

Cognitive Control: Trying to disentangle attention processes from inhibition.

Abstract:

The stop signal task (SST) is commonly used to study motor inhibition. However, a potential confound exists. Stop trials require both that the Stop signal is attended to and that response inhibition is engaged. Both the right inferior frontal gyrus (IFG) and the medial frontal lobe (mFL) have been proposed as critical regions for motor inhibition, although the right IFG also forms part of what is termed the ventral attentional system. We thus hypothesized that the right IFG plays a role in attending to the Stop signal, whereas the mFL is critically involved in response inhibition. In order to test this hypothesis, we modified the SST by introducing 'Continue' trials, which involved an unexpected cue that did not require inhibition of the on-going action. This allowed the identification of brain regions involved in response inhibition, whilst controlling for the attentional confound inherent in presenting unexpected cues.

The introduction of the Continue signal in the SST enabled us to identify distinct parts of the motor control network involved in attentional processing, response inhibition and error processing. This is the first fMRI study consistently showing that the pre-SMA is specifically activated by trials of successful motor inhibition independent of salient attentional capture. Right IFG activation is associated with the appearance of secondary stimuli regardless of whether they signal the need for response inhibition, suggesting a role for this region in the attentional processing of unexpected perceptual cues.