Conclusions: Crowding is stronger when target and flankers have a same complexity level when flanker contrast is the same between the complexity conditions. However, weaker crowding from flankers of different (and higher) complexity can be explained by the higher contrast threshold required to process such flanking characters. Our findings suggest that the flanker-complexity effect is not due to the similarity rule in crowding.

D2-022
Do some double-opponent cells in V1 code the light source color of scenes?

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There are mainly two types of double-opponent (DO) cells in primary visual cortex (V1) of the primate visual system, i.e., DO cells with concentric receptive fields (RFs) and with oriented RFs. Both types have been regarded as the building blocks of color constancy. Compared to the DO cells with oriented RFs, the DO cells with concentric RFs are quite rarer, and their role in color perception is less known. Sufficient physiological studies have revealed that for most DO cells, the cone inputs to the opponent center and surround are unbalanced, and weights of cone inputs to the surround are generally weaker than that to the center. It has generally supposed that the DO cells with concentric RFs are irresponsive to large regions of color (due to the cancellation of opposite-signed cone inputs in the center and surround of a DO cell like R+G-/R-G+), but respond strongly to the steep changes in color. In this work we found that with computationally modeling, the imbalance in cone weights could convert a pure DO cell with concentric RF into a color-luminance cell, i.e., such DO cell may respond well to both the color contrast and luminance contrast within its RF. Furthermore, the DO cells could code the light source color over the broad regions with appreciate weights of cone inputs to its centre and surround, i.e., the responses of such DO cells transformed from the DO space to the RGB space match well to the color direction of the illuminant of a scene. We predict that such type of DO cells in V1 contributes to the color constancy by signaling the illuminant of scenes, which was preliminarily validated by our computational results on color-biased images and needs further physiological verification.

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D2-023
The Ebbinghaus illusion in the absence of awareness

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Using the interocular suppression paradigm, we rendered the central circle of the Ebbinghaus figure invisible at the beginning of each trial while leaving the surrounding inducers intact. We found that the central circle broke from suppression sooner when surrounded by smaller relative to larger inducers, suggesting that its perceived size was subconsciously processed. Moreover, the strength of the Ebbinghaus illusion, as indexed by the illusory size change of the central circle, predicted the suppression time difference between these conditions across participants. The effect disappeared when the central circle was replaced with an irregular shape or when it was monocularly embedded in the suppression noise, thus ruling out the possibility of response biases. Our results thus provide clear evidence that the Ebbinghaus illusion existed below awareness, and shed new light on the interconnections between conscious and subconscious visual processings.

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D2-024
Double dissociations of magnocellular and parvocellular pathways in processing global topological and local properties

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The magnocellular (M) and parvocellular (P) pathways are segregated in anatomy as early as from the retina and lateral geniculate nucleus, as well as in function with M pathway conveying low-resolution information rapidly and P pathway conducting fine details slowly. Evidence shows that fast M projections facilitate object recognition via top-down modulations. Previous studies suggest global topological properties (TP), to which the visual system is highly sensitive, might serve as the starting point for the formation of object representations. Here we hypothesize that M pathway may contribute to fast object recognition by extracting TP in a visual scene and initiating a feedforward process, in addition to indirect feedbacks. We adopted unconscious response priming, a paradigm extensively used in studies on early vision, and used stimuli that were either of achromatic low-luminance contrast (M-biased), or chromatically defined and isoluminant (P-biased), to examine whether the processing of TP (e.g., number of holes) and other local properties (e.g., orientation) dissociate in the two pathways. To avoid potential confounding, we matched area and spatial frequency of stimuli. We found that priming effects of TP occurred with M-biased stimuli rather than P-biased ones, in both TP-relevant (i.e. discriminating no-hole from one-hole stimuli) and -irrelevant tasks (i.e. judging the orientation). Conversely, priming effects of orientation were observed only for P-biased stimuli, and only when orientation report was explicitly required. Moreover, the average response times (RTs) were shorter for TP judgment than those for orientation, and RTs were shorter for TP when stimuli were M-biased than when P-biased. Further measurement for prime identification showed neither of these properties in prime