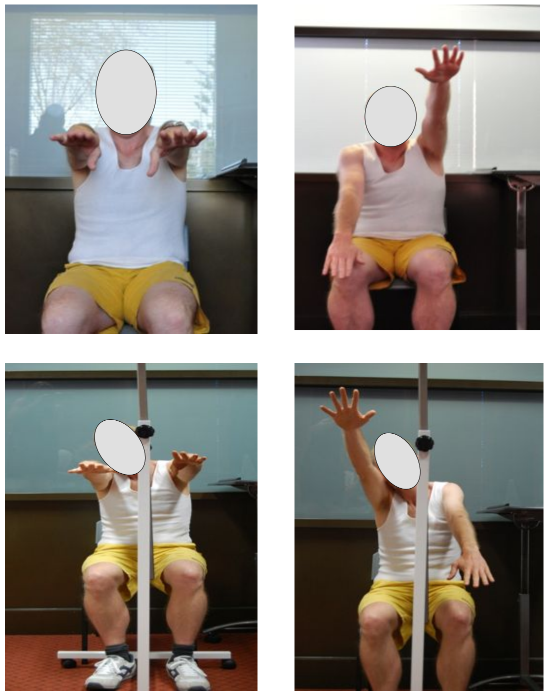

Figure Legend Subject without the mirror (A and B) and viewing the mirror (C and D) whilst performing upper limb synchronous (A and C) and asynchronous (B and D) movements.

Results

For average PPT there was no statistically significant difference for each bivariate comparison of condition ($p=0.887$), indicating no difference in PPT between movement conditions. The results of the sensitivity analysis using only the first PPT test yielded the same results. Similarly, for pain intensity there was no statistically significant difference for the bivariate comparison of condition ($p=0.771$), signifying no difference in pain intensity across the four movement conditions.

Discussion & Conclusions

We found that inducing a state of movement related sensory-motor incongruence in the upper limb of healthy volunteers did not lead influence PPT or the discomfort associated with PPT testing. The inability to detect any upregulation of the nociceptive system suggests that a mismatch between movement intent and feedback might not contribute to clinical pain states.

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Contact details: benedict.wand@nd.edu.au