

# Dim Level of Awareness and Color-Form Responses

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In order to answer the question if the tendency to find faster either the color aspect or the form aspect in visual stimuli in the recovering stage from clouding after the electro-convulsive shock might be due to some effect of the electro-convulsive shock, the author designed the present experiment. The insulin therapy served as the good chance for investigating the color-form response in a dim and weakened level of awareness of the subject. The present experiment also showed a noticeable fact that the subjects indicated the fairly constant tendency to find faster either the color aspect or the form aspect in visual stimuli in a dim and weakened level of awareness following the insulin therapy.

In the previous papers, the author reported that the subject indicated the constant tendency to find faster either the color aspect or the form aspect of stimuli, if he was induced in a dim and weakened level of his awareness. As the good chance for such a dim and weakened level of awareness, the recovering course from clouding following the electro-convulsive shock was used.

However, the question now arises if the above-mentioned tendency might be due to some effect of the electro-convulsive shock. In order to answer the question, the author designed the present study, in which the color-form responses of the subject was investigated in a dim and weakened level of awareness following the insulin therapy.

If the insulin injection was applied to him, the subject falls into the state of a coma with some kinds of the physical expressions, and then, given the injection of the dextro-glucose (40 %, 100cc) and drinking of the sugar water, he rapidly recovers from a coma. The moment falling into a coma and that recovering from a coma are much alike to the moment recovering from clouding following the electro-convulsive shock in that they have a dim level of awareness and a dim state of mental ability. This is a reason why the author intended to test the color-form responses in a dim level of awareness following the insulin therapy.

## Method

Subjects. The psychiatric inpatients under medical treatment in the Shinshu

University Hospital served as the subjects. All subjects used in this experiment were 14 unselected psychiatric inpatients, including 7 women and 7 men. They have the range in age from 16 to 31 years. They were mild cases who could have a good understanding of problems used, even before and after the insulin therapy. Their broad histories of the therapies are in Table 1. Six of the subjects had not

Table 1. Subjects and color-form responses

Subjects	Sex	Age	Illness	Days of hospital treatment till the day of test	Numbers of coma till the day of test	C-F responses after IT	C-F responses after ES
1	♂	16	Schizophrenia (Hebephrenic type)	89	5 11	(1) D→C...C→D (2) D→C...C→D	
2	♂	20	?	102	8 10	(1) ...C→D (2) ...C→D	...C→D
3	♂	22	Nervosity	3	14 17	(1) D→C...C→D (2) D→C...C→D	
4	♂	23	Schizophrenia (Hebephrenic type)	132	13 17	(1) ...C→D (2) ...C→D	...C→D
5	♂	25	Schizophrenia	10	2 5	(1) ...F→D (2) ...F→D	
6	♂	27	Schizophrenia	4	14 16	(1) ...C→D (2) ...C→D	
7	♂	31	Schizophrenia	69	5 6	(1) D→C...C→D (2) ...C→D	...C→D
8	♀	16	Schizophrenia	23	2 9	(1) ...C→D (2) ...C→D	
9	♀	16	Schizophrenia	19	4 6	(1) ...C→D (2) ...C→D	
10	♀	18	Schizophrenia	11	13 14	(1) ...C→D (2) ...C→D	
11	♀	19	Schizophrenia	35	5 10	(1) D→F...F→D (2) ...F→D	
12	♀	20	Schizophrenia	18	13 15	(1) ...C→D (2) ...C→D	...F→D
13	♀	23	Schizophrenia ?	48	10 11	(1) ...C→D (2) ...C→D	...C→D
14	♀	27	Schizophrenia	18	1 13	(1) ...C→D (2) ...C→D	...C→D

Nos. 5, 6, 9, 10, 12 and 14 are the subjects who have not the experience of the electro-convulsive shock treatment (ES) before the insulin therapy (IT).

the experience of the electro-convulsive shock therapy before the insulin therapy. The rest of the subjects had received the electro-convulsive shock therapy. But, there were more than three weeks between the both therapies. The color blind was excluded from the subject.

Procedure. The subject was laid down on a bed, and the therapy was given to the subject by a psychiatrist individually. The color-form response of the subjects was investigated by the author in a dim and weakened level of their aware-

ness following the insulin therapy was given to every subject at about 6 in the morning. Applied the insulin injection, the subjects showed the complicated physical expressions with a perspiration, watering at the mouth, an excitement, a muscular rigidity, a convulsive fit and others. The kinds and grades of the physical expressions manifested by the subjects differed from each other. But, all the subjects gradually fell into a coma. Given the intravenous injection of the dextro-glucose (40 %, 100cc) and drinking of the sugar water, the subjects recovered their awareness from a coma rapidly. The time course of a single usage of the therapy is about four hours. The chance of testing the color-form responses is twice, the moment falling into a coma and the moment recovering from a coma. The former chance was very difficult to be used for the test, because it was so often attended with a state of excitement and a convulsive fit. The latter was sufficient to test the color-form responses in a dim and weakened level of awareness.

The problems used in the investigation consisted of the 4 subtests, whose difficulties were all similar in degree. It was of the same principle as that used in the previous study and well effective to examine the color-form responses in a dim and weakened level of the subject's awareness. The materials of the 4 subtests are as follows.

Test 1. A red circle (4cm in diameter) as a sample stimulus, and a red square (4cm × 4cm) and a blue circle (4cm in diameter) as comparison stimuli.

Test 2. A yellow circle (4cm in diameter) as a sample stimulus, and a green circle (4cm in diameter) and a yellow square (4cm × 4cm) as comparison stimuli.

Test 3. A green triangle (4cm in side) as a sample stimulus, and a green square (4cm × 4cm) and a yellow triangle (4cm in side) as comparison stimuli.

Test 4. A blue square (4cm × 4cm) as a sample stimulus, and a blue triangle (4cm in side) and a red square (4cm × 4cm) as comparison stimuli.

All materials used made of the cardboard and pasted with the color papers. Color papers used were Nihon Shikisai Kenkyujo's (Color Institute of Japan), that is, red (1-14-10), yellow (7-18-6), green (12-15-6), and blue (16-14-6).

The experimenter holds one colored card as the sample stimulus between the fingers of his right hand, and two cards as the comparison stimuli between the fingers of his left hand so that the stimuli might be better seen by the subject. The positions of the two comparison cards were changed right and left in random order. The instruction given to the subjects is "Point to one of these two cards (moving the comparison card) which looks most similar for you to this card (moving the sample card) and "Do they look alike, yes or no? (pointing to the sample cards and one of the two comparison cards)". If the subject chooses a similar card to the sample card in color between the two comparison cards, it is determined that he responds to color in visual stimuli. On the other hand, in the case

of selecting a similar card to the sample card in form from the comparison cards, it is determined that he responds to form in visual stimuli.

The procedures of the 4 subtests are identical with each other. Each subject was administered with unlimited times.

Evaluation. The criteria evaluating the experimental results and the signs of the evaluated results are similar to those mentioned in the previous papers.

Selection on the basis of color in visual stimuli — color response (C).

Selection on the basis of form in visual stimuli — form response (F).

Selection on the basis of both categories of color and form — differentiated response (D).

### Results

1. Sub. No. 3 was a man of twenty-two years old, and a university student. His parents, five brothers, and four sisters were healthy. He has been complaining of something or others since he was about a second grader at a senior high school; "I can't concentrate my attention on school work", "My head feels

Table 2. Progress of insulin therapy of sub. No. 3 and C-R responses

Date	Injection of insulin (EH)	Symtoms	Time of coma	C-R responses
July 6 (1)	30	A little perspiration		
7 (2)	40	A little perspiration		
8 (3)	60	A little perspiration, dim awareness		
9 (4)	70	A little perspiration, dim awareness		
10	Suspension	—		
11 (5)	80	Dim awareness		
12 (6)	100	A little perspiration, dim awareness		
13 (7)	120	Perspiration, feeling of hunger		
14 (8)	140	Perspiration, convulsion, dim awareness		
15 (9)	160	Perspiration convulsion, watering at mouth	10.00	
16 (10)	"	Watering at mouth, mild convulsion	11.00	
		}		
28 (19)	100	Convulsion, perspiration	9.40	
29 (20)	"	Perspiration	9.40	
30 (21)	"	Convulsion, perspiration	9.00	
August 1 (22)	"	Convulsion, perspiration	9.00	
2 (23)	"	Convulsion, perspiration	10.20	D → C ... C → D
3 (24)	"	Convulsion, perspiration, watering at mouth	10.45	
4 (25)	"	Convulsion, perspiration, watering at mouth	9.00	
5 (26)	"	Perspiration	10.10	D → C ... C → D
6 (27)	"	Convulsion, perspiration	9.30	

heavy", "I have a poor appetite", "I can't sleep well", "I am driven by anxiety", and so on. He once consulted a doctor of an other hospital, and received the electro-convulsive shock therapy three times. But, his progress toward recovery was not satisfactory. He was diagnosed as a nervosity by the psychiatrist of the University Hospital. He received the insulin therapy from the third day of hospital treatment. The process of the therapy after that is shown in Table 2. His color-form responses in a dim state of awareness following the insulin therapy was tested at the 23rd day, and the 26th day from the start of the therapy. The time courses of his color-form responses will be mentioned. The under-mentioned time indicates the time of that day (not always strict). The insulin therapy was given in both cases at about 6 a. m. .

Time	Course
6.00	The start of the therapy.
8.10	The distinct D response was confirmed. (D response).
8.30	The D response, but the subject had, it seemed, a difficulty in recalling the name of color. He barely could recall the name of color.
8.45	He simply pointed to the red square of the comparison stimuli as the identical figure to the red circle of the sample card, but, the relation between the red circle as the sample card and the blue circle out of the comparison stimuli was, it seemed, not grasped by him. He cried aloud, "Color ! Color !" (C response).
8.48	He writhed himself in agony. His teeth were so tightly compressed. It was next to impossible for him to respond to our questions.
8.51	He was seen to be suffering greatly. No response to our questions was made.
9.00	He writhed himself in a desperate agony.
10.20	He fell into a mild form of convulsion and sweated greatly.
10.50	The dextrose injection (40%, 100cc) was carefully given by a psychiatrist to him. He began to recover from a convulsion.
10.55	The color-form test was administered. The subject said, "They are alike", "Red", pointing to a red circle and a red square. (C response). In Test 2, he said, "That's it", pointing to a yellow square or comparison stimuli, and "No" pointing to a green circle. (C response). He quickly and clearly displayed the C response in both Tests 3 and 4. He said, "Sugar ! Sugar !" Drinking sugar water, he was restored to good mood. In Test 1, "This is it !" pointing to a red square, and "It is unlike this", said he, pointing to a blue circle. His responses were clear. (C response). In the following tests, he indicated the C responses also.

- 11.08 In Test 1, he said, "The same one, the red circle", pointing to a red square, and "Round", pointing to a blue circle. (D response).
- 11.09 In Test 2, he said, "They are alike in color", pointing to a yellow circle as the sample card and a yellow square of comparison stimuli, "This is alike in form to that", pointing to a blue circle of the comparison stimuli. "After all, I see. To be sure! It's interesting", said he. (D response). The subject is one of the D→C.....coma.....C→D type.

The second test was administered to the same subject after three days. The procedure of the test is identical to that of the first test. The time course is as follows.

Time	Course
6.00	The start of the therapy.
7.15	The test was begun. He indicated the clear D response. (D response).
7.30	He pointed to a red square of the comparison stimuli and to the red circle as the sample stimulus. He said, "This", "Color", and "No", pointing to a blue circle and a red circle. He was seen to be suffering. (C response).
	In Tests 2, 3, and 4, he also displayed the C response with difficulty.
7.40	He recovered his mental ability just a little. In Test 1, he said, "They are alike in form", pointing to a blue circle and a red circle, and "Hum, color", pointing to a red square and a red circle. (D response).
7.48	He was seen to be suffering.
7.50	In Test 1, he said, "They are alike, round", pointing to a blue circle and a red circle, and "Color", pointing to a red square and a red circle. But, it took him a little time to say a single word "Color". (D response).
7.55	He was seen to be suffering greatly. It seemed that he did his best to respond to the test. He barely displayed the D response in the Test 2. (D response).
7.58	He said, "These colors are the same", pointing to a yellow square and yellow circle. As regards the relation between a green circle and a yellow circle, he did not make any response, and only groaned, "Hum!" (C response).
8.05	He was seen to be suffering increasingly. He perspired profusely.
8.11	His face was distorted in agony. He did never respond to any test.
9.15	He was seized with convulsion.
10.10	The dextro-glucose injection (40%, 100cc) was carefully given to him.
10.13	The experimenter asked him, "Do they look alike, yes or no?", pointing to a blue circle and a red circle. He only answered, "No". He displayed the C response again. In Test 2, he displayed the C response

similarly.

- 10.15 In Test 3, he responded to our questions with a smile on his face. He said, "They are alike in form", pointing to a yellow triangle and a green triangle, and then, "Ah, it's simple", "That's it", "These colors are alike", said he. (D response).

In Test 4, he also displayed the D response clearly. (D response).

In the above-mentioned tests, the subject recovered his mental ability just a little after transference from the D responses to some C responses. He displayed the D responses for a while, but, again displayed the C response, and fell into a coma. His color-form response in recovering course from a coma also displayed the C response. It was common in both cases that his tendency of the color-form responses at the weakened level of awareness was the C response type.

2. The subjects who could follow up the process of the color-form responses in the course from application of the insulin injection to falling into the state of a coma were only four out of the 14 subjects. The tendencies of the color-form response at the moment of recovering from a coma were identical to those of that at the moment of falling into a coma as shown in Table 1. The results of the test repeated on the same subjects at intervals of one to twelve days agreed with those of the first test very well.

The times of the insulin shock accumulated in the subjects before the present test on the color-form responses were 17 and less. The times of the insulin shock given, it seems, had no effect on the results of the test used in so far as the present subjects were concerned.

It might also be indicated that no effect on the results of the test of the sexual difference, the discrepancy of age, and the kinds of illness was recognized, though the number of the subjects was small.

Six subjects who had not received the electro-convulsive shock before the insulin therapy indicated the high congruity between the results of the two tests repeated. The rest of subjects experienced the electro-convulsive shock therapy before the insulin therapy. The congruity that they had shown in the two tests repeated also was of as high level as the former.

The subjects who had received the electro-convulsive shock therapy and participated in our previous study on the color-form response were six. Their tendencies of the color-form response in the recovering course of their awareness from the state of a coma following the insulin therapy were generally identical to those from clouding following the electro-convulsive shock therapy, as is shown in Table 1.

The several facts shown above are the evidences to suggest that the subjects induced in a dim and weakened level of their awareness indicate the fairly constant tendency to find faster and clearer the color aspect or the form aspect in

the stimuli.

### Discussion

The results of the experiment showed that the subjects used indicated the tendency to find faster either the color aspect or the form aspect in the visual stimuli in the state of the moment of falling into a coma and in the recovering stage from it. The chance for testing the color-form responses in this case was twice, the moment of falling into a coma and that of recovering from it. It was noteworthy that the last response in the state of the moment of falling into a coma was identical to the first response of the same subject in the recovering stage from a coma.

This fact was not found in the previous studies. The author once reported that the subject indicated the tendency to find faster either the color aspect or the form aspect in the visual stimuli in a dim and weakened level of his awareness following the prolonged sleep therapy. In this case, the more the subject was given the sleeping drug for some days running, the more he became sleepy. When he became heavily sleepy with the increasing quantity of the sleeping drug, he could neither talk nor eat. Then, reduced the quantity of the drug he recovered his awareness slowly. The time course of a single usage of the prolonged sleep therapy is about two to three weeks. The chance for the color-form response test is twice in the same way as the case of the insulin therapy, though the time course of the prolonged sleep therapy is longer and slower than that of the latter. The author found that the last response caught at the moment of falling into a heavy sleeping agreed with the first response appearing in recovering stage of the awareness from a heavy sleeping. The tendency of the color-form responses in a dim level of the awareness following the insulin therapy is much alike to that of the prolonged sleep therapy mentioned above. It seems to the present writer that this fact indicates the constancy of the color-form responses found in a dim level of awareness.

The results of the second test administered to the same subjects at intervals of some days agreed with those of the first test very well, though the interval could not be controlled at fixed times for hospital reasons. Of course, six subjects who had not received the electro-convulsive shock before the insulin therapy indicated the perfect congruity between the results of the two tests. This fact also indicates the high constancy of the color-form responses found in a dim and weakened level of awareness following the insulin therapy.

Supposing that the subject induced in a dim level of his awareness indicates the fairly constant tendency to find faster either the color aspect or the form aspect in visual stimuli, the first response in recovering stage from a coma fol-



lowing the insulin therapy is to agree with the first response of the same subject in recovering stage from clouding after the electro-convulsive shock, because the recovering courses from the state of a coma following the insulin therapy and those from the state of clouding after the electro-convulsive shock are much alike in that they have a dim and weakened level of awareness.

Six of the subjects used in the present study experienced the electro-convulsive shock therapy before or after insulin therapy and participated in the color-form test as the subjects for the previous study. Five out of the six subjects indicated the same trend in the color-form tests in both cases. This fact also is noticeable, though the number of the sample is small.

The materials of the test used in the present study differed, indeed, slightly from those used in the previous study. The former was simpler than the latter, but, they had a consistent principle. Therefore, it can be said with confidence that the former as well as the latter is capable of taking the first color or form response appearing in recovering stage of the weakened awareness. And, as there were more than three weeks between the both therapies, the electro-convulsive shock before the insulin therapy had, it seems to the present writer, little effect on the color-form response in recovering stage from a coma following the insulin therapy.

Taking the above-mentioned findings into consideration, the question if the fairly constant tendency of color-form responses in recovering stage from clouding following the electro-convulsive shock might be due to some effect of the electro-convulsive shock, could be solved. Moreover, it is of importance that the subject indicates the fairly constant tendency to find faster either the color aspect or the form aspect in visual stimuli, if he was induced in a dim and weakened level of his awareness, whether in the recovering stage from a coma following the insulin therapy or in that from a clouding after the electro-convulsive shock.

### References

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