STIMULUS CONTROLLABILITY CAN MODULATE THE INDUCTION OF HFS-INDUCED CENTRAL SENSITIZATION

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MATERIALS AND METHODS

Aims: investigate the effect of cognitive factors (stimulus controllability) on HFS-induced central sensitization.

Transcutaneous high frequency electrical stimulation (HFS, five one-second 100-Hz trains of electrical pulses, delivered at 20X detection threshold using a multi-pin electrode designed to preferentially activate skin nociceptors) of the left/foot sole forearm was used to induce secondary hyperalgesia in the surrounding unconditioned skin. In a within-subject design, we manipulated the temporal controllability and predictability of the HFS train release in two separate sessions (COG-CONTROL and NO-COG-CONTROL), counterbalanced across participants (panel B). A. Mechanical pinprick sensitivity was assessed at both forearms before (T0) and 20 minutes after (T1) HFS. B. In the COG-CONTROL condition, participants could choose when to release each train by pressing a button. In the NO-COG-CONTROL condition, they received the trains passively. Design: 2x 2, Stimulation (control-arm/HFS-arm) x Condition (Control/No control).

RESULTS I: SUBJECTIVE RATINGS

A. Group-level difference waveforms (T1-T0) of the PEPs obtained at the HFS and CONTROL arms (electrode Cz), averaged across participants and sessions. LMM analysis of single-trial PEP amplitudes (Cz) showed a main effect of stimulus (HFS vs. CONTROL vs. COG-CONTROL) and a significant interaction between stimulus and condition. C. Group-level average difference waveforms (T1-T0) of the PEPs obtained for the COG-CONTROL and NO-COG-CONTROL condition. There was no significant effect of condition (COG-CONTROL vs. NO-COG-CONTROL) on the change in pinprick sensitivity (T1-T0) for the COG-CONTROL condition as compared to the NO-COG-CONTROL condition when these sessions were the first administered.

RESULTS II: PINPRICK EVOKED POTENTIALS (PEPs)

A. Group-level average difference waveforms (T1-T0) of the PEPs obtained at both arms (HFS and CONTROL) in the two sessions. The increase of PEPs at the HFS arm was greater than the control arm only during the first session. There was no significant effect of condition (COG-CONTROL vs. NO-COG-CONTROL) on the change in pinprick sensitivity (T1-T0) for the COG-CONTROL condition as compared to the NO-COG-CONTROL condition when these sessions were the first administered.

RESULTS III: TIME-FREQUENCY ANALYSIS

B. Group-level average difference waveforms (T1-T0) of the PEPs obtained for the COG-CONTROL and NO-COG-CONTROL condition. There was no significant effect of condition (COG-CONTROL vs. NO-COG-CONTROL) on the change in pinprick sensitivity (T1-T0) for the COG-CONTROL condition as compared to the NO-COG-CONTROL condition when these sessions were the first administered.

CONCLUSION

Cognitive control and temporal predictability (cognitive manipulation) significantly affects the HFS-induced change in pinprick sensitivity. No similar effect was observed on pinprick-evoked EEG responses. The effect of the cognitive manipulation was dependent on the order of the sessions, and present only during session I, i.e. when participants were naïve regarding the after-effects of HFS on pinprick sensitivity.