

# COLOR-FORM RESPONDING AND GSR CONDITIONING

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In the generalization process the author found the particular tendency that the CR established was elicited by other stimuli with the same feature (color or form) as the originally conditioned stimuli. Even when other kinds of color and form in the CS were used, the tendency remained the same in each subject. Even when the UCS was changed from the electro-shock to the auditory stimulus, the tendency remained the same in each subject, with the exception of some samples. It seems that the particular tendency found in the generalization process is considerably constant in each subject. Therefore, it is suggested that a neural, in a sense, connections may exist in an individual between the cognitive systems for the color or form and autonomic nervous system.

The author has been concerned about the color-form responses in the dim level of a subject's awareness and reported (1960) that the subject indicated the tendency to find faster either the color aspect or the form of stimuli, if he was induced in a dim and weakend level of his awareness. Moreover, the interest of the author has gone into the study of color-form responding on the psycho-physiological level independent of a subject's awareness.

Recently, Grings, W. W. (1969) reported that there was no appreciable transfer of differential response from the original compound stimuli to the individual components. According to Grings's experiment, the difference between the compound stimuli and the components is quantitative. If the difference is qualitative, does the conditioned response transfer to the component features of the originally learned stimulus? Has conditioning been successfully carried out on a subject by using a red circle as a CS, the electro-shock as an UCS, and the GSR as an UCR, how does a subject respond to other stimulus such as similar color and dissimilar form, or similar form and dissimilar color, to a red circle as the originally conditioned stimulus?

The question to be investigated in the present study<sup>2</sup> was whether the CR established would be elicited by other stimulus with the same feature (color or form) as the originally conditioned stimulus.

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2. Some data of the study were presented at the 32nd Congress of the Japanese Psychological Association, 1968.

## Method

Subjects: 20 university students participated in the experiment. The color blind was excluded.

Materials: (1) The UCS was the DC shock (ES) from the Electro-Stimulator ES-132X and phosphor delivered to a subject's eye through a pair of bowl shape silver electrodes, one of which was placed above the eyebrow and the other on the homolateral temple of the subject. Shock intensity was set by the subject at his subjective maximum at the outset of the experiment.

(2) The UCR was the GSR, which was obtained from the right palm and forearm of the subject. The instruments used for the measurement were the DC Amp. EB-102 and ink-writing occirograph IR-302.

(3) The CS consisted of three red (the Shikken's colored paper, 1-14-10) circles (5cm in diam) arranged in a triangular form on the light gray paper.

(4) The stimuli used for the postconditioning test series were as follows: a) the light gray visual field as the background stimulus; b) the stimulus figure consisted of a blue (16-14-6) circle, a green (12-15-6) circle, and a purple (20-12-5) circle arranged in a triangular form, which were all 5cm in diam, each circle being of different color from and the same form as the originally conditioned stimulus; c) the stimulus figure of three red triangles (6.2cm in side) arranged at random and of the same color as and of different form from the originally conditioned stimulus.

(5) In order to test the adequacy of the result on the generalization, the three squares (4cm × 4cm) were prepared as the CS, and the stimulus figures of the same form and different color, or of the same color and different form also were prepared.

(6) Moreover, in order to test that adequacy, the auditory stimulus was prepared.

Procedures: 1. The duration of the presentation of the CS is 2.5 sec. The UCS is given after 2 sec. from the start of the CS, and its duration is 0.5 sec.

The order presenting the stimuli is as follows: 1) an adaptation of four stimuli (the CS, and three stimuli which were used to test the tendency of generalization), 2) a test of the suitable intensity of the ES as the UCS, 3) a re-adaptation of four stimuli, 4) a reinforcement by combined stimuli of the CS and UCS (15 times)—a test of the amplitude of the CR—the rest for 5 min.—a reinforcement (15 times)—a test of the amplitude of the CR, 5) a test of the generalization with the gray visual field as the background stimulus (5 times), 6) a reinforcement (5 times), 7) a test of the generalization with other stimuli such as the same color as, and different form from the CS (5 times), 8) a reinforcement (5 times), 9) a test of the generalization with other stimuli such as different color from, and the same form as the CS (5 times), 10) an extinction (ten trials). The order of 7 and 9 was inverted at random in each subject.

The principal purpose of the present experiment is the comparison of the GSR in the parts 5, 7, and 9 in the postconditioning test series. The CR counted in is the

GSR over 1mv in intensity. Owing to the presentation of stimulus figures the TKK Tachistoscope was used. The data were obtained from the subjects in the shielded room. The room was illuminated with a 40-watt gas-filled bulb. The room temperature was about 22-25 c.

2. Three blue squares and the stimulus figures of the same color as and different form from, or of different color from and the same form as the blue square are used as the CS or the stimuli to test the tendency of generalization respectively. Other parts of the procedure are the same as the procedure 1. The subjects were 10 out of the 20 university students.

3. The auditory stimulus from the buzzer is used as the CS. Other parts of the procedure are similar to the procedure 1. The same 20 students participated in the experiment.

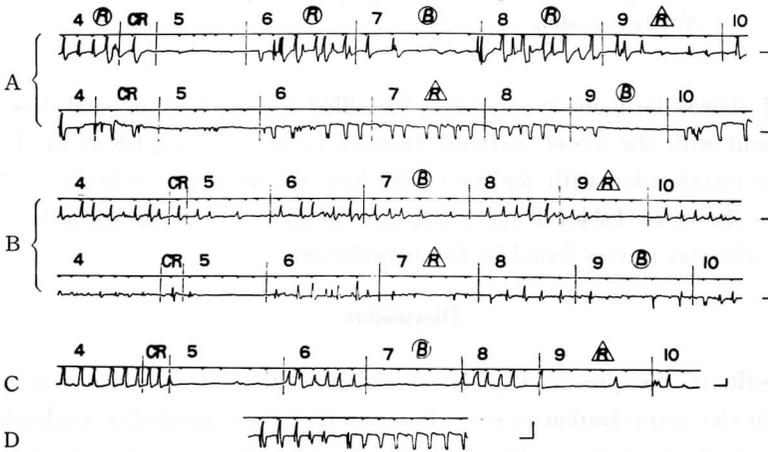
The procedures 2 and 3 were carried out to ascertain the adequacy of experimental results.

**Results**

By means of the qualitative comparison between the parts 5, 7, and 9 in the postconditioning test series, the following tendencies were distinguished in the generalization process.

1. At the part 7 or 9 in the experimental series, the testing stimulus, which is of the same color as and different form from the CS, evokes a marked manifestation

Fig. 1 Patterns of GSR The parts before the part 4 in the experimental series and the post of the 10 are omitted in the illustration.  
 A: C-dominant generalization. B: F-dominant generalization.  
 C: Non-C-F generalization. D: A sample of wave modification.  
 Vertical bar: 1mv. Horizontal bar: 20 sec.



of the CR. The CRs at the part 5 and the CRs to the same form as the CS are markedly inhibited. (Fig. 1A)—C-dominant-generalization

2. The remarkable manifestation of the CR is recorded to the stimulus of different color from and the same form as the CS. The CRs at the part 5 and the CRs to the same color as the CS are remarkably inhibited. (Fig. 1B)—F-dominant-generalization

3. Though the CR is remarkably recorded, it is not recorded at the parts 5, 7, and 9 in the experimental series. It seems that the inhibition of the CR at the parts 5, 7, and 9 is remarkable. (Fig. 1C)—Non-C-F-dominant-generalization

4. The manifestation of the CR is remarkable and is registered at the parts 5, 7, and 9 in the experimental series. This type has, it seems, a weak inhibition.—Over-sensitiveness

Table 1 The results of investigations using the ES and the auditory stimulus as the UCS

		Tendencies of CR in postconditioning test series									
UCS	ES	C	F	O-S	X	O-S	O-S	F	C	F	Non-CF
	AS	↓ C	↓ F	↓ O-S	↓ X	↓ C	↓ F	↓ O-S	↓ X	↓ X	↓ F
Number of sub.		4	4	3	1	2	1	1	1	2	1

※ X indicates the subjects whom the CR were not acquired.

Table 2 The results of investigations using the red circles and blue squares as the CS

		Tendencies of CR in postconditioning test series		
CS	Red circles	C	F	X
	Blue squares	↓ C	↓ F	↓ X
Number of sub.		4	5	1

Table 1 shows the number of subjects identified with each type, and the result of the experiment with the use of auditory stimulus in stead of the ES as the UCS. The result of the investigation with the use of the blue square as the CS is shown in Table 2. The facts shown in Tables 1 and 2 indicate the adequacy of the particular tendency in the generalization process found in this experiment.

### Discussion

The results of the present experiment indicated that there were some particular tendencies in the generalization process. It seems that these particular tendencies represent the "generalization" (generally accepted), because they are the responses elicited

by the stimulus with the same feature as the originally conditioned stimulus. These tendencies can also be regarded as the transfer of the CR to the stimulus with the same feature as the originally conditioned stimulus.

Grings, W. W., used the acquisition series consisted of the reinforced compound stimuli (one colored light pairs) and the nonreinforced compound stimuli (the second pairs) in his experiment (1969). After the differential responding to compounds has been established, test trials were introduced on components from the original pairs. He found that there was no evidence of the differential responding to components.

The author did not use the two kinds of stimuli, one followed by the ES and the other not, during the acquisition series. The compound stimuli reinforced were three identically colored figures, and the component features taken up in a postconditioning test series, were the color aspect and the form of colored figures. The results of the experiment showed that the CR established was elicited by the postconditioning test figures with the same feature (the color aspect or form) as the originally conditioned stimuli. If the generalization is taken the response elicited by the stimulus with the same feature as the originally conditioned stimulus, the CR reinforced should be elicited by the both stimuli of the parts 7 and 9 in the present postconditioning test series. However, in the present experiment the C-dominant-generalization and the F-dominant-generalization were found separately. This fact suggests that an autonomic discrimination might be active during a conditioning acquisition. If this be the case, it is suggested that a nervous relation between the cognitive systems for color or form and autonomic nervous system might exist in each individual, and it might have something to do with the subject's development or trait of personality. These findings also are supported by the high congruity of the particular tendencies in each individual as is shown in Tables 1 and 2.

According to Fig. 1 (A, B and C), the records of the GSR obtained from the subjects indicated the waves of various types, as if it were apparently not the GSR. But, the record obtained from the subject 1 shows a sample of the wave modification of the GSR, which remains to be studied. (Fig. 1D)

### References

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