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An Area in the Human Posterior Superior Temporal Sulcus (STS) Activated During Biological Motion Tracking

Hui Zhang*

Department of Cognitive Neurology, University of Tubingen, Tubingen, Germany

DESCRIPTION

The relationship between neural activity in this area and perceptual experience is orientation dependent: Inverting point-light animations makes them less visible. As observers watched animations of the inverted point light, we measured activity levels in that region. We also recorded neural activity while observers imagined biological motion and compared it with motion recorded while watching the animations. Each functional scan lasted 4.5 min, beginning with an 8's period in which observers passively viewed the fixation cross. A "quiet period" allowed saturation of the MR, and volumes sampled during this time were removed before analysis. The remainder of each scan was divided into 16's phases, with animations displayed every 2's, alternating between different stimulus conditions in each phase. AFNI 2.23 was used for offline reconstruction and analysis on a dual-processor SGI octane silicon graphics. The first four volumes of each functional scan were discarded before statistical analysis to allow stabilization of the MR signal. The remaining first volume served as a template against which subsequent volumes were aligned, correcting for in-plane and cross-plane movement. Image sequences were linearly smoothed, spatially smoothed, and linearly smoothed over time. The purpose of this research is to determine how neural activity in areas involved in the perception of biological motion changes as the biological stimulus changes. To do so, we must first identify brain regions that selectively respond to biological motion for each observer these areas will be pinpointed for our subsequent analysis. Our previous research showed an area in the posterior STS, but we needed to identify this area in our current group of observers. We therefore measured BOLD signals associated with tracking biological motion and compared them with responses associated with tracking scrambled motion in a blocked design. This state was not always the first scan in the session as shown below. Observers were shown alternating blocks of biological and scrambled motion to identify clusters of neighboring voxels that preferentially responded to biological motion. It is well known that attention can influence fMRI signals. Our findings suggest that monkeys and humans have similar neural substrates in the anterior temporal lobe that are specialized for the processing of non-rigid facial motion. We used a 1-back task to keep observers' attention fixated during data collection: during scanning, observers pressed a button whenever a 1's animation was identical to that seen in the immediately preceding 1's presentation. Each block contained eight animations, with repetition occurring roughly half the time. The resulting 135 bundles were cross-correlated with an ideal boxcar function that described changes in biological and mixed motion. The biological and scrambled motion phases each lasted 16 seconds and were repeated eight times, resulting in a total of 64 volumes acquired for each stimulus phase. The posterior STS region has previously been identified as selectively responsive to biological motion. We chose voxels on the posterior STS that were highly correlated with biological movement phases as our ROIs. Mean activation for biological and mixed phase was compared by averaging voxels within the ROI. Average activation in response to biological motion is expressed as a percentage change from the activity levels of the encoded motion.

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Corresponding author: Hui Zhang, Department of Cognitive Neurology, University of Tubingen, Tubingen, Germany; E-mail: hui.zhang@buaa.edu.de

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