INTRODUCTION

Multiple color filling-in percepts (see examples in Methods section) are observed with complex stimuli (Hamburger et al., 2006).

QUESTION: What determines the filling-in percepts in such a complex stimulus?

PURPOSE: To investigate the role of the magnitude and spatial arrangement of cone contrast as determinants of color filling-in percepts.

METHODS

Stimuli: 3 equiluminant fields: Inner (I); Annulus (A); Outer (O)

Filling-in Percepts:

- Multiple percepts could be perceived in one trial for the same stimulus

Experiment Conditions:

1) Chromaticity spatial arrangement
   • Monotonic arrangement in chromaticity (I→A→O)
   • Non-monotonic arrangement in chromaticity (O→A→I)

2) With vs. without a chromaticity difference

Task: To report filling-in percepts continuously while maintaining steady fixation for 25 seconds in each trial.

5 Observers x 10 repeats per chromaticity combination

RESULTS

Analysis: The first percept of each trial and the subsequent full-screen percept that followed immediately the first percept (sequential filling-in, for example, O→A→I) were analyzed.

Filling-in percepts without a contrast between chromaticity were not observed with complex stimuli (Hamburger et al., 2006).

A control experiment with all 3I chromaticities below or above EES showed similar patterns.

Sequencial Filling-in Percept (%) (out of trials of first percept perceived)

<table>
<thead>
<tr>
<th>First Percept</th>
<th>Mono</th>
<th>Non-mono</th>
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<tbody>
<tr>
<td>I→A→O→A</td>
<td>38%</td>
<td>22%</td>
</tr>
<tr>
<td>A→I</td>
<td>16%</td>
<td>19%</td>
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In a complex stimulus with two edges, the color filling-in percepts depend on the magnitude and spatial arrangement of cone chromaticity along the two edges.

SUMMARY

In a complex stimulus with two edges, the color filling-in percepts depend on the magnitude and spatial arrangement of cone chromaticity along the two edges.

- Color is easier to spread along the edge of a smaller contrast magnitude.
- Monotonic arrangement in I without a contrast leads to a dominant filling-in to the annulus from the other fields, followed by a subsequent filling-in to the full screen.
- Having an I contrast between the annulus and the inner/outer fields leads to a dominant filling-in to the inner field from the annulus.

DISCUSSION

- Symbolic theory surmises that color filling-in results from a reconstruction of chromatic information in higher visual areas, and neural activation of early visual cortex does not change when filling-in is perceived (Komatsu, 2006; von der Heydt et al., 2003).
- Isomorphic theory assumes a retinotopic spread of neural activation in early visual cortex from the border to interior of an region when filling-in occurs (Komatsu, 2006; von der Heydt et al., 2003).
- The effect of spatial arrangement on filling-in percepts and the occurrence of sequential filling-in imply the importance of retinotopic representation. Therefore our results are more consistent with the isomorphic theory.

REFERENCES


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