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Neural representation of geometry and surface properties in object and scene perception

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Abstract

Multiple cortical regions are crucial for perceiving the visual world, yet the processes shaping representations in these regions are unclear. To address this issue, we must elucidate how perceptual features shape representations of the environment. Here, we explore how the weighting of different visual features affects neural representations of objects and scenes, focusing on the scene-selective parahippocampal place area (PPA), but additionally including the retrosplenial complex (RSC), occipital place area (OPA), lateral occipital (LO) area, fusiform face area (FFA) and occipital face area (OFA). Across three experiments, we examined functional magnetic resonance imaging (fMRI) activity while human observers viewed scenes and objects that varied in geometry (shape/layout) and surface properties (texture/material). Interestingly, we found equal sensitivity in the PPA for these properties within a scene, revealing that spatial-selectivity alone does not drive activation within this cortical region. We also observed sensitivity to object texture in PPA, but not to the same degree as scene texture, and representations in PPA varied when objects were placed within scenes. We conclude that PPA may process surface properties in a domain-specific manner, and that the processing of

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