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INTRODUCTION. The rod and cone photoreceptors of the retina are organized such that the central fovea contains no rod photoreceptors. It is generally accepted that this pattern of organization continues through the input into the early retinotopic visual areas in human occipital cortex. Thus, signals from both rod and cone photoreceptors travel from the retina to the more peripheral regions of primary visual cortex (V1), while the central foveal representation in V1 only receives cone signals.

Most studies of retinotopy have examined visual field map organization under full luminance (photopic) conditions. However, there are controversial reports that there are not inputs from the rod photoreceptors into the color-responsive maps in human ventral visual cortex (Hadjikhani and Tootell, 2000). Here we report new measurements of color-responsive visual field maps in human ventral occipito-temporal cortex (VOT) under low luminance (scotopic) conditions that only activate the rod photoreceptors.

METHODS. We measured angular and eccentric retinotopic organization in human VOT using fMRI at two different luminance levels. Retinotopic stimuli consisted of black and white, drifting radial checkerboards 3° in diameter comprising wedges, ring, or bars. We examined the organization of the responses of the previously defined color-responsive maps in VOT (hV4, VO-1, VO-2; Brewer et al., 2005) to these stimuli under photopic and scotopic conditions. We additionally measured the population receptive fields (Dumoulin and Wandell, 2007) of these regions under both luminance levels.

RESULTS. Our measurements show that, in contrast to previous reports, the color-responsive VOT maps receive rod signals in the peripheral representations of these maps. The central foveal representations of these maps do not contain rod signals. This organization in the ventral color-responsive maps follows that of the posterior visual field maps (V1/V2/V3).

CONCLUSION. These results suggest that VOT color-responsive visual field maps do not only subserve the color-processing pathway.

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