Neural Correlates of the Perceptual Spaces of Low-Level Features and Objects

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Abstract: While low-level features, e.g., color, vary continuously, semantic information, e.g., objects, often appears categorical. In past psychophysical experiments[1] we collected similarity judgments between stimuli, from five stimulus domains varying in their semantic content, and analyzed them using a variant of multidimensional scaling. The stimulus domains included 1) animal names, 2) images of the animals, 3) lightly-texturized images, 4) heavily-texturized images and 5) textured discs. Stimulus domains where object identity was evident (1-3) were represented in a common way[2]. To study the neural correlates of these representations, we ran an fMRI study (n=7). Over four fMRI sessions, participants viewed each stimulus at least 7 times, while performing a one-back memory task. The data were acquired on a 3T Siemens scanner (multiband acquisition, TR=0.8s). Data were preprocessed using fmriprep. Voxel-wise responses to the stimulus domains were obtained using GLM and compared in early and late visual areas. Responses to image, image-like, texture-like domains (2, 3, 4) were most similar, and different from responses to words (1). Whereas psychophysical experiments showed that less semantic and more semantic domains were represented differently, the fMRI experiment showed a different progression in representations: the three picture domains were represented most similarly, despite not sharing semantic content.

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