The effect of color contrast between center and surround grating on the tilt illusion

Jung Jiyeon Jung Woo Hyun*

Department of Psychology, Chungbuk National University
com4man@gmail.com*

Introduction

- The repulsive tilt illusion** (Westheimer, 1990)

Orientation	
Center: real	Vertical
Surround: real	Clockwise from the vertical
Center: perception	Counterclockwise from the vertical

- Could **color** (hue + lightness + saturation) affect on the tilt illusion? → The results are not consistent (Clifford, Spehar, Solomon, Martin, & Qasim, 2003; Lovegrove & Badcock, 1981; Wade, 1980)

[Aims of research]

- To Investigate the possibility of interaction between color pathway and form pathway on the tilt illusion
- To test whether intensity of the tilt illusion could changed depending on color contrast and lightness contrast between center and surround gratings

Method

Exp 1: The effect of color of center and surround

Hue (center)				Hue (surround)
Gray	Green	Yellowish-green	Yellow	

- Hue of center gratings:
- Hue of surround gratings:

DV → The amount of tilt illusion in the center grating(°)
= (perceived orientation) – (real orientation)

* Task: Adjust the center orientation to appear horizontally/vertically

Exp 2: The effect of match of hue and lightness between center and surround

Hue between center-surround		Phase of luminance between center-surround
Matched	Not matched	

- * All color of gratings: chromatic color
- * Hue of gratings: dark parts ≠ light parts

- Hue between C-S: matched, not matched
- Phase of luminance between C-S: matched, not matched

Exp 3: The effect of color contrast and lightness contrast between center and surround

Color is matched		Color is not matched		4. Hu	
Lightness contrast (center)				High	Lightness contrast (surround)
Low	High	Low	High

- Contrast (C): low, high
- Contrast (S): low, high
- Color between C-S: matched, not matched
- Hue (C):

- The control of color**
→ Using the DKL color space (Derrington, Krauskopf, & Lennie, 1984)
- The control of perceived lightness contrast**
→ Using the Heterochromatic Flicker Photometry (Lee, Martin, & Valberg, 1988)

Result

Exp 1 (n = 7)

Exp 2 (n = 7)

Exp 3 (n = 5)

Discussion

- The largest illusion when color was matched between center and surround**
 - No difference that color differences or the number of colors in the gratings
 - ALL matched hue + lightness + saturation → A necessary condition for perceiving the same color?
→ **Color pathway can influence on orientation pathway independently**
- The illusion could facilitated when lightness contrast is high**
 - The size of lightness contrast > the match of lightness contrast
 - The effect of lightness contrast could influenced by color contrast
→ **It is appear that interaction between color-form pathway in the orientation perception**

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