The effects of acute tryptophan depletion on reversal learning and response inhibition related brain activity

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Serotonin (5-HT) has been implicated in both behavioral inhibition as well as in the processing of aversive signals. Acute tryptophan depletion (ATD), a well-recognized research method for reducing central 5-HT, impaired reversal learning, decision making and response inhibition in healthy volunteers. Two separate studies used functional magnetic resonance imaging to examine the effects of ATD on brain activity during reversal learning and response inhibition.
In the first study twelve healthy male volunteers performed a probabilistic reversal learning task and viewed a flashing checkerboard following either a tryptophan-balancing or a tryptophan-depleting drink (in a counterbalanced, double-blind design). The use of a probabilistic reversal learning task enabled the separate examination of effects of ATD on behavioral reversal following negative feedback and negative feedback per se (not followed by behavioral adaptation). Consistent with previous findings, behavioral reversal was accompanied by highly significant signal change in both the right ventrolateral prefrontal cortex as well as the dorsomedial prefrontal cortex. Acute depletion of central serotonin enhanced significantly and selectively the BOLD signal in the dorsomedial PFC during reversal, whilst leaving the signal in the ventrolateral PFC completely unaffected. The ATD-induced signal change in the dorsomedial PFC during behavioral reversal extended to trials where subjects received negative feedback but did not change their behavior. These data are consistent with the proposal that ATD affects reversal learning by modulating the processing of aversive signals.
In the second study 14 healthy male volunteers performed a Go/NoGo task following either a tryptophan-balancing or a tryptophan-depleting drink (in a counterbalanced, double-blind design). Our hypothesis is that acute tryptophan depletion does not affect the performance on the task, but does affect the brain activity related to response inhibition especially in prefrontal brain areas. Data will be presented.

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