

Face-selective brain regions share the visual-field anisotropies of early visual cortex

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Abstract

Face recognition has long been considered “special”, involving dedicated brain regions with selectivity for faces invariant of their visual-field location. Recent findings show that the location of faces in our visual field does however alter their perception – face recognition has higher resolution along the horizontal vs. vertical meridian and in the lower vs. upper visual field (Morsi et al, 2024), matching the variations of low-level vision. We sought to determine whether these performance anisotropies are driven solely by variations in early visual cortex, or by similar variations in the spatial properties of face-selective brain regions. Using fMRI, retinotopic mapping and population receptive field (pRF) analyses were conducted with large-field bars ($\pm 21^\circ$ eccentricity) of either upright or inverted faces in both early (V1-V3) and face-selective cortical regions (OFA, pFus, mFus). The size and number of pRFs, and associated visual field coverage (the sum of all pRFs), was estimated in wedges around the visual field. Though pRF sizes increased with eccentricity in all areas, they did not vary reliably with polar angle in either early visual cortex or face-selective regions. Both early cortex and face-selective areas nonetheless showed both a greater number of pRFs and a concomitant increase in visual-field coverage along the horizontal vs. vertical meridian and in the lower vs. upper field. These variations in visual-field sampling could therefore drive the variations observed in face-recognition abilities. We further show that pRF numbers (but not pRF size or coverage) were higher for upright than inverted faces in mFus, providing a link between spatial variations and the perceptual advantage for upright faces. The shared pattern of these variations in visual-field sampling

supports recent proposals for “visuospatial coding”, whereby the spatial selectivity of higher-level areas is built upon the selectivity of early visual cortex, even for specialised processes like face recognition.

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