LETTER

Can the functional MRI responses to physical pain really tell us why social rejection "hurts"?

We read with great interest the recent PNAS report by Kross et al. (1). In this study, the authors selected a population of volunteers who recently experienced an unwanted breakup of their love relationship, and used functional MRI (fMRI) to record the brain responses elicited by (*i*) observing a photograph of their ex-partner as they think about being rejected and (*ii*) receiving actual nociceptive somatosensory simulation. Based on the observation of an "overlap between social rejection and physical pain[...] areas", assumed to "support the sensory components of physical pain (secondary somatosensory cortex; dorsal posterior insula)", they conclude that their "results give new meaning to the idea that rejection 'hurts'."

We believe this conclusion is not justified, as it crucially relies on an invalid assumption: that fMRI activations in the secondary somatosensory cortex and dorsal posterior insula in response to nociceptive stimulation "support the sensory components of physical pain." Indeed, this assumption has been now repeatedly proven to be incorrect. As a matter of fact, when the neuronal activity is measured using currently available macroscopic functional neuroimaging techniques (e.g., fMRI), nociceptive somatosensory stimulation elicits responses in a wide network of brain areas. This network, although often referred to as the "pain matrix," has been shown to be largely unspecific for nociception and pain, and, instead, to reflect multimodal neural processes triggered by salient sensory stimuli regardless of their sensory modality (reviewed in refs. 2, 3), and probably related to attentional orienting toward these stimuli (4). In particular, both the secondary somatosensory cortex and the posterior insula—i.e., those regions assumed by Kross et al. (1) to "support the sensory components of physical pain"—are able to respond to a wide range of nonnociceptive and non-painful sensory stimuli, provided they are salient (e.g., a sudden, bright visual stimulus or loud noise) (5).

We understand the intuitive tendency of interpreting the brain responses recorded during the experience of physical pain as reflecting the neural basis of pain perception. However, the hypothesis that the so-called "pain matrix" reflects neural processes that are unspecific for pain and probably related to the detection of saliency would provide an alternative and entirely different, albeit less charming, explanation for the results of Kross et al. (1). Indeed, observing the photograph of an ex-partner we still care about is likely to be as salient as an actual nociceptive stimulus and, hence, to trigger saliency-related multimodal responses in the secondary somatosensory and insular cortices.

Thus, the overlap between the brain responses elicited by observing the photograph of an ex-partner and receiving nociceptive stimulation does not justify the conclusion that "social rejection shares somatosensory representations with physical pain." For all these reasons, we believe that the results by Kross et al. (1) could and should be interpreted in a more prudent fashion.

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