Neural Correlates of Object Indeterminacy in Art Compositions

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Indeterminate art works invoke an unusual state of awareness in which the formal aspects of perception (form, color) become dissociated from the semantic aspects (meaning, association). In this lecture, I will describe a series of behavioral and fMRI studies in which we used representational and indeterminate art paintings to study object recognition, memory and aesthetic judgment.

Our studies show that subjects identified familiar objects not only in representational paintings but also in indeterminate compositions in which objects are only suggested. The images rated as more aesthetically stimulating were also more likely to be recalled in subsequent memory tests. We found that the paintings evoked activation across a distributed cortical network. Coherent, cluttered scenes activating more the temporoparietal junction, which mediates the binding of visual features and spatial locations, whereas meaningless, scrambled paintings evoked imagery-related activation, reflecting the strategy that subjects used to resolve the object indeterminacy.

We also found that a short training session on object recognition in cubist paintings (a special class of indeterminate art works) resulted in significant behavioral and neural changes. Trained subjects recognized more familiar objects in more paintings and showed enhanced and differential activation in the parahippocampal cortex. Moreover, trained subjects were slower to report not recognizing objects in cubist paintings, and their longer response latencies were correlated with activation in the fronto-parietal network for spatial attention. Trained subjects, thus, adopted a visual search strategy and used contextual associations to perform the task.
Taken collectively, our studies suggest that the human brain is a compulsory object viewer that automatically sorts indeterminate visual input into coherent images. Our findings also support the ‘proactive brain framework’, according to which the brain uses associations to generate predictions.