

Prior Knowledge Modulates Peripheral Color Appearance

Bilge Sayim¹, Erik Myin², Tilde Van Uytven³,

¹ Laboratory of Experimental Psychology, University of Leuven (KU Leuven)

² CST, Literature and Philosophy, Philosophy, University of Antwerp

³ Royal Academy of Fine Arts Antwerp

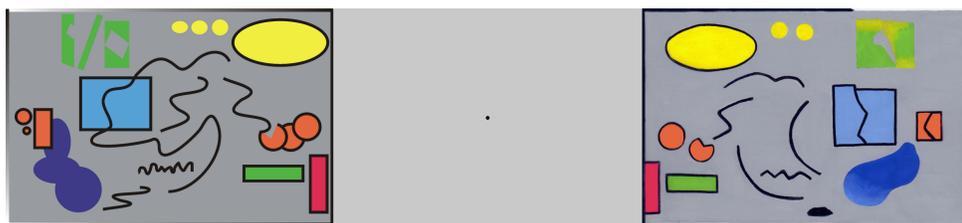
Abstract

Color perception deteriorates with increasing eccentricity in the visual field. Here, we investigated peripheral color perception using a painting method, asking how prior knowledge affects color appearance. A professional artist was presented with complex, cluttered images in the visual periphery. The task was to paint with foveal vision how each image appeared. After finishing a painting, the target image was freely viewed to acquire knowledge about it. Next, the same image was presented at the same peripheral location and painted again. Salient color regions in the images that were not painted during the first presentation, were painted during the second presentation. Our results indicate that prior knowledge of peripheral targets strongly shapes perception.

Methods

Images were presented at 12 degrees in the peripheral visual field, and painted with free viewing. Eye tracking assured that the image was only viewed in the periphery. Stimuli consisted of two complex, cluttered images, 15.0 degrees wide and 10.2 degrees high. We used two images: “Miro”-Image (Figure 1) and “Mondrian”-Image (Figure 2). Each target image was painted twice. After completion of the painting, the image was shown foveally for visual inspection. Next, the target image was again presented in the periphery and painted once more. In the “Miro”-condition, the target image was again only shown when fixating the fixation dot, and masked otherwise. In the “Mondrian”-condition, the target image was not masked.

Figure 1: “Miro”-condition.

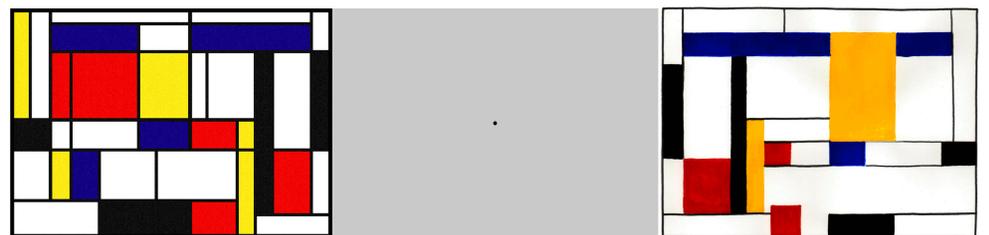


A) The target image was presented at 12 degrees in the right visual field (shown mirrored on the left), and masked when not keeping fixation.



B) The first painting of the target image was presented at the same peripheral location as the original target (Figure 1A), and again masked when not keeping fixation. The second painting is shown on the right.

Figure 2: “Mondrian”-condition



A) The target image was presented at 12 degrees in the right visual field (shown mirrored on the left), and masked when not keeping fixation.



B) The first painting of the target image was presented at the same peripheral location as the original target image (Figure 2A). The image was not masked when making eye movements away from the fixation dot. The second painting is shown on the right.

Conclusions

Our results show that peripheral vision can be strongly modulated by knowledge. In particular, images that were unknown to the participant and only viewed peripherally (first painting) resulted in different perceptions when additional knowledge was acquired about the images (second painting). We suggest that our results are due to vague percepts caused by crowding which are strongly susceptible to prior knowledge. We propose that the painting method is useful to explore the perception of complex stimuli, in particular to capture perceptually vague phenomena, as painting is more precise and efficient than, e.g., verbal descriptions when stimuli are complex.