THE IMAGES OF COLORS WITH DIFFERENT SHAPES AND IN DIFFERENT MOTIONS

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ABSTRACT

A color stimulus (red, green or blue) of different shape (circle, triangle or square) was presented on the screen in different motions of circular, vertical and horizontal, or steadily (without motion). The images were evaluated with 7-points SD scales. Twenty-five subjects participated.

The main results are as follows: (1) the image of color considerably changed both due to shape and motion. Sometimes it completely reversed. (2) The image of green was easy to change generally both due to shape and motion. (3)The image of red, on the contrary, was least affected both due to shape and motion. (4)The shape of ○ was affected by color most when it did not move, and △ was most resistant to the color. (5)When the motion was introduced, the shape of △ and □ turned to be most changeable , and that of ○ least. (6)The circular motion did not affect much the image of color, and the vertical one did much. (7)The image of "soft - hard " was most changeable due to shape and the images of "thick - plain" and "monotonous -changeful" were most affected due to motion.

INTRODUCTION

It appears that the movements of dancers wearing in different colors gives us different images when they move straight or move around. Also we feel different images when the F1 racing cars of different colors run straight or when they come around in the corners. Many studies have been done so far on the images of colors[1][2][3][4]. Some of them were conducted to explore the interactive effects in the image between the shape and the color. Tomita et al showed that the colors of red, orange, blue and especially purple were less affected by their shape, and that the colors of green and yellow were more affected by their shape[5]. Ohmi et al. showed that the geometrical figures tended to change their image by their colors and less affected were the figures having names and least were the meaningless figures[6].

But none of them were studied in different motions. The motion is quite a strong cue for the animal to find out a target in the environment. It is, therefore, possible that the image of a color could change by their motion, as well as by their shape. Such effect of the motion seems quite important for, e.g. web designing with motions.

The aim of the present paper is explore how the image of colors do change due to shape and motion using SD method

METHOD

Apparatus and Stimuli:

Color stimuli were presented on a screen via a computer-projection system. The luminance (cd/㎡) and the chromaticity coordinates(CIE x, y coordinates) were (65.3, .530, .366) for the red stimulus, (110, .191, .239) for the blue one, and (210, .268, .539) for the green one. The luminance and the

CIE x, y coordinates of the screen off the stimulus were (334, .285, .392). The average horizontal illuminance (lx) and the chromaticity coordinates(CIE x, y coordinates) during the stimulus on the screen was (46.3, .330, .389) for the nearest seat to the screen and (39.6, .336, .376) for the farthest seat.

The nearest and the farthest seats was about 3m and 5m away from the screen respectively forming the visual angles of the stimulus in 3.42° for the diameter of the circle and a side of the equilateral triangle, and 3.14° for the square. The visual angles of these stimuli at 5m were 2.05° and 1.88° respectively.

The distances of the motion were 16.15° (9.69°) in visual angle for the diameter of the circular motion at 3m (5m), 15.2° (9.12°) for the vertical and 22.8° (13.68°) for the horizontal motions respectively.

The temporal condition of the stimulus was controlled by the Power-Point System of Microsoft Co. Ltd. after preliminary experiments. When the speed of motion of the stimulus was slow, the image was formed solely by their color irrespective of their motions. The speed of motion of the stimulus, therefore, should have been set for their image to be affected by both of their color and motion. Eventually the speed of motion turned to be at the maximum, i.e. 1 back-and-forth in 1 second for the horizontal and vertical motions and 1 rotation in circular locus in 1 second.

Three colors, red, green and blue were examined in three different shapes, circle, triangle and square, in four motions, circular, vertical, horizontal and steady, i.e. without motion. Each of those 36 patterns of stimuli were presented at random.

Participants:

In total of 25 participants were recruited. All of them were students of Kanagawa University at ages ranging from 18 to 21. The experiment were conducted in their classes and so they were not paid.

SD scales:

Fig.1 shows the SD scales used. These scales were adopted with reference to Oyama et al [1].

1. like - dislike
2. soft - hard
3. thick - plain
4. elegant - vulgar
5. monotonous - changeful
6. heavy - light
7. dynamic - static
8. simple - tedious
9. romantic - realistic
10. modern - ancient
11. natural - unnatural
12. beautiful - ugly

Fig.1 SD scales used.

Procedure

The participants evaluated the image of the color in different shape and motion using 12 SD scales with 7 points (See Fig. 1). Each stimulus was on the screen until all the participants

completed the SD sheet for that stimulus. The circular motion was repeated on the same site and the horizontal and vertical motions were repeated back-and-forth. Almost one hour was needed to complete the experiment.

RESULTS AND DISCUSSION

Table 1 Average evaluation points in each motion for circular red (○).
S: Steady, C: Circular, V: Vertical, H: Horizontal

	Motion			
SD scale	S	C	V	H
1	0.71	0.5	-0.07	-0.14
2	0	0.57	0.71	0.43
3	0.71	1.36	2.14	1
4	0.5	0	0.07	-0.14
5	1.5	0.43	-1.14	0
6	0.71	0.21	-0.21	0.5
7	0.86	0.79	1.57	0.79
8	-0.21	-0.21	-1.14	-0.57
9	0	0.21	0.29	0.43
10	0.93	0.57	0.71	0.29
11	0.57	0.14	-0.79	0.14
12	1.43	0.21	0.36	0.21

Table 1 shows the average evaluating points for each scale for the red ○stimulus, where ○ indicates the shapes of the stimulus and S, C, V, H Steady (without motion), circular , vertical and horizontal motion respectively. The negative signs mean the higher evaluation towards the right hand in each scale.

The image of the scale 1, "like-dislike", for the steady red ○ stimulus reversed when it moved in vertical and horizontal ways. On the other hand the image of the scales 2, 3, 7, 8, 9, 10 and 12 did not change from the steady one whatever motion was introduced.

In summary, the red color was least affected by the shape and the green color most. The shape of △ was least affected by the color and ○ most by the definitions. The scale of 2. "soft-hard" was easy to change due to the shape.

Table 2 Reverse of image due to motion (The digits inside the matrix are the kinds of SD scale reversed) .

	Motion			
Color	C	V	H	Total
red	-	5	-	1
blue	-	3,5,7	3	4
green	-	1,3,4,5	3	5
Total	0	8	2	10

Table 2 shows the cases in which the image of the steady color reversed for all three shapes when it was presented with motions. It should be pointed out that the digits inside the matrix show

the kinds of SD scales reversed. It is clear that the circular motion did not change the image of a color presented steadily, and the vertical motion did affect much. As for the color, the red color seems to resist to motion in image.

Also the images of 3 ("thick-plain") and 5 ("monotonous - changeful ") were easy to change due to motion. The images of "plain" and "monotonous" turned to be "thick" and "changeful" respectively when a motion, especially the vertical one, was introduced for any kinds of shape.

The red color has very strong image generally in that the images changed least both due to shape and motion. Despite of that, the image of 5 ("monotonous - changeful ") reversed in the vertical motion.

The green color was easy to change for both characteristics. As for the effect of shape, the tendency in the present results is coincident with Tomita et al.[5]. Green is included in "neutral colors" which are not either "warm" nor "cold" in the dichotomy of "warm-cold" impression.
It can be said that the green color does not have any distinct or strong image. The present results demonstrated that the image of green was also affected due to motion, particularly by the vertical one.

It was seen that the shape of ○ was affected due to color more than △ or □, and △ least, indicating △ was most stable as a shape when it was seen without motion. The stability of red as a color and that of △ as a shape may produce similar images, which was suggested in Babbit (from Tsukada [7]).

As for the cause for the changeability of the image of △ or □ when the motion was introduced, it was suggested that the diminished recognizability of corners, rather than the locus of the motion, should be concerned.

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