Networks for integrating sensory evidence and value in the human brain

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In Bayesian models of perceptual decisions, a belief distribution over the stimulus is combined with the value of each outcome to yield a choice that maximises expected value. How this integration is implemented by the human brain is unknown. We measured fMRI BOLD responses while inducing shifts in perceptual decision criteria through asymmetric value. We used a blend of house and face images in order to generate a full psychometric function between objects with known stimulus-selective activation profiles in inferior temporal cortex. Asymmetric monetary losses were imposed for incorrect face and house decisions, varying on a trial-by-trial basis. Preliminary behavioural analysis revealed a distribution of optimal and suboptimal strategies across subjects. Functional imaging showed that activity in stimulus-selective regions in inferior temporal cortex was invariant to increases in stimulus-specific value. Instead, both types of asymmetric value trials (face and house) revealed consistent activations in prefrontal cortex, thalamus and caudate.

Together, our data suggest a theoretical framework in which value and uncertainty are integrated at a late stage of a perceptual decision hierarchy. This post-sensory integration of value may be adaptively advantageous, allowing action selection to be flexible in its usage of sensory evidence in different reward contexts.

Word count: 197