



Color Vision as a bio-marker diagnosing the blindsight

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Letter To Editor

Dear Editor,

the primary visual cortex (V1) is the entrance point for cortical visual processing, and damage to V1 leads to blindness in the contralateral visual field, namely cortical blindness.

In the early part of the 20th century, a handful of clinical reports challenged the established view that humans are rendered completely blind following damage to primary visual cortex by showing that patients with such damage can have some residual sensitivity.

However, these case reports had sufficient detail, making clear interpretation of them as "blindsight" cases difficult. At the Literature today it is observed a curious dissociation in war veterans who had suffered penetrating head wounds affecting the occipital cortex. The patients were able to delineate what they called fields for object vision and for motion. There had regions of visual space in which they were unable to see static objects but could report a sense of movement. These patients were not describing "normal" vision, with the stating that their perception "had neither form nor color. They gave the impression of a shadow". The two classes of residual visual behavior that have been most commonly demonstrated in blindsight are motion discrimination and action blindsight; the "blind" in blindsight reflects the patients' claims nor to see the stimuli at all, while the "sight" refers to their residual or recovered ability to localize, detect and discriminants between such unseen stimuli.

Lesions that destroy the visual cortex cause massive degeneration of the lateral geniculate nucleus, and lead to trans-neuronal degeneration of -50% of retinal ganglion cells. The survivors continue to project to their retinorecipient nuclei, which in turn transmit the information, directly or via further sub-cortical way stations, to visual cortical areas beyond V1. The strongest of these remaining routes is to the superior colliculus of the midbrain, which has been shown to be involved in the localization and motion processing of blind-field stimuli. Pathways to the pretectal area contribute to pupil responses, optokinetic nystagmus and light vs no light discrimination, and those to the inferior pulvinar and the koniocellular layers of the geniculate nucleus may be involved in processing orientation and wavelength information from the blind field.

The usefulness of color vision as a bio-marker diagnosing the blindsight has shown by Anna Piro et al. (2023). In fact, color vision can monitor the clinical status before and post the surgical ventricular-peritoneal shunt in Normal Pressure Hydrocephalus. The anatomic implications of blindsight seem fairly obvious to us now; there are multiple pathways for visual information to reach cortical regions and not all need to be relayed through primary visual cortex to influence behavior.

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