Enhanced blue-yellow sensitivity in individuals with depressive symptoms

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Introduction
Recent research has produced growing evidence for a relationship between depression and low-level visual perception. For example, previous studies demonstrated a reduced contrast sensitivity (2) and enhanced motion sensitivity (3) of individuals with depression. However, the relationship between depressive symptoms and color perception remains unclear. Given that people with depression show dysfunction of the GABAergic and dopaminergic systems which are closely involved with color perception (1), it is plausible that color perception is modulated by depressive symptoms. Therefore, we investigated whether a chromatic (i.e., saturation) and achromatic (i.e., luminance) discrimination sensitivity was modulated by depressive symptoms inferred by Beck Depression Inventory-II (BDI-II) (1).

Methods

Participants
- 90 participants

Task
- 2-AFC task indicating the location of stimulus with higher saturation or contrast (left or right).

Procedure
1 | Questionnaires
   2 | Equiluminance control
   3 | Main experiment

- The main experiment consisted of three blocks of stimulus with higher saturation or contrast (7 levels low to high).

Stimuli
- Gabor patches subtending 3 deg visual angle in diameter were systematically varied in saturation or contrasts (7 levels low to high).

Temporal frequency : 30 Hz

Spatial frequency: 0.6 cpd

Comparison between discrimination slopes and three primary symptoms for depression

- The overall regression was not significant (R2 = 0.03, F(1, 86) = 0.01, p > .91).

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- The slope of blue-yellow discrimination function was significantly predicted by BDI-II score (β = 0.13, p < .001). The distribution of BDI-II scores
- The degree of depressive symptoms was divided into three groups according to the clinical criteria: "Minimal" (0-13), "Mild" (14-19), "Moderate" (20-25), and "Severe" (26-63) (1). To avoid a bias toward a specific range of BDI-II score, thirty participants per group were recruited.

- Relationship between discrimination slopes and primary symptoms for depression

- Simple linear regression

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- The slope of blue-yellow discrimination function was significantly predicted by BDI-II score (β = 0.13, p < .001). Negative affect score (β = -0.65, p < .01), positive affect score (β = 0.42, p < .05), and PSQI score (β = 0.56, p < .01).

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Conclusion
These results suggest that saturation sensitivity for blue-yellow is enhanced as depressive symptoms as well as anxiety, negative affect, and sleep disturbance, are higher. The blue-yellow sensitivity index has a potential as a biomarker for the initial identification of high-risk group of depression.

It has been reported that patients with depression showed decreased levels of the inhibitory neurotransmitter GABA in the occipital cortex (4). GABAergic neurons are known to be involved in chromatic processing at a cortical level (5). The enhanced blue-yellow saturation sensitivity might reflect a consequence of dysfunctional GABAergic system.

References & Acknowledgment