



DAMPENED NUCLEUS ACCUMBENS BOLD RESPONSE IN MALES: AN FMRI STUDY ON THE EFFECTS OF CHRONIC PAIN AND SEX ON REWARD NETWORKS
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Abstract:

Chronic pain affects around 30% of the US population [1]. There are known sex differences in chronic pain in prevalence [1], self-reported pain intensity [2], and escalation from exposure to addiction to analgesics [3]. However, it is unknown why such sex differences exist, or what neurobiological mechanisms may modulate such differences. To that end, we utilized functional magnetic resonance imaging (fMRI) to explore the hypothesis that there are different neuroadaptations in the reward pathways of men and women, with and without chronic pain conditions. Blood oxygen dependent level (BOLD) responses of 70 participants (41 healthy controls, 29 chronic non-specific back pain patients) were quantified using fMRI to observe the subjects perform the monetary incentive delay (MID) task. Our study focused on two conditions: reward anticipation and loss anticipation. The imaging data were preprocessed using fMRIPrep, which co-registered and normalized into MNI space for group-level comparisons. Then, the data were subjected to GLM analyses using SPM12. The whole-brain, one-sample t-test group analysis of reward anticipation showed significant activation of the left nucleus accumbens (NAcc) ($p < 0.00001$ FWE, $x=10.0$, $y=10.1$, $z=-0.5$). Two-way ANOVA analyses of region of interest data revealed a statistically significant interaction between chronic pain status and sex in the left NAcc during reward anticipation ($p=0.017$) and loss anticipation ($p=0.007$). Post-hoc analyses further revealed that, under both anticipation conditions, the left NAcc BOLD response in males was significantly higher than in females. In contrast, there was no significant differences in NAcc BOLD response between male and female patients. Further analysis revealed that the erasure of sex differences was due to a significant reduction in NAcc BOLD response between control males and patient males. Similar patterns were seen in the right NAcc. These results indicate the necessity of including sex as a biological variable of interest when investigating the neurobiological antecedents of chronic pain.

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