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Differences on Use of Colors before and after Color Stimulations

—Two different stimuli of images by design majors and non-design majors—

색채자극 전과 후 달라진 색 사용에 관한 연구

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Abstract

The study is about how the difference in education levels can affect the subjects' use of color and find out the features of the effect. This experimental study focused on the differences in color expression using the outline picture of a painting before and after being exposed to a full-color picture of the original painting. Differences between two conditions with two different stimuli were observed and the cause of the differences was analyzed based on the number of colors and the quantity of colors and composition of the colors used by the subjects. The study precedes an experiment based on how the level of education though experience can affect the use of colors. This study is focused on the various effects of color usage by children and adults who have various degrees of visual experience. In addition, the study analyzes how design majored subject differed in the use of color from non-design majored subject and compares the use of colors by the two groups. The results showed that design majored subject tended to use less coloring patterns after seeing the stimulus of the Monet picture with more colors, and included the colors from the stimuli they were exposed to. The non-design majored subject who viewed the Mondrian painting demonstrated opposite results by using less number of colors than before seeing the stimuli. In comparison to design majored subject, the variations in selected colors and the quantity of color by non-design majored subject were not consistent.

Keywords : Color, Color stimulation, Color sensation, Use of color, Color analysis, Color distribution

요 약

본 연구에서는 피험자의 경험에 의한 학습의 정도가 색사용에 어떠한 영향을 주고 있으며 그 요소는 무엇인지를 찾아보는 것에 있다. 본 실험에서는 서로 다른 두 유명작품을 자극으로서 사용하였으며, 피험자에게 자극의 전과 후, 같은 패턴에 색칠하기를 그려 받았다. 자극의 전후에 그려 받은 색칠하기에서 선택한 색과 색 양, 색 수, 색의 구성의 변화를 비교 분석함으로써 자극으로부터 받은 요인을 찾아보고자 한다.

본 연구는 경험의 정도가 다른 어른과 어린이의 색사용의 변화를 비교한 선행실험의 결과를 토대로 하였다. 본 실험에서는 전공에 의한 학습경험의 정도가 다른 디자인 전공자와 비 디자인전공자의 색사용의 변화를 비교해보였다. 결과로부터 디자인 전공자의 경우, 색의 자극이 다양했던 모네그림의 자극 후에는 색 수의 감소 현상이 나타났으며 자극의 그림에서 사용된 색의 선택이 높아지거나 색 양이 증가하는 경향이 보였다. 비 디자인전공자의 경우, 몬드리안그림의 자극 후 자극전의 색 수보다 감소하는 반대의 경향이 나타났으며, 디자인전공자와 비교하였을 때 선택한 색과 색 양의 변화는 있었지만 불규칙적인 경향을 나타내었다.

주제어 : 색채, 색채자극, 색채 감성, 색 사용, 색 분석, 색 분포

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1. Introduction

This study was conducted to identify the variations in color sensations induced by stimuli and focus on the characteristics of the painting stimuli. That is, the measurement of color changes in color sensations, the number of colors, the quantity of color, the selected color and the color composition is centered. The purpose of this research is to determine factors involved in color changes by varying stimuli and different subjects, and to consider development and possibilities of color sensory input.

In this study, results on colors use showed that in case of children, it increased on colors use after seeing the picture stimuli, and adults showed a decrease on colors use. Also after seeing the stimuli, there was difference in chosen colors and the quantity. Adults showed more increased reaction to certain colors than children in colored quantity[1]. The study clarified special features of the test subjects by comparing by color use color amounts and changes of chosen colors after the stimuli was presented.

That is, when coloring in their images after being shown the original works, children tended to add their impression from their own experience, whereas adults tended to consolidate their re-working of the works and their experience.

In this study images were presented to subjects and the disparity between colored-in line drawings and the original images before and after exposure to the stimuli was considered. In addition, after presenting two different stimuli, changes in color numbers, quantity of coloring area, the selected color and compositions were observed, and then factors were analyzed. In order to clarify importance of these results, additional experiments with achromatic stimulus and without stimuli were conducted. Differences by color use were observed in two separated subject groups, Design majored subject and Non-design majored subject[2].

1) S. H. Kim and S. H. Lee. (2007). Measurement of Sensitivity Information in Color Education, Japan Society of Kansei Engineering. (CD ROM).

2) This was after 'design majored subject' a 'design majors, 'non-design majored subject' a 'non-design majors an appellation.

2. Methodology

2.1. Subjects

Total subjects: A total of 14 students consisting of seven design majors and seven non-design majors from the Tsukuba of university participated in the study. The groups were divided based on the criteria specialties of the college/ university majors. (e.g. The Design major group includes people from the Design Department of a University and the Non-design major group is from major fields other than the Design Department of a University.) Conducted in Ibaraki School in Tsukuba, Japan, the study was held in the city's National University.

2.2. Main experiment

The experiment was conducted by questionnaire and visual stimulation.

(1) The experiment was conducted to all subjects. The questionnaires were based on favorite color and number of memorizing colors and images that pops up when seeing the color. Also subjects were questioned about art knowledge, learning experience on art, painting experience and interest in art.

(2) Subjects were exposed to two pictures which utilized colors in significantly different ways ('Composition with Red Blue Yellow' by Piet Mondrian, 'Viale Del Giardino' by Claude Monet). Two experiments were conducted in one week gap in order not to influence each other, and subjects were exposed to stimuli for 5 minutes (Figure 1).

(3) To increase concentration on stimuli, subjects were given an order to create a story while being exposed to stimuli.

(4) Outlined versions of images were given to subjects, before and after stimuli were presented and 24 crayon colors were used as drawing medium. We focused on selection of colors, color amounts in the area

painted, and color numbers selected by subjects.

(5) In order to observe changes in subject's coloring procedure in reaction to stimuli, we compared pictures produced before and after exposure to stimuli. In addition, in order to examine on colors use by two different stimuli, we compared pictures after stimuli (Figure 2).

(6) For additional experiments, an achromatic stimulus experiment and an experiment without stimulus were conducted, and 5 people were randomly selected as subjects.

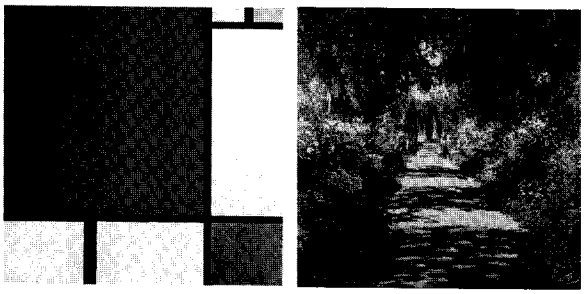

Figure 1. Stimuli of the experiment

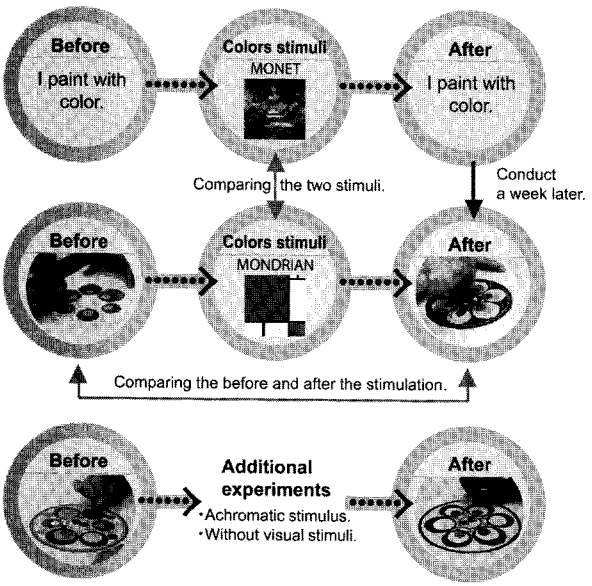

Figure 2. Flow experiments

3. Results

3.1. The number of colors

As a result, subjects used an average of 8 to 9 colors before stimuli. However, subjects used an average of 8 colors (7.5colors) after seeing Monet picture stimuli[3], and an average of 7 colors (6.93colors) after seeing Mondrian picture stimuli[4]. For the average, there were no bigger changes in used color for painting before and after stimuli, but showed big changes in used colors depended on a major field.

Results of design majors after being presented the Monet stimuli are as follows: an increase in colors: 1 subject, no change: 1 subject, a decrease of colors: 5 subjects. Results following the Mondrian stimuli are: an increase of colors: 2 subjects, no change: 2 subjects, a decrease of colors: 2 subjects and as for non-design majors seeing the Monet stimuli resulted in: an increase of colors: 3 subjects, no change: 2 subjects, a decrease

Table 1. Comparison of the number of colors by major

design major						
subject No.	Monet			Mondrian		
	Before	After	difference	Before	After	difference
1	8	4	-4	4	4	0
3	3	4	1	5	6	1
6	14	10	-4	7	10	3
7	8	8	0	6	5	-1
10	10	7	-3	5	7	-2
11	7	3	-4	3	3	0
12	10	6	-4	6	5	-1
Average	8.5	6	-2.6	5.1	5.7	0

non-design major						
Subject No.	Monet			Mondrian		
	Before	After	difference	Before	After	difference
2	10	9	-1	11	8	-3
4	7	9	2	9	9	0
5	8	8	0	9	9	0
8	11	12	1	12	10	-2
9	3	4	1	6	3	-3
13	12	12	0	12	11	-1
14	11	7	-4	10	6	-4
Average	8.8	8.7	-0.1	9.8	8	-1.8

3) This was after 'Monet picture stimuli' a 'Monet stimuli' an appellation.

4) This was after 'Mondrian picture stimuli' a 'Mondrian stimuli' an appellation.

of colors: 2 subjects, and for Mondrian stimuli: an increase of colors: 0 subjects, no change: 2 subjects, a decrease: 5 subjects. This shows design majors showed a decrease on color use after Monet stimuli, and non-design majors oppositely showed a decrease on color use after Mondrian stimuli. As the results from stimuli, subjects showed increase and decrease of colors in paint drawings after the test, and showed differences between design majors and non-design majors.

3.2. The selected colors and compositions

The result of changes by color uses: subjects showed high usage of cool colors out of 24 colors, but after stimuli, usage of cool colors had decreased.

After Monet stimuli, there were different changes on color use depended on a major, but not regularity. After Mondrian stimuli, design majors showed an increase of red, yellow, black, gray and white. This clearly shows subjects are imitating picture used as stimuli. Also for non-design majors showed a general decrease of color usage, but this does not appears to be a stimuli influence (Figure 3, Figure 4).

3.3. The quantity of colors

The results of increase and decrease of color quantity with subjects showed unstable increase and decrease of color quantity after Monet stimuli and after Mondrian stimuli, they showed an increase of red, black and white. Also decrease of sky blue, blue, indigo blue and pink colors.

In case of design majors, results clearly showed stimuli directly influenced subjects by an increase in certain color quantity. In case of Monet stimuli on design majors, there was increased color usage of orange, lemon, Olive brown and white, and a decrease in color usage of sky blue, dark blue and indigo blue. For non-design major there was an increase color usage of yellow, light orange, and dark green, and a decrease usage of cool colors like sky blue, dark blue and purple.

In case of Mondrian stimuli, design majors have shown greater differences on color use than non-design major. Therefore this indicates that subjects with design majors were more reactive toward stimuli. That is, In case of Mondrian stimuli for design majors, an increase of usage of red, black and white were remarkable and decrease of orange, gray, and cool colors were remarkable (Figure 5). For non-design majors, an increase in usage of red, light green, green and dark blue, and a decrease usage of yellow, purple and gray (Figure 6).

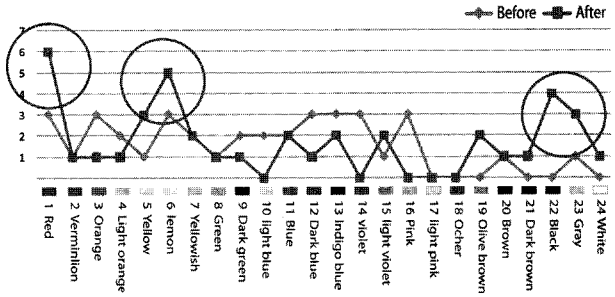

Figure 3. Changes of selected colors before and after by Mondrian picture stimuli (design major)

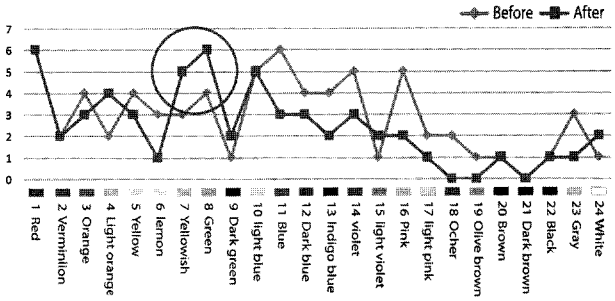

Figure 4. Changes of selected colors before and after by Mondrian picture stimuli (non-design major)[5]

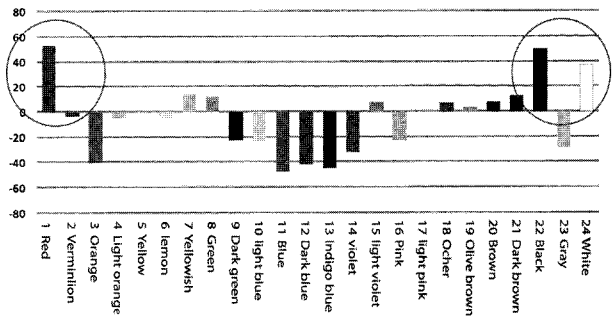

Figure 5. Change the colors quantity of Mondrian stimuli(design major)

5) A graph to show 24 crayon colors used in the experiment.

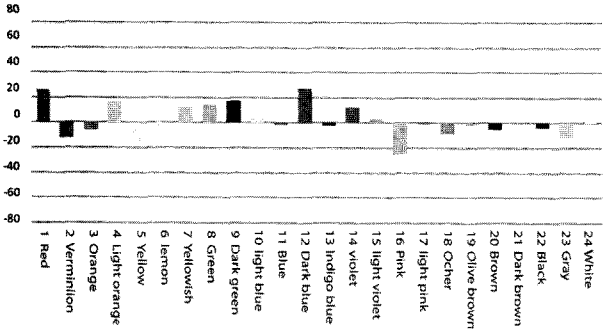

Figure 6. Change the colors quantity of Mondrian stimuli (non-design major)

3.4. Additional experiments

3.4.1. Achromatic stimulus experiment

In order to observe changes in subject's coloring procedure in reaction to stimuli, the experiment was conducted with monochrome images. As a result, many subjects either reduced color numbers, they used in response to both stimuli or did not change used color numbers. However, it is noticeable that compositions and color quantity only for monochrome images increased significantly. It is considered that subjects were influenced by visual stimuli. In Figure 7, it is the result that is showed changes on uses of colors after a stimulus with an achromatic color. Through painting in picture, it can observe color selections and changes of color compositions.

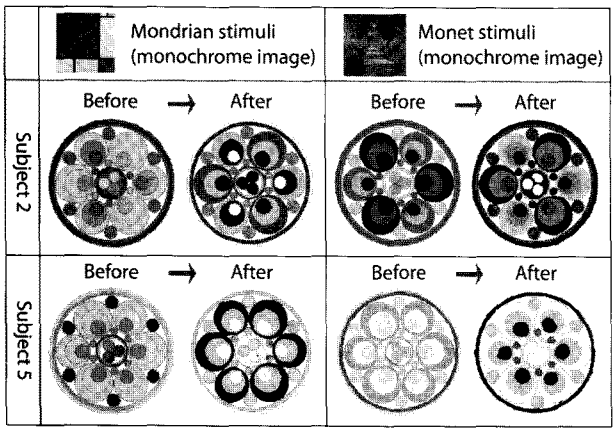

Figure 7. Change in the color compositions by stimuli

3.4.2. Experiment without visual stimulus

From the result of an experiment without stimulus, it is not able to find out changes of color numbers, compositions of colors, and color quantity. It is a very important result which can verify changed in numbers of colors, compositions and quantity of colors were influenced by stimuli. As an additional experiment, it made progress of an experiment without stimulus and an achromatic color, and this is the graph of compared results by color numbers (Figure 8).

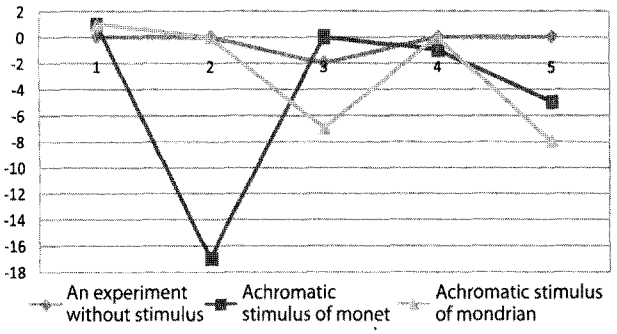

Figure 8. Difference in the number of color

4. Analysis

Comparing the results of showing stimuli to children and adults with completely different levels of experience it has shown that on color use changed by experiences. This study has shown how on colors use change after being presented stimuli of two categories of adult subjects.

The result of color numbers, design majors showed a decrease on color use after Monet stimuli, and non-design majors oppositely showed a decrease on color use after Mondrian stimuli. As the results from stimuli, subjects showed increase and decrease of colors in paint drawings after the test, and showed differences between design majors and non-design majors. The result of selected colors changes, the result of changes on colors use: subjects showed high usage of cool colors out of 24 colors. After stimuli, usage of cool colors had decreased. The result of changes on colors use by subjects showed that design majors were more influenced by it than non-design majors. Also, the Mondrian stimuli had more

influence on color style than the Monet stimuli. The result of increase and decrease of color quantity, subjects showed unstable increase and decrease of color quantity after the Monet stimuli, and after the Mondrian stimuli showed an increase of red, black, and white. In case of design majors, results clearly showed stimuli directly influenced subjects by an increase in certain color quantity. In case of the Mondrian stimuli, design majors has shown greater difference on colors use than non-design majors, and this means that they are more reactive toward stimuli.

Furthermore, changes were not noticeable in all aspects of color numbers, compositions and color quantity in the experiment without visual stimulus. In the experiment with monochrome stimulus, monochrome colors (black and white) increased in terms of selected colors and color amounts. Consequently, it can be verified that test results corresponded to changes in visual stimuli.

5. Conclusions

With results of the experiments, we observed that two different stimuli influenced more in changes in numbers of color, compositions and color quantity, and more importantly experiences of subjects influenced the results. As the results show there was big difference on use of colors after stimuli between design majors who had well experience in art and non-design majors. Especially with abstract pictures with limited color, which of influenced more changes on use of colors than landscapes with various colors. In case of design majors, there was a decrease of color usage after stimuli, and showed patterns of used colors in stimuli. Also showed increase in color quantity that stimuli showed. In case of non-design majors, there were changes in usage of colors, such as increase and decrease of color quantity by stimuli, were seen but it was quite unstable. Also decrease in numbers of color usage after Mondrian stimuli opposite to design majors. The result was as same as the result of adult and child comparison test. The level of education and experience affected the on use of colors after the stimulus. That is means, level of education and experience affects use of colors.

When a visual stimulus design majors was given, showed a more marked trend to select and use colors depended on color compositions (an abstract painting or a landscape) than non-design majors. For example, in case of stimuli were simple colors, design majors expressed colors variously by using their own experience. Meanwhile in case of stimuli were various colors, they first put them in order of color characteristics and expressed them. These results showed the similar pattern with the study of S. H. Kim and S. H. Lee. (2007) [6], that is in design majors, characteristics affects stronger in adults them children.

For future study, the factors and reasons of how different expression is made by the colors image of experiences and real image, will be studied.

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