NEUROIMAGING

Conflicting emotions

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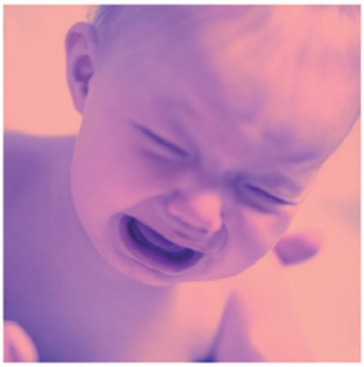

To focus on a task we must ignore irrelevant stimuli. The more distracting an interfering stimulus is, the more conflict it creates, and the longer we take to react to the relevant stimulus. But we can adapt to conflict: studies have shown that the effect of a high-conflict distracter on reaction time decreases when it is preceded by another high-conflict distracter. Mansouri *et al.* now show that the dorsolateral prefrontal cortex (DLPFC) is involved in this behavioural adjustment in monkeys and, in a different study, Egner *et al.* show that, in humans, this region is involved in non-emotional conflict adaptation whereas a different network mediates the resolution of emotional conflict.

Mansouri *et al.* used non-emotional distracters to demonstrate that, like humans, monkeys show conflict adaptation. Furthermore, monkeys with lesions in the DLPFC did not adapt, whereas lesions in the anterior cingulate gyrus (ACC) had no effect.

The authors then measured activity in DLPFC neurons in two intact monkeys. Some neurons showed higher activity during low-conflict trials, whereas others fired more during high-conflict trials. Interestingly, individual neurons retained this activity until the start of the following trial, indicating that DLPFC cells retain a 'memory' of the previous conflict. This might be important for the behavioural adjustment that was observed.

In the study by Egner *et al.*, participants in an fMRI scanner were shown photographs of male and female faces expressing either fear or happiness. In non-emotional trials the label 'male' or 'female' was projected over the photo as a distracter, and the participants indicated the person's gender while trying to ignore the labels. In emotional trials, participants identified the expressed emotion while ignoring affect labels ('happy' or 'fear') that were displayed over the faces.

As in previous studies, in both emotional and non-emotional tasks, participants showed conflict adaptation in the second of two consecutive incongruent (high-conflict) trials. The authors then showed that, in both tasks, incongruent trials activated the dorsal ACC (dACC), indicating that this region might represent a general conflict-detection mechanism. Interestingly, behavioural adaptation correlated with activation of the right LPFC in non-emotional tasks, but with activation of the rostral ACC (rACC) in emotional tasks, suggesting that separate neural mechanisms mediate adaptation to interference from non-emotional and emotional distracters.

A subsequent connectivity analysis revealed that during emotional conflict adaptation, activity in the rACC predicted reduced activity in the amygdala, whereas during non-emotional conflict adaptation, activity in the the LPFC predicted activity in the fusiform face area (FFA), a region that is involved in face processing.

These studies indicate that in monkeys and humans the LPFC resolves conflict from non-emotional distracters, but that in humans interference by emotional distracters activates a different network involving the rACC, which then exerts top-down inhibition of processing of irrelevant emotional stimuli by the amygdala. As the dACC was found to be involved in monitoring conflict from both emotional and non-emotional stimuli, it is possible that the activated dACC subsequently recruits either the rACC or the LPFC, depending on the type of distracter.

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ORIGINAL RESEARCH PAPERS Egner, T. *et al.* Dissociable neural systems resolve conflict from emotional versus nonemotional distracters. *Cereb. Cortex* 16 Oct 2007 (doi:10.1093/cercor/bhm179) | Mansouri, F. A. *et al.* Mnemonic function of the dorsolateral prefrontal cortex in conflict-induced behavioral adjustment. *Science* 25 Oct 2007 (doi:10.1126/science.1146384)