Suppression of Corticomotor Excitability During the Transition Towards Persistent Muscle Hand Pain

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INTRODUCTION

- Previous studies have described inhibition of corticomotor excitability of the hand muscles in response to acute tonic pain (e.g., during the application of topical capsaicin or intramuscular injections of hypertonic saline) [1,2]
- What remains unclear, however, is how changes in corticomotor excitability develop in response to muscle hand pain over several days.

AIM

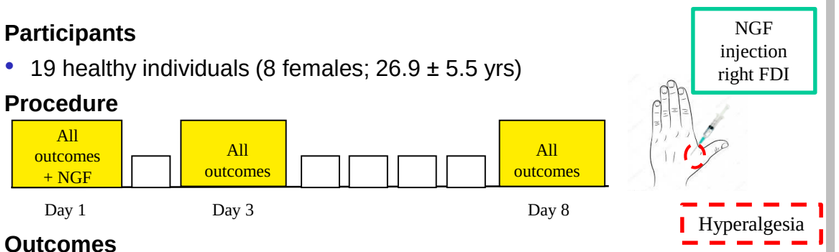
This study aimed to investigate the corticomotor excitability over several days in response to prolonged experimental muscle pain and deep tissue hyperalgesia induced by intramuscular injections of nerve growth factor (NGF) in healthy subjects.

METHODS

Participants

- 19 healthy individuals (8 females; 26.9 ± 5.5 yrs)

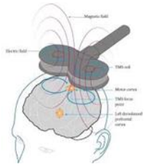
Procedure



Outcomes

Pain distribution and intensity

Pressure Pain Threshold (PPT) over the First Dorsal Interosseous (FDI)



Motor Evoked Potentials (MEP) over the hotspot of the FDI

RESULTS

All participants developed hyperalgesia in the NGF hand, as indicated by lower PPTs (Fig. 1A) and increased pain intensity scores (Fig. 1B) during Day3 and Day7 compared to Day1 ($p < 0.001$).

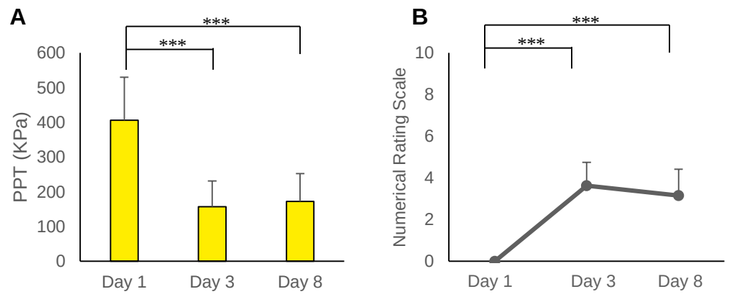


Figure 1. (A) Pressure pain thresholds and **(B)** pain intensity of NGF-induced pain at Day 1, Day 3, and Day 8

Pain extension also increased on Day 3 and Day 8 compared to Day 1.

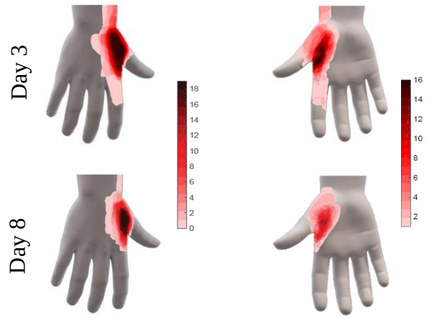


Figure 2. Pain distribution of NGF-induced pain at Day 3 and Day 8.

RESULTS (CONT.)

MEPs recorded on Day3 were reduced compared to the Day1 session ($p < 0.05$; Fig. 3A). Moreover, a significant negative correlation was found between pain intensity scores on Day3 and Day8 with MEPs changes on Day7 ($p < 0.05$ and $p < 0.001$, respectively) but not with MEPs changes on Day3.

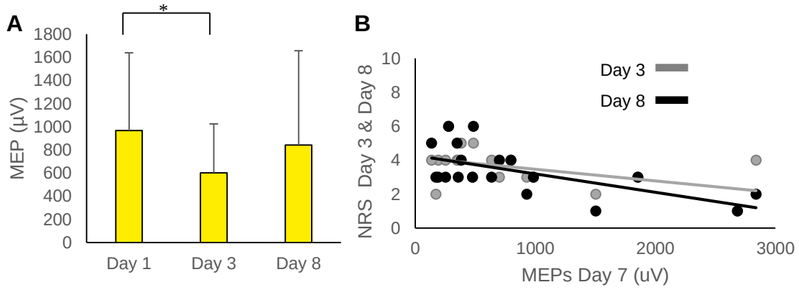


Figure 3. (A) Motor evoked potential (MEP) amplitudes recorded at Day 1, Day 3, and Day 8. **(B)** Correlations of motor evoked potentials with pain intensity measured with a numerical rating scale (NRS)

CONCLUSIONS

- A reduction of the MEP magnitude and the pressure pain thresholds reflects a prolonged neuroplastic event, characterizing the progression of prolonged experimental muscle pain previously found in other arm muscles (e.g. ECRB) [3].
- Together with a significant association found between increased pain intensity and reduced MEP changes across days, these data support the relevance of corticomotor excitability as a biomarker of interrumped central mechanisms.
- The current findings also provide novel information about how the transition from acute to persistent hand muscle pain may interfere with the sensorimotor system.

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