Hands in motion: an upper-limb-selective area in the occipitotemporal cortex shows sensitivity to viewed hand kinematics.

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**Abstract:**

Regions in the occipitotemporal cortex (OTC) show clear selectivity to static images of human body parts, and upper limbs in particular, with respect to other object categories. Such selectivity was previously attributed to shape aspects, which presumably vary across categories. Alternatively, it has been proposed that functional selectivity for upper limbs is driven by processing of their distinctive motion features. In the present study we show that selectivity to static upper-limb images and motion processing go hand in hand. Using resting-state and task-based functional MRI, we demonstrate that OTC voxels showing greater preference to static images of arms and hands also show stronger functional connectivity with motion coding regions within the human middle temporal complex (hMT+), but not with shape-selective midtier areas, such as hV4 or LO-1, suggesting a tight link between upper-limb selectivity and motion processing.

To test this directly, we created a set of natural arm-movement videos where kinematic patterns were parametrically manipulated, while keeping shape information constant. Using multivariate pattern analysis, we show that the degree of (dis)similarity in arm-velocity profiles across the video set predicts, to a significant extent, the degree of (dis)similarity in multivoxel activation patterns in both upper-limb-selective OTC regions and the hMT+. Together, these results suggest that the functional specificity of upper-limb-selective regions may be partially determined by their involvement in the processing of upper-limb dynamics. We propose that the selectivity to static upper-limb images in the OTC may be a result of experience-dependent association between shape elements, which characterize upper limbs, and upper-limb-specific motion patterns.

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