

Neural circuitry underlying emotional vs. cognitive conflict and control: facial expressions as a model behaviour.

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Recently, the neural basis of emotional control has become a topic of empirical interest; however, overlaps and differences in the neural circuitry underlying emotional and cognitive control have yet to be systematically established. We have identified emotional facial expressions as actions modulated by both emotional and cognitive influences: thus, their use as performance measures in emotional control tasks may provide greater ecological validity than previous tasks, using arbitrary behavioural responses, have permitted. In this study, we examined brain activity during emotional and cognitive versions of the AX-Continuous Performance Task (AX-CPT), a cue-probe task used to examine controlled processing and conflict. Participants responded via facial expressions (smiling or frowning) to emotional probes (IAPS images) or unemotional probes (letters, numbers and symbols). In both tasks, trial frequency and contextual cues introduced a bias towards the target cue-probe combination that leads to two forms of conflict in non-target trials: top-down (i.e., cue-driven) vs. bottom-up (i.e., probe-driven). However, in the emotional condition, the conflict was further amplified by the incongruency between the required facial expression and the emotional valence of the picture. A mixed block/event fMRI design enabled separation of sustained and event-related neural correlates of task activity. The results address the question of whether affective brain regions (e.g., ventral striatum, orbitofrontal cortex, amygdala) are selectively engaged in the emotional conditions, and further whether conflict in this condition engages regions associated with cognitive control (e.g., anterior cingulate cortex and lateral PFC) but in anatomic locations distinct from those activated in the cognitive condition.