

Color-Form Responses in Recovering Stage from Clouding following the Electro-Convulsive Shock

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The present study was designed to examine the color-form responses in the dim and weakened level of awareness. The recovering course from clouding following the electro-convulsive shock offered the good chance for the purpose of the present study. The subjects used were 113 inpatients under the psychiatric treatment in the Shinshu University Hospital. Some subjects showed a greater tendency to react to visual stimuli on the basis of the color in recovering stage from clouding following the electro-convulsive shock, while other subjects reacted to the same visual stimuli on the basis of the form. Few subjects showed the differentiated response. The constancy of these responses as the first response appearing in recovering stage was of the fairly high level.

Up to this time, a considerable amount of research has been devoted to the study of color-form response, and the previous investigations have generally been related to the developmental level of children, and to personality characteristics. The obvious differences obtained from these studies were that the former was concerned with the variation or development of perceptual or abstract function and the latter with the relatively constant types of personality.

It seems that the main reason why the differences arose lies in the differences between the methods used in these studies. In order to investigate the color-form responses of adult subjects, the tachistoscopic method, the memory method, and the Rorschach technique have often been used. But, we have been concerned with the color-form responses in the dim level of a subject's awareness (Nakagawa, 1960). The good occasion for our approach was given in the recovering courses of clouding following the electro-convulsive shock treatment.

The present study was designed to investigate which appears faster the color or the form that are parts of the visual stimuli in recovering stage of clouding following the electro-convulsive shock. If the recovery after convulsion be varied in time according to the color and the form, the first response (the color or the form) appearing in recovering stage would be constant by subjects respectively, and the process from the first response to the differentiated response would be investigated thoroughly, these facts may project a light to solve the contradicted findings as mentioned above.

Method

Subjects. Subjects tested were 113 unselected psychiatric inpatients ranging in age from 16 to 60 years, the group including 47 males and 66 females, who had been under the psychiatric treatment in the Shinshu University Hospital. All subjects were mild cases who could have a proper understanding of problems used in the present study. The times of the electro-convulsive shock, which had been given to the subjects before the first experiment was begun, were less than 10 in any case. The color blind was excluded from the subject.

Procedure. A subject was laid down on a bed, and given the electro-convulsive shock treatment individually. The moment the electro-convulsive shock was given him, a subject lapsed into a state of clouding. (Of course, it is also a state of cognitive disturbances.) He would begin to recover his awareness from the state of clouding in a short time. At this dim and weakened level of psychological function, the experiment was administered.

All subjects were tested individually on the same problems administered in the same order. The problems used were 7 out of 14 tests used in the previous studies (Nakagawa, 1954). The 7 tests were as follows.

Test 1. The visual stimuli consisted of a red square (3cm \times 3cm), a red circle (3cm in diameter), and a blue square (3cm \times 3cm), which are arranged in a triangular form on the light grey paper (20cm \times 28cm). An upper red square is the sample stimulus, and a red circle and a blue square are the comparison stimuli. By presenting the visual stimuli, the experimenter makes a subject choose the same stimulus as the sample out of the two comparison stimuli. The instruction given to a subject is "Point to an object that looks most similar".

If a subject chooses the same stimulus as the sample in color out of the two visual stimuli, it is determined that he responds to the color in visual stimuli. On the other hand, if he selects the same stimulus as the sample in form out of the two stimuli, it is determined that he responds to the form in visual stimuli. The same procedure used in Test 1 is administered to the subsequent Tests 2, 5, and 6. Colored papers used were Nihon Shikisai Kenkyujo's (Color Institute of Japan); that is, R (1-14-10), Y (7-18-6), G (12-15-6), and B (16-14-6).

Test 2. The sample stimulus — the yellow triangle (3cm in side). The comparison stimuli — the red triangle (3cm in side) and yellow square (3cm \times 3cm). The size of the circle, square, and triangle used in the subsequent Tests 3, 4, 5, and 6 is similar to that of stimuli as mentioned above respectively.

Test 3. The sample stimulus — the yellow square. The comparison stimuli — the blue and the red square. A subject is asked whether the same stimulus as the sample is in the comparison stimuli, and if he answers "Yes", it is sug-

gested that he responds to the form in visual stimuli. On the other hand, if he answers "No", it is suggested that he responds to the color in visual stimuli.

Test 4. The sample stimulus — the blue circle. The comparison stimuli — the red and the yellow circle. The procedure is similar to that of the Test 3.

Test 5. The sample stimulus — the blue square. The comparison stimuli — the three red squares and three blue triangles which are arranged in randomized order on the light greypaper.

Test 6. The sample stimulus — the green circle. The comparison stimuli — the three yellow circles and three green squares. The instruction given in the Tests 5 and 6 is similar to that of the Test 1. A subject is expected to sort three objects according to the category of color (or form) in visual stimuli.

Test 7. This is a sorting test involving a definite shifting from the one principle of order to the other. A cardboard frame and four cards, as is shown in Fig.

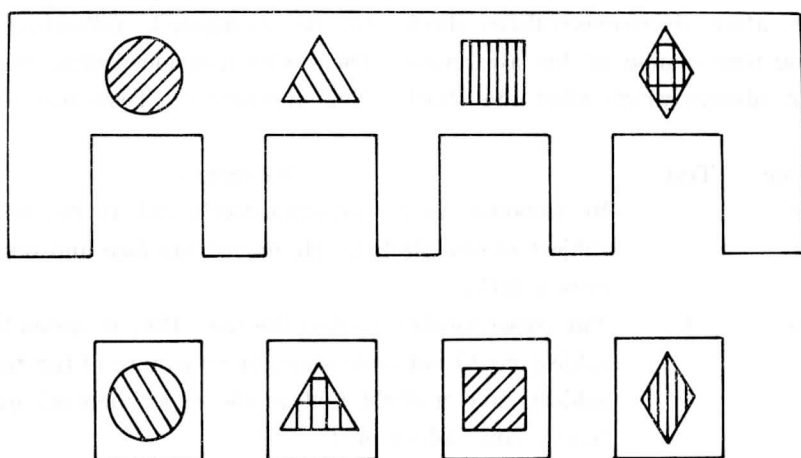


Fig. 1. Materials of Test 7

The figures on the four cards are of the same color as and different color from, the figures on the frame respectively.

1, are used. At first, the frame on which the four colored papers in geometric figure are pasted is placed beside the subject. The four figures of the same form as, but of different color from the four geometric figures on the frame respectively, are placed at random between the frame and the subject. The subject is asked to interpose a card of the figure that looks most similar to a figure on the frame under the figure on the frame. If a subject has arranged the four cards according to the color (or the form) in visual stimuli, he is asked to sort them again by the order of another principle. Then, the instruction given is "Sort again in a different way".

Each Test as mentioned above was administered with unlimited time. Evaluation. The criteria evaluating the experimental results and the signs of the evaluated results are as follows.

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

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

Selection on the basis of the color (or the form) as a feature in whole stimuli and capability changing the arrangement on the basis of the form (or the color) respectively — differentiated response (D).

Results

1. A recovering course of color-form response. Sub. S. M. was the schizophrenic case of 39 years old male. He received the third electro-convulsive shock treatment that day. His color-form responses in recovering courses of cognitive disturbances after electro-convulsive shock will be mentioned, following up the recovering time-course of his awareness. The under-mentioned time means the time (not always strict) after the shock. The numbers of Tests are stated in figures.

Time	Test	Responses
8'		In response to an experimenter's call of his name the subject moved slightly. He moved his face and opened his eyes a little.
10'	1	The experimenter started the test. But, it seems that the subject could not understand the meaning of the test. The subject gave a slight nod to the experimenter's question, "Can't you understand?"
12'	1	"Well, — I can't", said he.
14'	1	Pointing to the red square and the red circle "Very alike", said he. Then, pointing to the red square and the blue square "Not alike", said he. (C response).
15'	2	Pointing to the yellow triangle and the yellow circle "Alike", and pointing to the yellow triangle and the red triangle "Not alike", said he. (C response).
15'	3	"I don't know", said he. (If he responds to a form in visual stimuli, he must answer "Alike".).
16'	4	"No", said he. (C response).
16.5'	5	"Color?", pointing to the blue square and the red square "These are alike in form", and pointing to the blue squares and the blue triangles "These are alike in color", said he. (D response).

17' 6 "Color? In color, these are alike, and in form, these are alike", Said he. (D response).

(The rest is omitted.)

The color response of this subject started in 14 minutes after the electro-convulsive shock. The start of the differentiated response was about 16.5 minutes after the shock. This subject could be regarded as one of the C-type. Some subjects used showed the form response as the first response (F), and then the differentiated response (D). Other subjects used at first responded to the color (C), and then the form (F), after that the differentiated response (D). In the responses of subjects, the trend of persistence in responding was occasionally found.

The time required to the start of the first color or form response appearing in recovering courses of awareness after the electro-convulsive shock was about 5 to 55 minutes, and that required from the first response to the differentiated response was about 1 to 33 minutes. There were individual differences in both cases.

2. Color-form responses and illness. The trends of color-form responses as a

Table 1.
Color-form responses as a function of illness

Illness	Responses			Total
	C	F	D	
Schizophrenia	39	14	2	55
Depression	14	7	4	25
Schizophrenia?	9			9
Neurosis	3	2	1	6
Depersonalisation	3	1		4
Mania	4	1		5
Involuntional melancholia	1			1
Presenile psychosis	1			1
Presenile psychosis ?	1			1
Catatonia	1			1
Progressive paresis	1			1
Neurosis ?	2			2
?	2			2
Total	81	25	7	113
%	71.7	22.1	6.2	100

function of illness are shown in Table 1. The first response in recovering stage from cognitive disturbances following the electro-convulsive shock was generally dominant in color responses in every case.

3. Color-form responses as a joint-function of sex and age. The trends of color-

Table 2.
Trends of color-form responses as a joint-function of sex and age

			Responses							
									Total	
			C		F		D			
Age			N	%	N	%	N	%	N	%
Males	Under	29	22	79	5	18	1	4	28	101
	Above	30	10	53	7	37	2	10	19	100
Females	Under	29	32	84	5	13	1	3	38	100
	Above	30	17	61	8	28	3	11	28	100
Total			81	72	25	22	7	6	113	100

form responses as a joint-function of sex and age of our subjects are shown in Table 2. Generally speaking, the score of the C response is great in each group. An analysis of variance performed for purpose of evaluating differences between males and females, and those between young people and old people in making the C response yielded a significant result. There was a significant main effect due to the disparity in age, that is, there was a significantly greater amount of the C response in young people than in old people. On the other hand, no consistent sex differences were shown by our subjects. No significant interaction effect

Table 3.
Analysis of variance for evaluating differences between males and females and those between young people and old people in making C responses

Source	SS	df	$x^2 = SS/\sigma^2_w$	P
Sex	18.8356	1	1.275	
Age	244.9225	1	16.575	<0.01
Sex \times Age	0.0841	1	0.006	
Total	263.8422	3	17.855	<0.01
σ^2_w			14.777	

(sex and age) was found, either. The analysis of variance is summarized in Table 3.

4. Constancy of color-form responses. In order to investigate the constancy of the color or form response as the first response appearing in recovering stage of clouding, the same color-form test was administered on 30 out of all the subjects used after the period of time from seven days to seven months. The congruity between the results of the two tests was 86.7%, and it was of the fairly high level.

Discussion

As is mentioned above, the subjects used showed the particular tendencies of color-form responses in recovering stage from cognitive disturbances following the electro-convulsive shock.

Some subjects chose the color aspect faster than the form aspect from the visual stimuli in the dim and weakened level of the awareness, and other subjects the form aspect. They showed the differentiated response at advanced level of recovering course of awareness. Few subjects showed the differentiated response as the first response appearing in recovering course from clouding. The recovering tendencies of cognitive function were fairly constant in individual subjects, and those were analogous to the developmental courses of children's color-form response for its form's sake, though its time courses were shorter than those of the latter.

Color-form responses appearing in developmental process of children have often shown in the previous papers. But, it seems that the types of the first responses appearing through the developmental course of individuals could not be obtained by means of the lotto method or its modified one, and the memory method used in the previous studies.

On the other hand, the previous studies on the personality type using the tachistoscopic method failed in the explanation of the developmental feature of color-form responses.

The relation between the investigation of color-form responses by the tach-

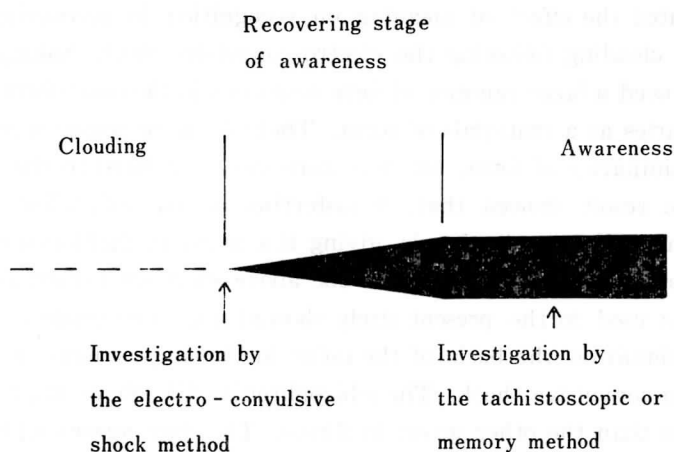


Fig. 2. A diagram showing the relation between the investigation by the electro-convulsive shock and that by the tachistoscopic or memory method.

stoscopic or memory method used in the previous studies and that of the first color or form response appearing in the recovering courses from the cognitive disturbances following the electro-convulsive shock plainly would be indicated using such an illustration as Fig. 2. Thus, it seems that the present method is a useful approach to the color-form problem.

A question, of course, arises. The subjects used in the present study were not normal in any case, though they could easily give the definite answers to the same tests administered before the electro-convulsive shock. It might, therefore, be considered unreasonable to try to apply the findings obtained from the abnormal subjects used to the comprehension of color-form responses of the normal subjects in that condition. However, it could not be doubted that its findings would throw a light on the color-form problem.

In some previous papers (Scholl, 1926; Oeser, 1932; Aikawa, 1961), it has been indicated that the women were more color dominant. Of course, there was the opposite fact (Doehring, 1960) that the males are apt to make more color responses than the females. But, no consistent sex differences were shown by our subjects. This finding was the same as the result shown in the previous paper (Nakagawa, 1954) and that of Brian et al (1929).

The young people out of the subjects used reacted to color more significantly than the old people. What does it mean? The difference between the two groups in age is clearly contradictory to the fact that the trend of the first response appearing in recovering stage from clouding was fairly constant in each individual. However, if we consider that the appearing trend of the first response was not always inborn, and also influenced by the experiences in the course of subject's lifetime, the contradiction would be solved. In the previous experiment, the author investigated the effect of meaning on recognition in recovering stage of awareness from clouding following the electro-convulsive shock (Nakagawa, 1970). The subjects showed a large number of form responses in the color-form test using Japanese syllabaries as a materials of form. Their form responses were not only manifested by similarity of form, but also were closely related to the reading of syllabaries. The result showed that, transferring of an unfamiliar code to a Japanese syllabary "*Katakana*", that is, giving it a meaning facilitated recognition of stimuli. This fact should be referred to the above-mentioned discussion.

The subjects used in the present study showed a greater tendency to differentiate visual stimuli on the basis of the color in the experiments administered after the electro-convulsive shock. The schizophrenics did, above all, react to the color more often than the other group in illness. This fact agrees with the findings shown by J. D. Keehn (1954), J. D. Keehn and A. Sabbagh (1956), and K. W. Schaie (1963), though the methods used are different from each other. It is interesting that not only schizophrenics and infants of 4-to 5-year-olds (Nakaga-

wa, 1954), but also deaf children (Doehring, 1960), feeble-minded children (Nakagawa, 1954, 1967), mental defectives, epileptics (Keehn & Sabbagh, 1956), manic-depressives (Keehn, 1954), and the congenitally blind given their sight later (Hebb, 1958; Umezū, 1972) were all more or less color responsive. It might be explained by pointing out that the color response is more immediate and primitive than the form response (Rickers-Ovsiankina, 1943; Shapiro, 1956).

However, we could not disregard the fact that some of our subjects reacted to the form in visual stimuli in recovering stage from cognitive disturbances following the electro-convulsive shock. It is noteworthy that their color response or their form response constantly appears as the first response in recovering stage after convulsion.

References

- Aikawa, T. 1961. Some experimental studies on the "Form-Farbe-Problem". Bulletin of the Aichi Gakugei University 9 : 147-164.
- Brian, C. R., and Goodenough, F. L. 1929. The relative potency of color and form perception at various ages. Journal of Experimental Psychology 12 : 197-213.
- Doehring, D. G. 1960. Color-form attitudes of deaf children. Journal of Speech and Hearing Research 3 : 242-248.
- Hebb, D. O. 1958. A textbook of psychology, W. B. Saunders Co.
- Honkavaara, H. 1958. The accuracy of perception in relation to the color and form reaction. Journal of Psychology 46 : 13-18.
- Keehn, J. D. 1954. The color-form responses of normal, psychotic, and neurotic subjects. Journal of Abnormal and Social Psychology 49 : 553-537.
- Keehn, J. D. and Sabbagh, A. 1956. Colour-form responses as a function of mental disorder. Journal of Mental Science 102 : 319-323.
- Nakagawa, D. 1954. Über die teilinhaltliche Beachtung von Form und Farbe. (in Japanese with German summary). Japanese Journal of Educational Psychology 2 : 43-50.
- Nakagawa, D. 1960. Abstraction of color and form in recovering stage of awareness from clouding following electro-convulsive shock. (in Japanese). Proceedings of the 24th Congress of Japanese Psychological Association : 57-58.
- Nakagawa, D. 1967. Color-form responses mentally retarded as a function of etiology. Studies in Humanities, Shinshu University 2 : 9-18.
- Nakagawa, D. 1970. Meaning and recognition. Studies in Humanities, Shinshu University 5 : 11-17.
- Oeser, O. A. 1932. Some experiments on the abstraction of form and colour. British Journal of Psychology 22 : 200-215.
- Rickers-Ovsiankina, M. 1943. Some theoretical considerations regarding the Rorschach method. Rorschach Research Exchange 7 : 41-53.
- Schaie, K. W. 1963. The color pyramid test. Psychological Bulletin 60 : 530-547.
- Shapiro, D. 1956. Color-response and perceptual passivity. Journal of Projective Techniques

20 : 52-69.

Scholl, R. 1926. Untersuchungen über die teilinhaltsliche Beachtung von Farbe und Form bei Erwachsenen und Kindern. *Zeitschrift für Psychologie* 101 : 225-280.

Umezu, H., Torii, S., and Uemura, Y. 1972. Recovering from congenital blindness after operation. Abstract Guide, 20th International Congress of Psychology.