Basic Verification to Adopt Colors for the Nursing Care

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Ⅰ. Objective

As for elderly people, it is desirable to enhance cerebral activity during drinking and eating, recreation, and so on. I, researcher, considered whether I could use colors as routine stimulation. However, at existing state, there aren't many studies conducted so far that relates to color in the field of nursing.

Therefore, as the study purpose in this study, I decided to perform the basic verification of the relationship between the color preference and the influence which was exerted on the frontal lobe activity and subjective awakening degree by adopted colors in the nursing environment. Considering the colors to be adopted in the nursing-care environment, I performed the verification of different colors using five colors of tablecloths.

Ⅱ. Methods

1. Subjects

I enrolled 14 young healthy women of 18 to 30 years old (average age 22.1±2.1 years old) whose study consent could be obtained. They were healthy subjects with normal color sense and normal autonomic nervous function.

2. Color stimulation

Using a small table of 150cm×90cm (light gray color, 5Y7/1), I changed only the colors of the tablecloth covering it. For the colors used in the experiment, I used chromatic colors from the Munsell hue circle (Figure1). I selected red, yellow, blue and green with high chroma. For the achromatic colors, I selected white. I used color tablecloths that were marketed products. The Munsell values were red (5R4/12), yellow (7.5Y8.5/10), blue (5PB4/10), green (7.5G4/8), and white (N9.25).

The colorimetry was selected using visual judgment based upon the colors in the Munsell system devised by the Japan Color Research Institute Foundation and instrumental judgment using the colorimetry of the ColorMunki Design (X-Rite, Incorporated, Figure2).

All subjects participated in five color experiments on the same day, and the tablecloth order was randomly determined for each subject.

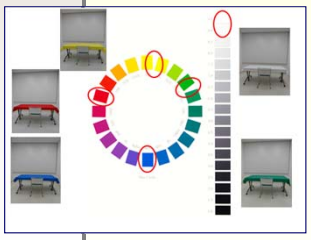

Figure1. Using colors on the Munsell hue circle

Figure2. The color measuring device

3. Measurement items and a measurement tool

1) Blood-flow volume change in the frontal lobe

I used a light imaging cerebral function measuring device OEG-16 (made in Spectratech, Figure3).

This measuring device can measure the blood-flow volume change in the frontal lobe using Near-infrared spectroscopy (NIRS) at the same time in multi-channel.

Figure3. The cerebral function measuring device

http://www.spectratech.co.jp/index.html

2)Subjective awareness

I collected data using the Japanese UWIST Mood Adjective Checklist (JUMACL). JUMACL is a Japanese version of the mood checklist was developed by a group of Cambridge University. This tool consisted of 20 items pertaining to the subject's emotion.

Outcomes are Tense Arousal (TA) and Energetic Arousal (EA). Each score is measured by four-point scale.

These scores evaluated according to a test guide (table 1). Before and after subjects looked at each color, I collected the data.

4. Study procedures and analysis method

The study time in one measurement course was a total of 6 minutes: eye-opening at rest (one minute), closed eyes at rest (two minutes), and color stimulation (three minutes). The procedure in each study course was set the same and subjects took a five-minute break after each of five study courses was completed.

The analysis points of the blood-flow volume change in the frontal lobe were set in the two points consisting of CH4 (the right frontal lobe) and CH13 (the left frontal lobe) in this study and then calculated average values of the Oxy-Hb changes between during the eye-opening at rest and during the color stimulation. As for the five colors, I compared blood-flow volume changes between during eye-opening at rest (the color of the small table) and during the color stimulation in each color. I also compared them between five colors.

Ⅲ. Results and discussion

The color stimulates people!

1. Changes of brain blood-flow volume

In the comparison during the eye-closed at rest and during the color stimulation, the activation of the frontal lobe could be confirmed with the significant increases of the values for all color in CH4 and CH13. This shows that I was able to measure cerebral activation by the color stimulation in this device.

In the comparison during the eye-opening at rest and during the color stimulation, the activation of the frontal lobe could be confirmed with the significant increases of the values for blue in CH4 and for red, blue, and green in CH13 (Table1). There was no significant difference between five colors.

Table1. Comparison of resting with eyes open and color stimulation

Red	Right（CH4）		Left（CH13）	
	ΔOxy-Hb	Wilcoxon	ΔOxy-Hb	Wilcoxon
eye-opening	0.5±0.2	0.064	0.2±0.1	0.026
color stimulation	0.7±0.2		0.4±0.1	
eye-closed	0.4±0.2	0.001	0.1±0.1	0.004
color stimulation	0.7±0.2		0.4±0.1	

Blue	Right（CH4）		Left（CH13）	
	ΔOxy-Hb	Wilcoxon	ΔOxy-Hb	Wilcoxon
eye-opening	0.3±0.2	0.008	0.1±0.1	0.008
color stimulation	0.6±0.2		0.3±0.1	
eye-closed	0.2±0.1	0.002	0.02±0.1	0.011
color stimulation	0.6±0.2		0.3±0.1	

White	Right（CH4）		Left（CH13）	
eye-opening	ΔOxy-Hb	Wilcoxon	ΔOxy-Hb	Wilcoxon
color stimulation	0.4±0.3		-0.1±0.1	
	0.6±0.3	0.300	-0.2±0.1	0.198
eye-closed	0.2±0.2		-0.3±0.1	
color stimulation	0.6±0.3	0.001	-0.2±0.1	0.011

Yellow	Right（CH4）		Left（CH13）	
	ΔOxy-Hb	Wilcoxon	ΔOxy-Hb	Wilcoxon
eye-opening	0.4±0.2	0.074	0.2±0.2	0.064
color stimulation	0.6±0.2		0.4±0.2	
eye-closed	0.2±0.2	0.001	0.1±0.1	0.002
color stimulation	0.6±0.2		0.4±0.2	

Green	Right（CH4）		Left（CH13）	
	ΔOxy-Hb	Wilcoxon	ΔOxy-Hb	Wilcoxon
eye-opening	0.6±0.3	0.084	0.3±0.2	0.048
color stimulation	0.7±0.3		0.4±0.2	
eye-closed	0.3±0.3	0.001	0.01±0.1	0.001
color stimulation	0.7±0.3		0.4±0.2	

Note :
ΔOxy-Hb=amount of change values (mM・mm).
Values in the tables are averages and standard errors (n=14, average±SE).
P-values are indicated in the test results (Results of the Wilcoxon signed-rank sum test).

2. Study on subjective awakening degree

As for the TA, a significant score increase for yellow and a significant score decrease for green were found. As for EA, a significant score increase for red and significant score decrease for white were found. It was demonstrated that yellow and red stimulated the subjective awakening degree, while green and white calmed it.

Table2. Comparison pre- and post-trial of JUMACL scores

	pre-trial	post-trial	Wilcoxon test
Red			
TA	TA 14.1±0.7	16.1±1.5	0.007
EA		32.6±1.1	0.001
Yellow			
TA		17.0±1.5	0.001
EA		29.5±1.4	0.017
Blue			
TA		13.1±1.0	0.004
EA	EA 29.0±1.2	27.6±1.7	0.012
Green			
TA		11.3±0.5	0.000
EA		26.9±1.8	0.012
White			
TA		14.9±1.2	0.014
EA		27.3±1.3	0.003

Note
Values in the tables are averages and standard errors (n=17, average±SE).
TA: tense arousal, EA: energetic arousal.

Ⅳ. Conclusion

When looking at the changes in cerebral blood flow caused by color stimulus, a significant increase in value was recognized in red, blue and green and frontal cortex activation was confirmed. Subjective investigation presented that yellow and red are stimulus color and green and white are the color that helps to calm. **The result suggested a possibility that color can be used on a daily basis as nursing care in order to stimulate cerebrum.**

It is considered to have a high general versatility as the tablecloths method which can be easily used by anyone was adopted in this study.

I will extend the study subjects to elderly people and will discuss the practical use of it in the nursing-care in the future.

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Thank you for your interest in my presentation.