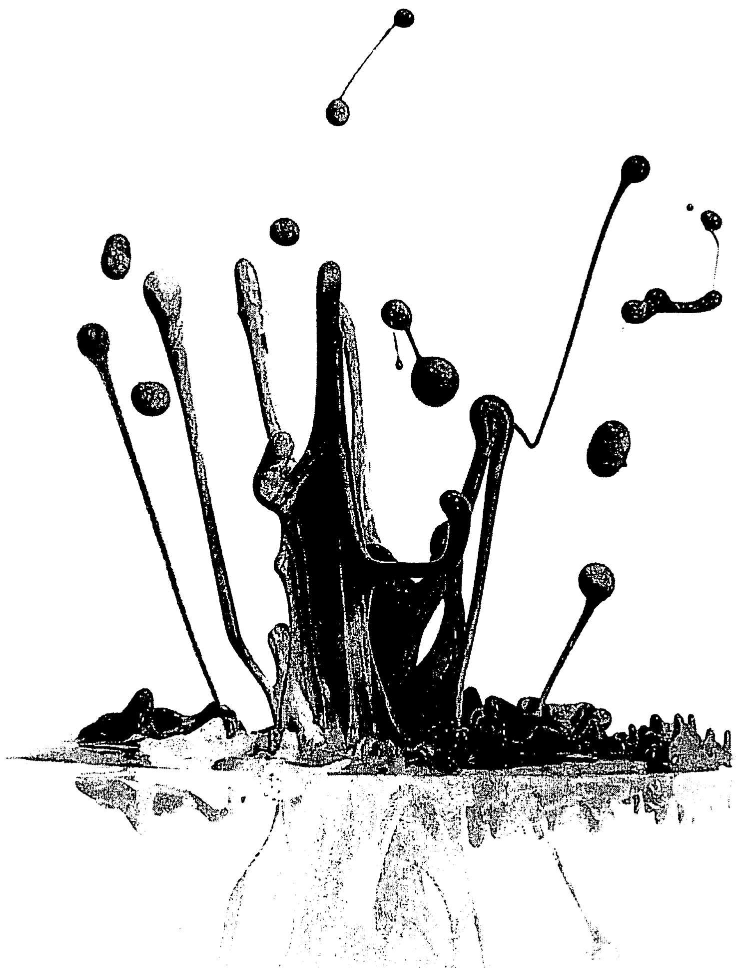
ACA2013Thanyaburi
Bloomming Color for Life

The 1st Asia Color Association Conference
11-14 December 2013

Facuty of Mass communication Technology
Rajamangala University of Technology Thanyaburi
Thailand

Proceedings Book



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Oral paper OA35

COLOR CONSPICUITY FOR SINGLE COLOR AFFECTED BY COLOR ATTRIBUTES

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Keywords: Color conspicuity, monochromatic design, ecological designs

ABSTRACT

Color conspicuity, although, has been investigated since the early times, it remains a source of debate among the public in many fields such as advertisings, product design, packaging and so on. It is well known that a colorful design catches a customer's attention. This design is required to use more inks in printing process. As environmental conservation issue, monochromatic design is one of methods in ecological designs, using ink decreasing technique. The major aim of this study, hence, is to investigate the effect of monochromatic design on color conspicuity. A psychophysical experiment was carried out to examine the relationship between color conspicuity and color attributes. Fifty-two color chips in Munsell notation varying in hues and chromas were simulated on monitor as stimulus. Ten subjects were asked to evaluate a color conspicuity score for given color by using a conspicuity rating scale. The experimental results showed that the color conspicuity score correlates with chromaticness and lightness. The empirical evidence reveals that it might be possible to use monochromatic designing technique as an application for ecological design.

INTRODUCTION

Color was often considered as an important element in customer choice. The Institute for Color Research reported that people make a subconscious decision about a product in 90 seconds or less of their first interaction with it, and between 62% and 90% of that assessment is based on color alone. This is especially important for in-store purchases where a product often has little time to make an impression. One of the important roles for catching a customer's attention is to color conspicuity of product package. It indicates a characteristic that which product can be distinguished most clearly among various products. It said to be that a colorful package attracts a subject's attention and to arouse the desire to consume in marketing [1, 2].

Regarding the environmental conservation matter, ecological design in printing seeks to conform to the environment and substantially reduce material consumption. Monochromatic design in printing has been noted as alternative technique as ecological design. Amount of ink on substrates for this design is less than that for color printing in printing process. Moreover, this design reduces the printing troubles and cost of packaging. Although monochromatic design seems to conform to ecological design, the color conspicuity is required for product design. It would like to know how to catch customer's eyes with the monochromatic design. Several factors are said to be responsible for color conspicuity for instance difference in age, gender and so on [3-6]. Color conspicuity, although, had been widely studied, a few studies have concentrated on monochromatic color. In this study, hence, the relationship between color conspicuity and color attributes was explored.

EXPERIMENT

The individuals who took part in the experiment served as subjects were 10 undergraduate student (mean age = 21 years). All subjects had either normal or corrected-to-normal vision. Fifty-two color chips selected from the Munsell Color System were used as the stimuli. The color chips included N5 and eight hues (5R, 5YR, 5Y, 5GY, 5BG, 10B and 5P) varied in different chormas. The Munsell value of all color chips was 5. The xy chromaticity coordinate of them are shown in figure 1. The color stimuli were successively observed through 1^{o} square aperture (T) at a viewing distance of 1.3 m in the windowless room as shown in figure 2. The test stimuli were large enough for the aperture to be filled with the color of one of the stimuli. All subjects received verbal instruction about task before the assessment. Subjects were asked to judge the degree of color conspicuity for each given stimuli by using the scale which divided into 7 level from -3 to +3 according to subject's unnoticeable – noticeable. Within each session, color stimuli were randomly presented on LCD monitor. Each subject did five repeatable to make 260 judgments. No time limits were set for making the judgments.

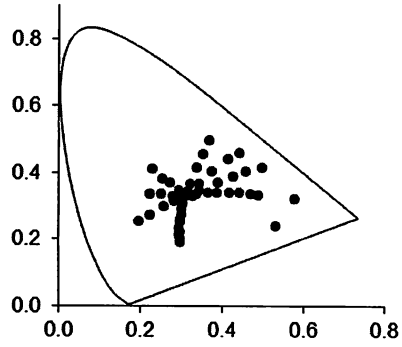

Figure 1 xy chromaticity coordinate of stimuli.

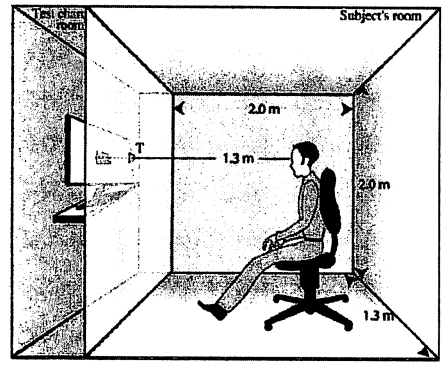

Figure 2 Schematic diagram of the apparatus.

RESULTS AND DISCUSSIONS

For each color stimuli, the color conspicuity scores from all subjects were averaged. Figure 3 shows the effect of the Munsell chroma (a) and Munsell value (b) on color conspicuity. As seen in figure 3 (a) the results showed that color conspicuity score increased when the Munsell chroma was increased and then gradually dropped off after Munsell chroma 8. The same tendency occurred in all hues. This implied that the vivid color was not ranked as the most conspicuous color. In addition, figure 3 (b) showed that the higher the Munsell value of the color stimuli, the higher the color conspicuity score. This suggests that a brighter color reaches the target of color conspicuity.

Next, we sought possible correlations between the color conspicuity and the color attributes. The CIE-Yxy value of each color stimuli was measured from the observational position using Minalta CS-100A chroma meter. Then the CIE-Yxy value was converted to CIEL*a*b* in order to investigation. Figure 4 showed the correlation between color conspicuity and hue angle (h_{ab}). The results seem to be no correlation between them. The result differs from the previous study. An effect of hue on color conspicuity was founded by many researches [3-8]. However, we thought that the contradict result may be effect by a low number of test stimuli and subjects. In the future work, then, more subjects and test stimuli will be recruited.

In addition, the relationship between color conspicuity and chromaticness (C^*_{ab}) is expressed in figure 5. The results corresponded to figure 3 (a). This showed that the color conspicuity score was increased with chromaticness and started to decrease at chromaticness approximately 60. This confirmed that more saturated colors might be inconspicuous.

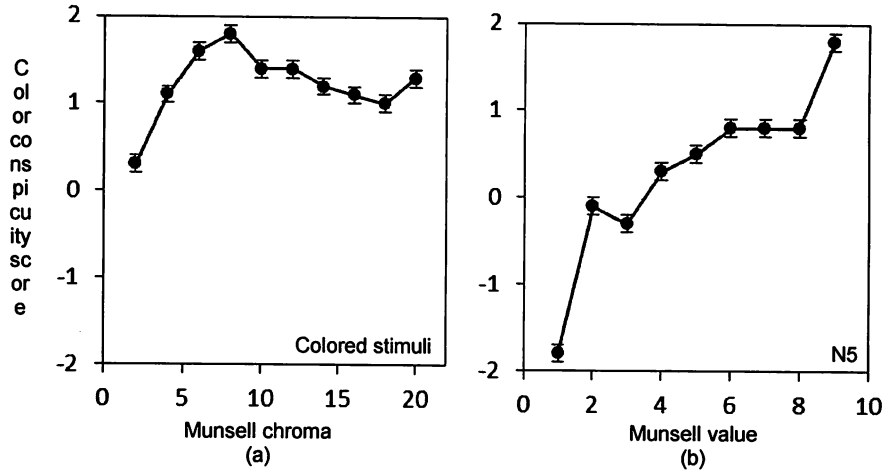

Figure 3 *Mean color conspicuity score plotted against (a) Munsell chroma and (b) Munsell value*

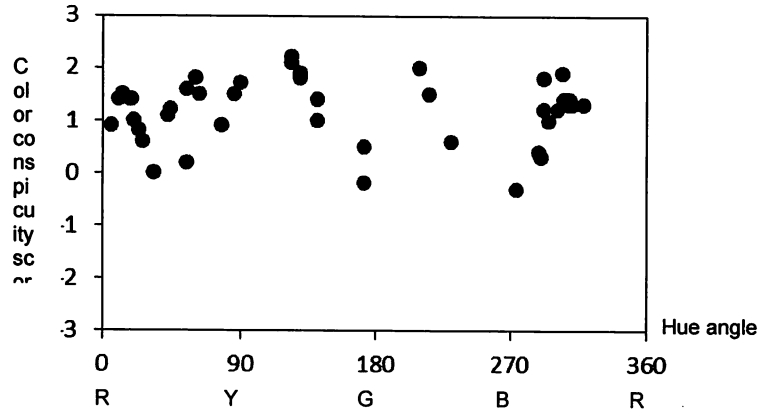

Figure 4 *Mean color conspicuity score plotted against hue angle (h_{ab})*

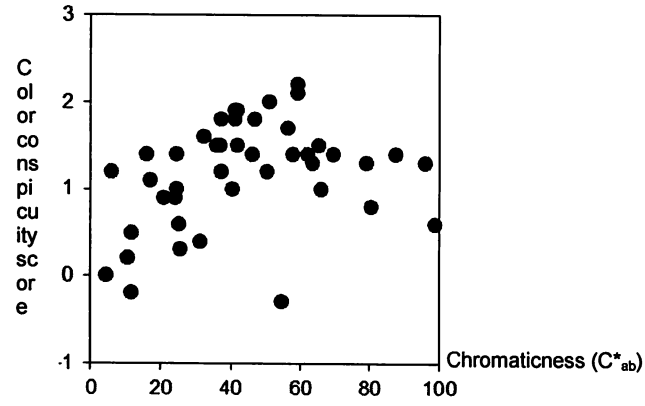

Figure 5 *Mean color conspicuity score plotted against chromaticness (C^*_{ab})*

CONCLUSION

In this study, a psychophysical experiment was carried out to investigate the color attributes effect on color conspicuity. Fifty-two color stimuli varying in hues and chromas were assessed. The findings show that the chromaticness and brightness corresponded to conspicuity score. It was clarified that the more saturated and brighter color would not reach eye-catching. The proper chromaticness and brightness remain a source of debate in the future. However, this study explored that decreasing amount of ink in printing process could be considered as monochromatic printing for ecological design.

ACKNOWLEDGEMENT

This research was funded by the grants from Rajamangala University of Technology Thanyaburi.

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