

CHANGES IN THE PERCEPTION OF COMFORTABLE LIGHT COLOR FROM PARTIAL TO HOLISTIC SPATIAL PLANES

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ABSTRACT

Television, mobile phones, computers and other communication media make access to information easier. However with our growing dependence on such devices, there is a need for research on how people react to luminous light sources. This research aims to discover the difference in the perception of the luminous color which is the most comfortable for people as their field of vision shifts from a partial to a holistic spatial plane.

1. RESEARCH BACKGROUND

Human beings get around 65% of their information through vision, about 25% by hearing, and 10% through the other senses. That means visual information takes up a great part of our sense channels.

These days, with increasing information, through television, mobile phone, computer and other communication media information display devices with luminous sources have become more important than ever before.

There have been lots of studies on color psychology. It is very complicated to explain how human beings feel. Human character depends on the surrounding situation. An individual reacts differently to specific stimuli in different surroundings.

Faber Birren (1900-1988) found that human beings usually show common reactions when they are in a similar situation. He said that the feeling and blood flow of human beings are changed by the colors in their surroundings.

Color psychologists have been improving their research on human sensory reaction. However, it does not provide adequate understanding of the human meaning of visual stimuli and how this underlies human reaction to them.

Researchers in design fields conducted lots of studies on human reaction to color in terms of human physiology. They provide information about color and human reaction in general, not about emotions in the human mind. So, that is not enough to explain the specific non-verbal feelings and images floating in the human mind as moving shapes when an individual faces different situations. That is why research on human reaction to color, shape, and movement in specific situations is needed.

2. AIMS OF RESEARCH

Human beings have experienced lots of stress since 1789, and this gets worse as time goes by. These days, many artifacts trigger stress, even though they were originally designed to meet human needs. Human beings, living in contemporary times, need to do something to find relief from stress.

It has become increasingly common to access information through display devices with luminous light sources, e.g., television, mobile phones, computers and other communication media. Given this situation, understanding human reaction to light color, especially luminous light color, is highly relevant to everyday life.

If we could find the visual reaction points at which people come to feel comfort, relaxation, pleasure and calm, designers can improve our visual environment.

This research aims to discover how people react to the colors of luminous sources and measure the difference in their reaction to the same luminous color from a thing, a partial spatial plan and a holistic spatial plane.

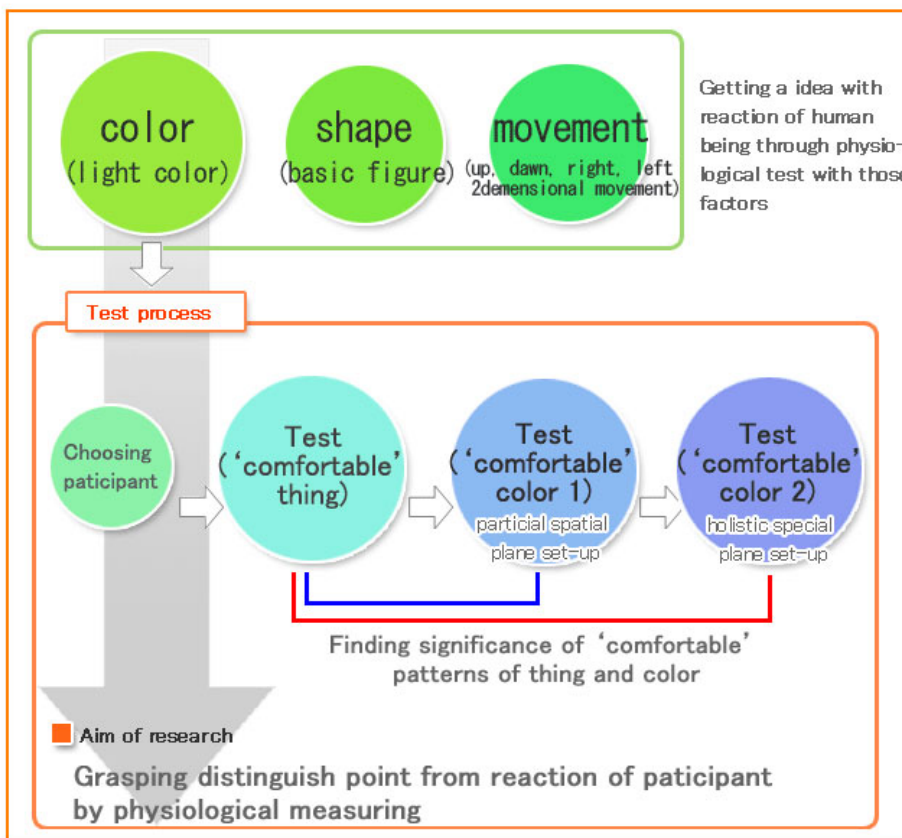


Fig 1: test process of the research aim

2. 1. Test process with [comfortable thing] and [comfortable color]

In this research, [comfortable: iyasareru in japanese] means [relax], [pleasure] and [calm]. In the test process, a comfortable thing or color makes the participant to comfortable as they are tested.

The participants were interviewed and asked to choose comfortable thing and a comfortable color for themselves before the test.

Let the participant see the thing and the color, that made in feel comfortable.

And measure their condition with the [HSK-centered rhythm monitor slim]

Find the correlation between what the participants said made them feel comfortable and the data obtained through the test. The comfortable color test is in two parts. One part is conducted with a partial special plane set-up, the other is a holistic spatial plane set-up. To process is as follows:

2. 2. Physiology measuring device used in the research

[HSK-centered rhythm monitor slim];

This device measures the comfortable and pleasure statuses of the participants. It can measure the condition of the participant without any direct pressure. This is why we chose the HSK to read the data based on the Yosida's pleasure measure model.

Many psychological research studies show that emotion evaluation measure can operate on two axes, i.e., Valence : positive-negative and Arousal : excited-calm, and these are the basic factors of pleasure. The movement of the Alpha wave spectrum of the brain has been found to correlate with emotion.



Fig.2. HSK-centered rhythm monitor slim

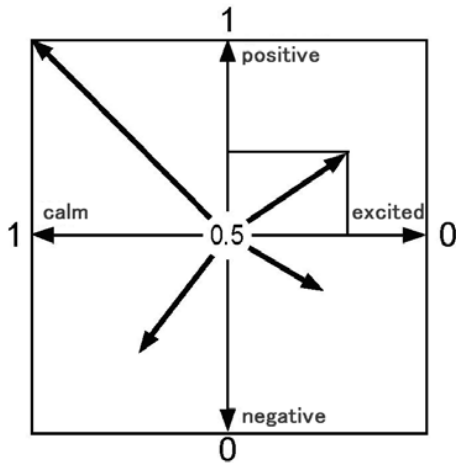


Fig.3. Affection vector model (Yoshida, 2002)

An individual's feeling condition is estimated on the basis of the slope coefficients of the frequency fluctuation of the Alpha waves in the left/right frontal area plotted in two valence/arousal dimensions. The absolute value of slope coefficients varies between 0 and 1. The horizontal axis, corresponding to the right frontal area, expresses the "feeling of arousal". The vertical axis, corresponding to the left frontal area, expresses the "pleasure-negative mood". When a subject is in a negative mood and a state of high arousal, the absolute value of slope coefficients is near 0 point, whereas the absolute value of slope coefficients is near 1 when a subject is in a pleasure mood and a state of low arousal. The arrow vector represents the degree of comfortableness, calculated in the most of the two slope coefficients.

2. 3. Test contents

Test by comfortable thing

Define the word 'stable', 'relax', and 'pleasure' involved in the 'comfortable' state. And stimulate the participant with the 'comfortable' thing. Then find out the distinguishing in condition of the brain wave movement.

Test by luminous light source with the partial spatial plane set-up

Show the chosen color from a partial at plane to the participant. Then check the condition of the brain wave movement.

Show the chosen color in a holistic at room to the participant, then measure the condition of the brain wave movement.

2. 4. Test order

1. Interview all 8 participants to find out what their comfortable thing and color are.
2. Adjust the light, temperature, and humidity to suit the participant.
3. Interview the participant about their condition.
4. In a dark room, set up the partial spatial plane and the holistic at experimental plane set-up, after finding the specific visual setting which is the most comfortable for the participant (figure 4).
5. Ask participant to close the eyes for 30 seconds, then show the 'comfortable' thing to him/her .
6. Ask participant to close the eyes for 30 seconds after getting the participant to give information about the point at which they begin to feel comfortable (figure 4).

7. Interview the participant to make sure that he/she was comfortable when he/she was tested.

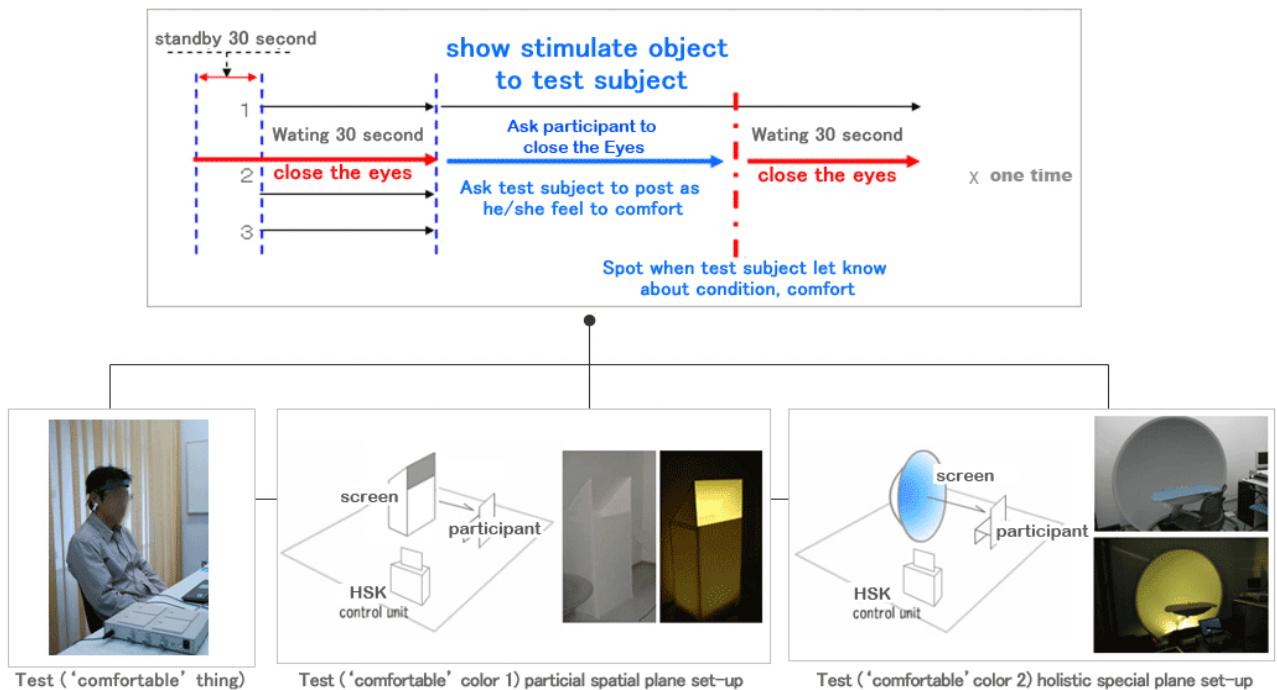


Fig.4. stimulus and test condition of three different situation.

3. RESULT FROM THE COMFORTABLE THING TEST

No	Participant	Comfortable thing	Data code
1	A	Picture(puppy)	A-iM
2	B	Book(bible)	B-iM
3	D	Picture(participant's picture of face)	D-iM
4	E	Picture(landscape picture)	E-iM
5	F	Book(bible)	F-iM
6	I	Picture(family)	I-iM
7	J	Picture(picture of participant's child's)	J-iM
8	K	Picture(acquaintance child)	K-iM

Fig.5. Comfortable thing to every participant(example)& the result of comfortable thing

time (second)		displeasure – pleasure (0-1)	excited-calm (0-1)	degree of pleasure (%)
before	0-30	0.35	0.98	73.9
after	165-185	0.32	0.13	27.2
after-before		-0.03	-0.85	-46.7

Fig.6. Data by [positive-negative, exited-calm, degree of pleasure] (ex.)

3. 1. CONSIDERATION FROM THE COMFORTABLE THING TEST

Given the cause of time take to get comfortable from 8minutes to 653seconds, it is supposed to have valence. The participant who chose book as the comfortable thing took 653seconds.

Dispersion analysis of the data showed that the participants who chose picture took a shorter time to get comfortable than those who chose book.

But changing the picture content had no affect on the participant.

	participa nt	comfortabl e thing	attribute of thing	whether including children or not	landscape or creature / bible	taking time to comfort
1	A	picture	general	etc	creature/ bible	135
2	B	book	bible	etc	creature/ bible	89
3	D	picture	acquaintance	etc	creature/ bible	100
4	E	picture	general	etc	landscape	8
5	F	book	bible	etc	creature/ bible	635
6	I	picture	acquaintance	kid	creature/ bible	70
7	J	picture	acquaintance	kid	creature/ bible	89
8	K	picture	acquaintance	kid	creature/ bible	41
analysis of variance : ANOVA		P=0.0734	P=0.2356	P=0.4249	P=0.5070	—

Fig.7.comfortable thing chosen by every participant

No particular changes during the process were found. So we need to consider the “before” and “after” values of [positive-negative], [excited-calm], and [degree of pleasure].

Compare the participant’s condition to “after” values with his/her participant’s brain wave measurement.

For [positive-negative], the “after” average is up a little or the same as before. For [excited-calm], the “after” average of 5 of the 8 participants is up [red circle and blue rectangle areas]

The pleasure degree of 6 of the 8 participants climbed [where black triangle].

In other words, the comfort condition is identifiable based on the participant’s reaction by his / her post.

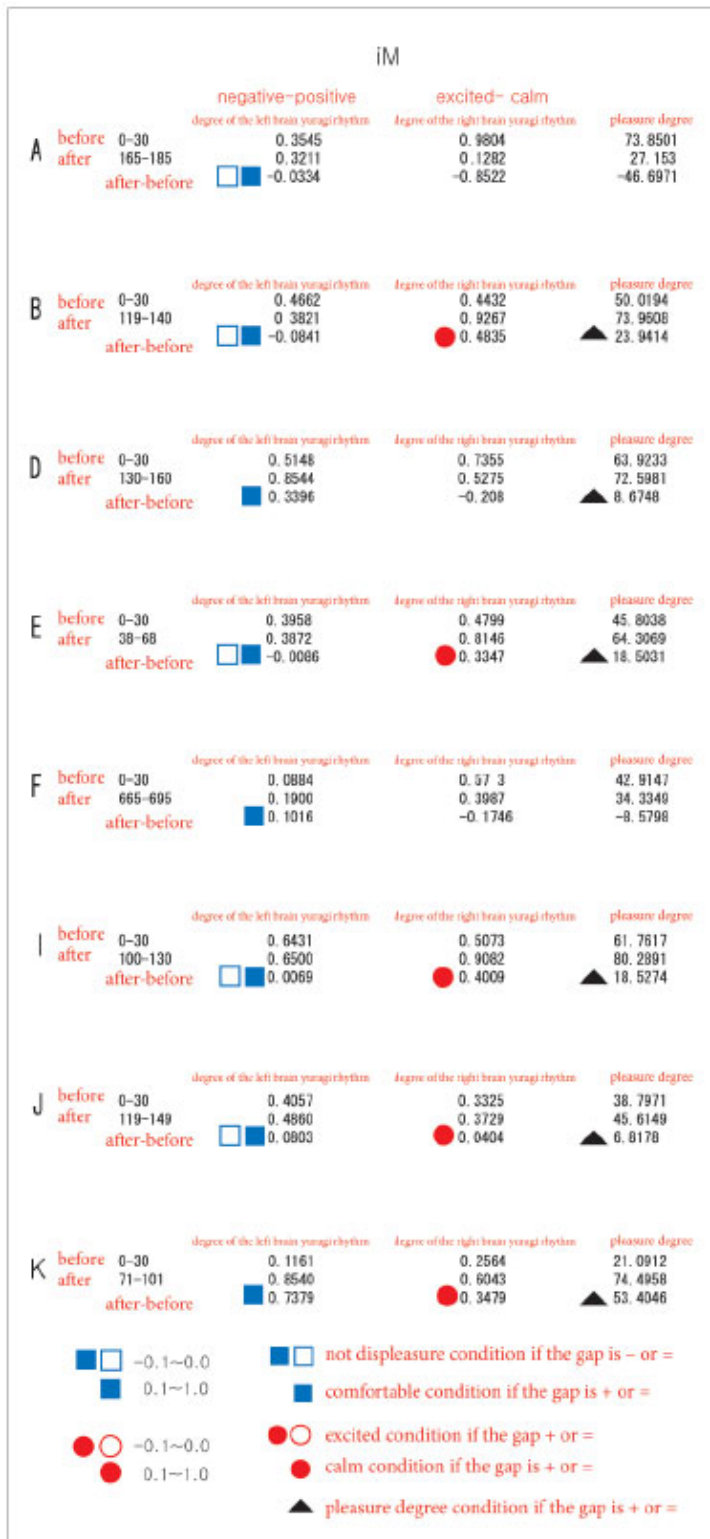


Fig.8.compare after condition of participant with before

4. RESULT OF LUMINOUS LIGHT COLOR IN PARTIAL SPATIAL

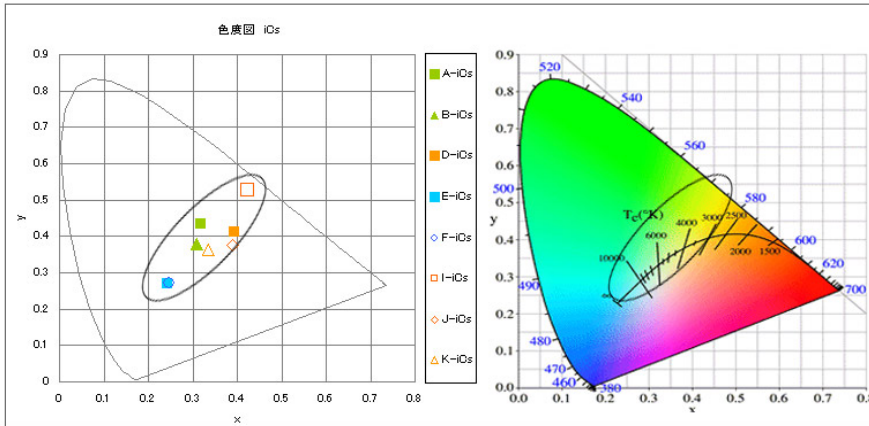


Fig.9.comfort luminous light color of participant in partial spatial

There is no valence between the color chosen by the participant and the time takes to be come to feel comfortable.

No	Participant	Comfortable luminous light color in partial spatial	Taking time to comfort(second)
1	A	Green color series	41
2	B	Green color series	41
3	D	Yellow color series	72
4	E	Light blue color series	22
5	F	Light blue color series	121
6	I	Yellow color series	30
7	J	Yellow color series	196
8	K	Yellow color series	14
analysis of variance : ANOVA		P=0.8360	-

Fig.10.Color series at the time participant pointed as comfort

For [positive-negative], the “after” average is a little up or the same as before. For [excited-calm], the “after” average of 5 of the 8 participants is up [where red circle and blue rectangle].

The pleasure degree of 6 of the 8 participants climbed [where black triangle].

In other words, the comfort condition is identifiable possible based on participant’s reaction by his/her post.

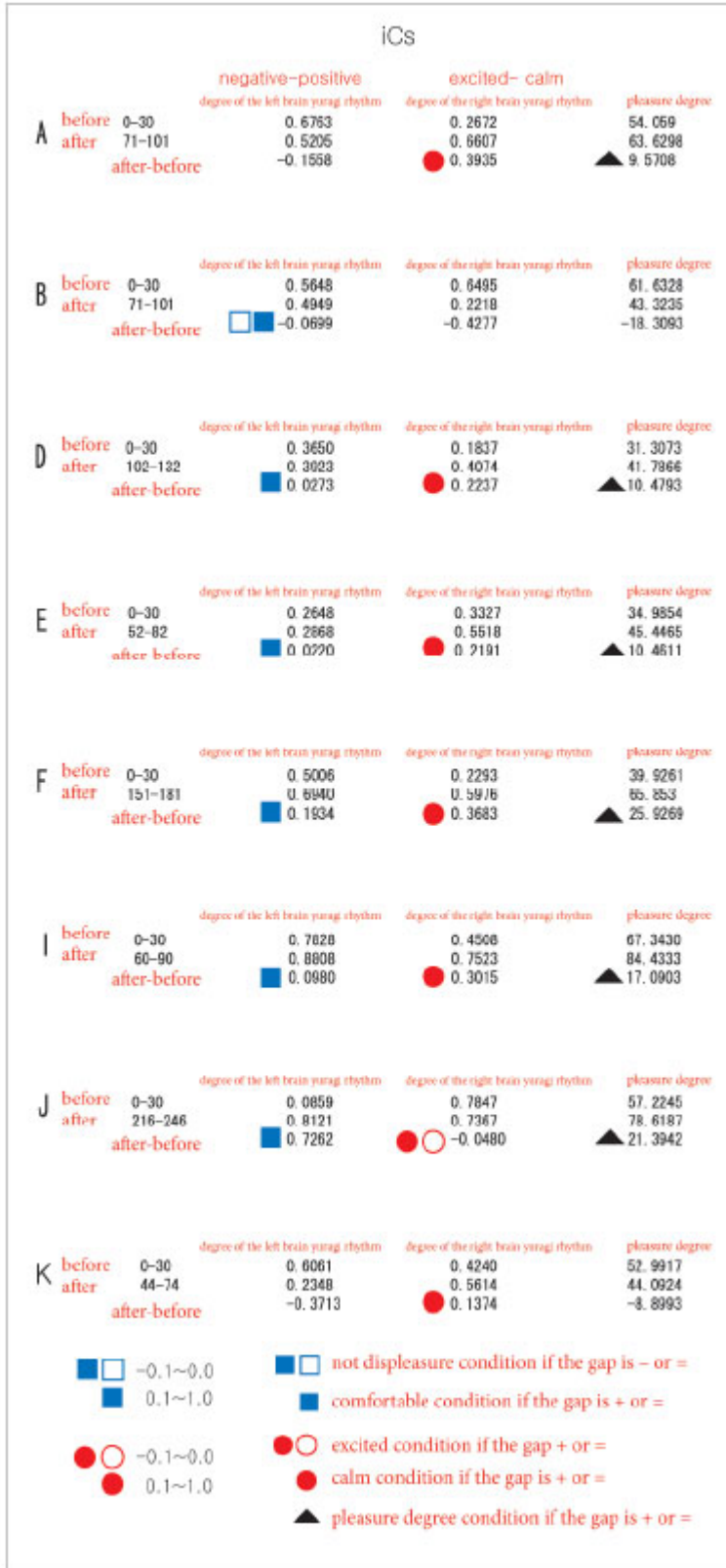


Fig.11.compare after condition of participant with before

5. RESULT OF LUMINOUS LIGHT COLOR IN HOLISTIC SPATIAL

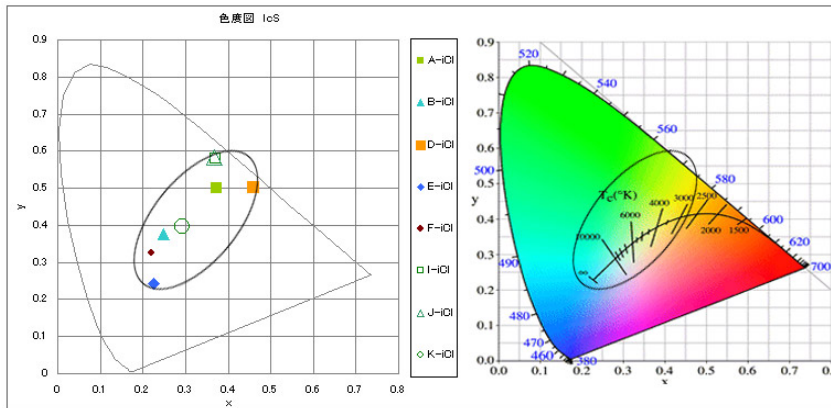


Fig.12. comfort luminous light color of participant in holistic spatial

time (second)		displeasure – pleasure (0-1)	excited-calm(0-1)	degree of pleasure (%)
before	0-30	0.68	0.27	54.1
after	136-166	0.93	0.96	94.6
before – after		0.25	0.69	40.6

Fig.13. Data by [positive-negative, excited-calm, degree of pleasure] (ex.)

There is no valence between color chose by participant and taking time.

No	Participant (participant)	Luminous light color n holistic spatial plane	Taking time to be comfort(second)
1	A	Green color series	106
2	B	Light blue color series	53
3	D	Yellow color series	61
4	E	Light blue color series	14
5	F	Light blue color series	52
6	I	Green color series	36
7	J	Green color series	116
8	K	Green color series	15
analysis of variance : ANOVA		P=0.6812	-

Fig.14. Compare after condition of excited- calm, and positive-negative to before ones.

The test result showed that the “before” and the “after” average of 6 of the 8 participants for [positive-negative] was the same or up, and that for [excited- calm] was up [red circle and blue rectangle].

The pleasure degree of 6 of the 8 participants increased [black triangle].

In other words, the comfort condition is identifiable on the brain of the participant’s reaction by his/her post.

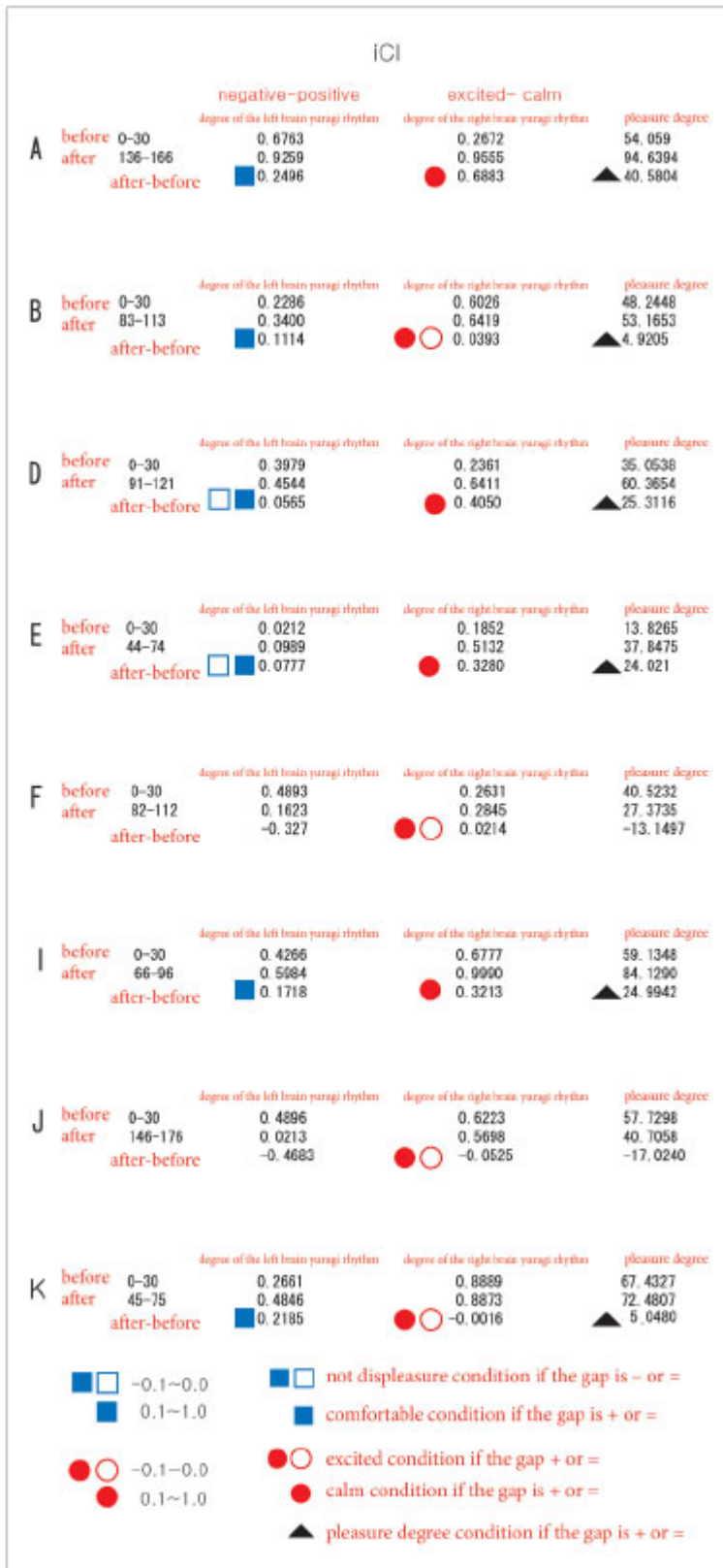


Fig.15.Comparing condition of participant before and after with stimuli

6. CONSIDERATION OF IM (COMFORTABLE THING FOR PARTICIPANT) & ICS (COMFORTABLE COLOR FOR PARTICIPANT IN PARTIAL SPATIAL PLAN)、IM & ICL (COMFORTABLE COLOR FOR PARTICIPANT IN HOLISTIC SPATIAL PLAN)、ICS & ICL

There was no connection between the participants in terms of iM & iCs、iM & iCl、iCs & iCl in the same time period. It means that the participants experienced different physiological conditions in respond to the surrounding situation, even when using the same word “comfortable”.

Time (second)	At the start time stimulate participant		At the end time stimulate participant	
	-correlation	+correlation	-correlation	+correlation
max	2	1	1	-
15	1	1	-	3
10	2	2	1	2
5	1	2	2	3
3	5	2	3	5
1	5	3	3	2
total	16	11	10	15

Fig.16.Example of correlation

From the start point of giving the participant stimuli, 16-correlation spots, and 11+ correlation spots were found. At the ending points of giving the participant stimuli, 10-correlation spots, and 15+ correlation spots were found. It shows that there was stronger correlation of +and -points between the time zone getting from 3 minutes to 0 minute than others.

7. RESULT

This research finds that the comfort condition is different even though the participants use the same word “comfortable”. With more concentration on +correlation than -correlation with valence significance on 3 groups, ie., iM (comfortable thing for participant) & iCs (comfortable color for participant in partial spatial plan)、iM & iCl

(comfortable color for participant in holistic special plan)、iCs & iCI, the data shows that the participants feel comfortable after the test. The result shows there is a common factor for human comfort. It is going to be the clue for more research to improve on the human on “comfort”.

8. ACKNOWLEDGMENT

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