

The analgesic effect of electroacupuncture on acute thermal pain perception--a central neural correlate study with fMRI.

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Source

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Abstract

BACKGROUND:

Electrical acupuncture (EA) has been utilized in acute pain management. However, the neuronal mechanisms that lead to the analgesic effect are still not well defined. The current study assessed the intensity [optimal EA (OI-EA) vs. minimal EA (MI-EA)] effect of non-noxious EA on supraspinal regions related to noxious heat pain (HP) stimulation utilizing an EA treatment protocol for acute pain and functional magnetic resonance imaging (fMRI) with correlation in behavioral changes. Subjects underwent five fMRI scanning paradigms: one with heat pain (HP), two with OI-EA and MI-EA, and two with OI-EA and HP, and MI-EA and HP.

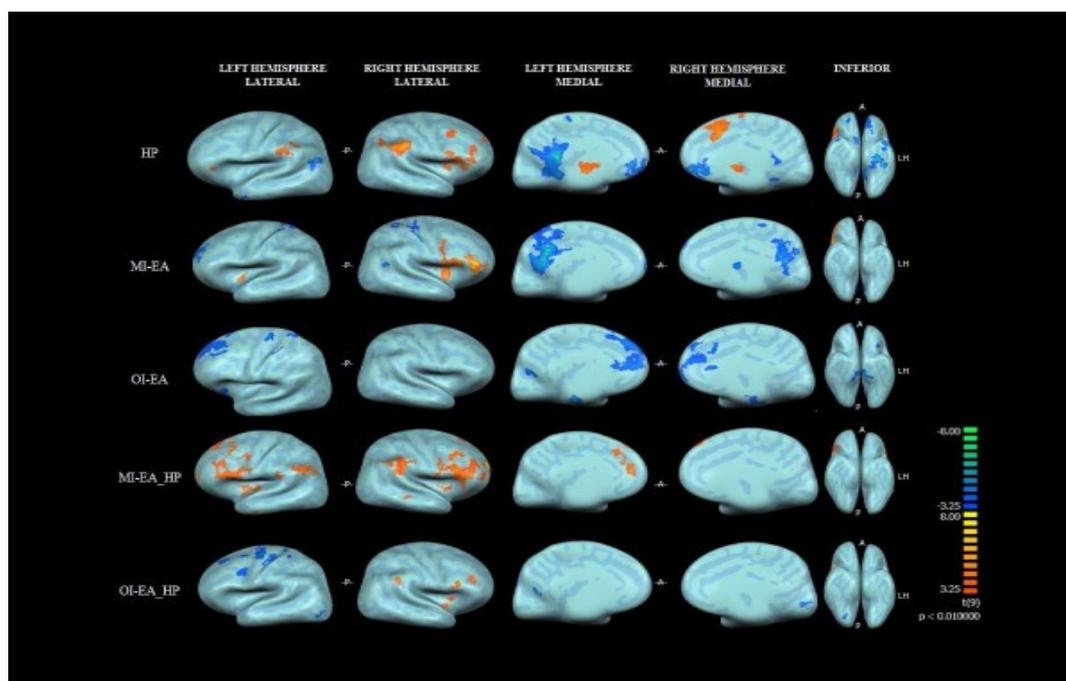


Figure 1.

The inflated group (n = 10) cortical representation of brain activations and deactivations ($P < 0.01$) in all five paradigms. HP: heat pain; MI-EA: Minimal intensity electrical acupuncture; OI-EA: Optimal intensity electrical acupuncture; A: Anterior; P: Posterior; LH: Left Hemisphere.

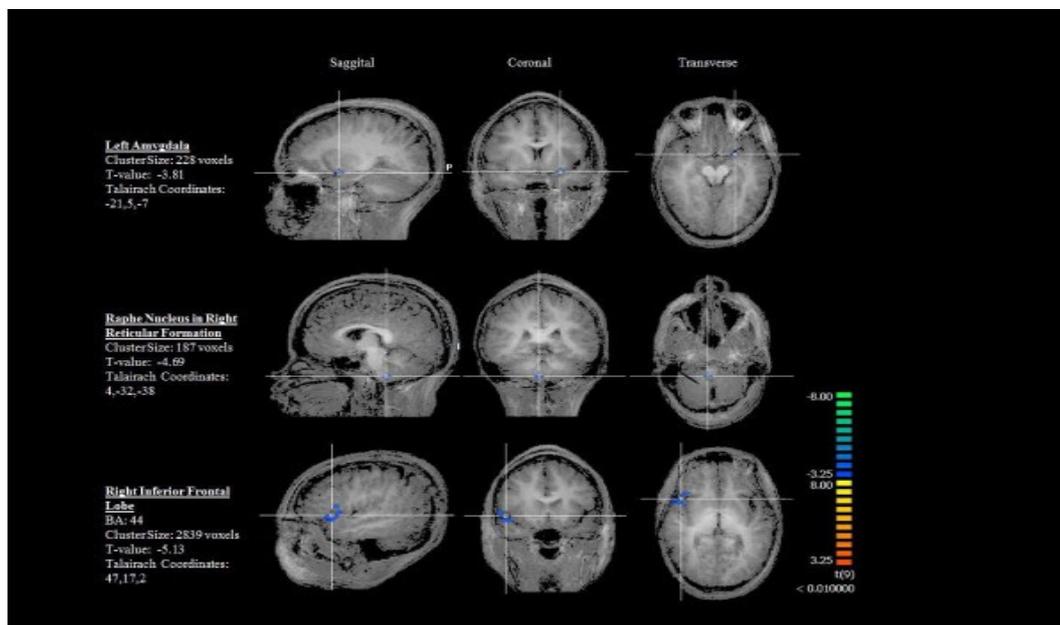


Figure 2. Brain regions with significant ($P < 0.01$) deactivation with OI-EA > MI-EA group comparison

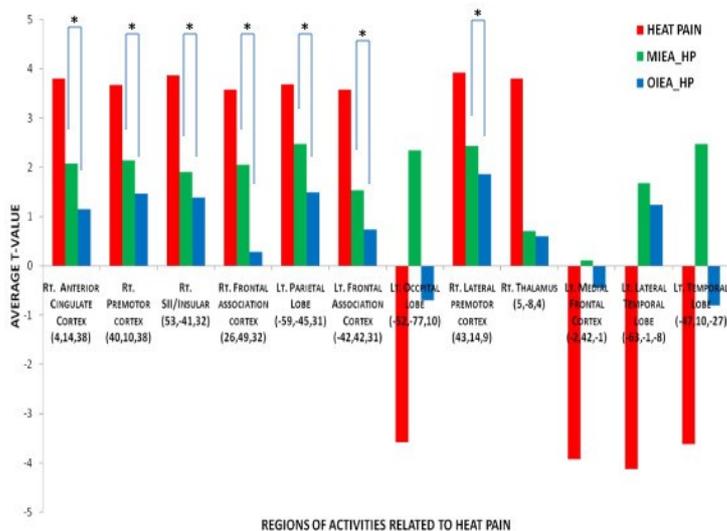


Figure 3.

Comparison of the average T-value in the heat pain (HP) related regions (average voxel x, y, z coordinates) after the two different modes of EA: minimal intensity electrical acupuncture

(MI-EA) and optimal intensity electrical acupuncture (OI-EA). * indicates regions with significant difference in EA × Intensity interaction between the two paradigms.

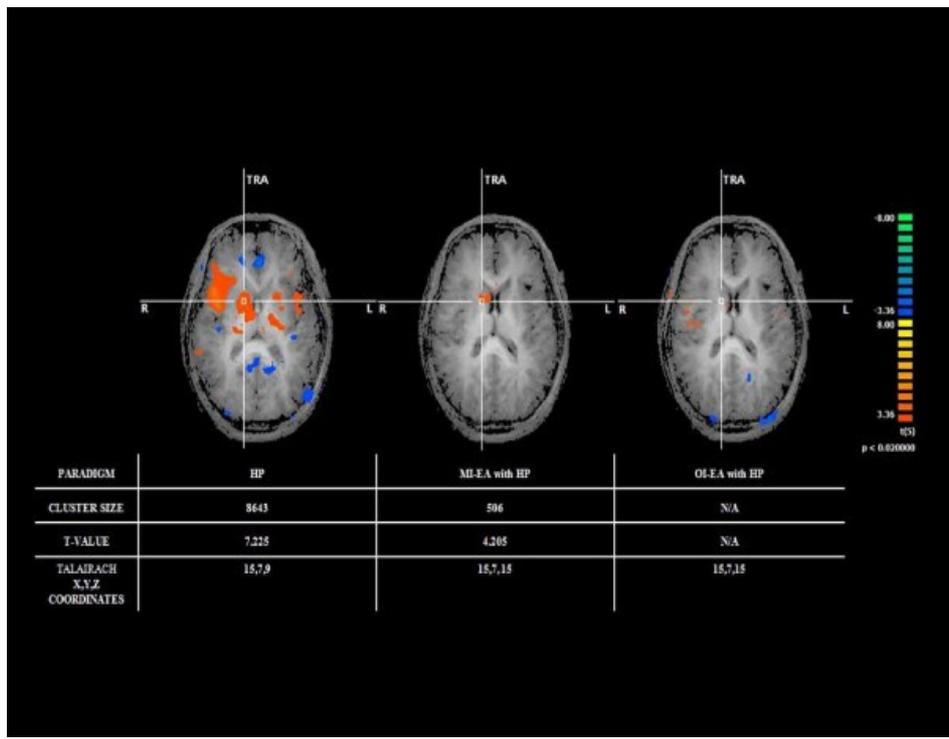


Figure 4.

The relative degree of right thalamic activation observed with heat pain (HP), HP with minimal intensity electrical acupuncture (MI-EA) and HP with optimal intensity electrical acupuncture (OI-EA).

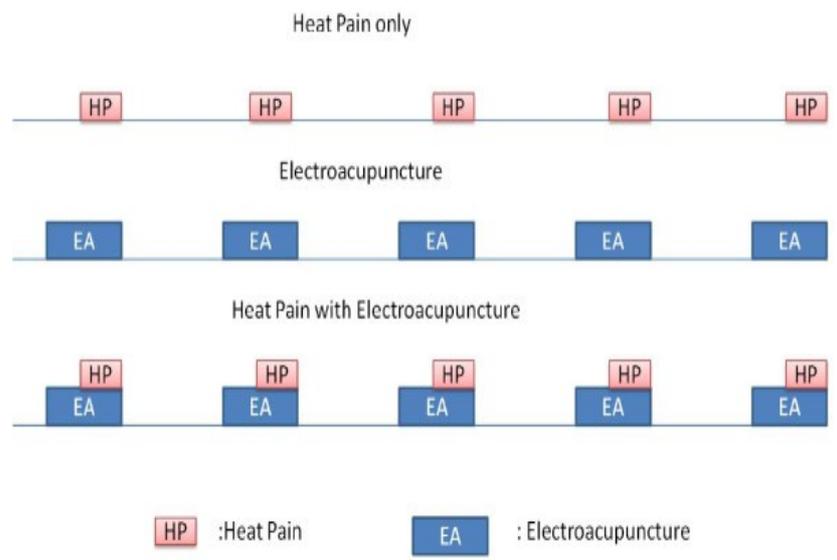


Figure 5.

The study paradigms with heat pain (HP), two intensities of electrical acupuncture (MI-EA &OI-EA) with and without HP.

RESULTS:

While HP resulted in activations (excitatory effect) in supraspinal areas known for pain processing and perception, EA paradigms primarily resulted in deactivations (suppressive effect) in most of these corresponding areas. In addition, OI-EA resulted in a more robust supraspinal sedative effect in comparison to MI-EA. As a result, OI-EA is more effective than MI-EA in suppressing the excitatory effect of HP in supraspinal areas related to both pain processing and perception.

CONCLUSION:

Intensities of EA plays an important role in modulating central pain perception.