Modeling the Neural Structure Underlying Human Action Perception

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Presentation Abstract Summary When humans view others' movements, large swathes of the visual cortex are activated (Kilner, 2011), but the major representational divisions organizing this neural activity are not well understood. To explore this architecture, 13 observers underwent functional neuroimaging while observing 120 2.5s videos depicting everyday actions. Using voxel-wise modeling (Mitchell et al., 2008), we found that a variety of encoding models—with features for the body parts involved in the actions, what the actions were directed at (e.g., object, person, space), and the visual image features present—all successfully predicted visual cortex responses to individual actions (leave-2-out accuracies: 43-79%). Prediction accuracy for these models varied across the cortex, revealing divisions of ventral and dorsal streams with different underlying action representations. We also used data-driven clustering to discover natural parcellations in visual cortex based on voxels' response profiles (Lashkari et al., 2010), providing a convergent approach to the dataset. These analyses reveal several meaningful functional divisions within the regions involved in action perception, including two networks linking ventral and dorsal stream representations, and begin to formalize the neural representational structure underlying our visual understanding of everyday actions.

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