The Experimental Analysis of Set: The Effects of Instructions on the Perception of Visual Objects

THE EXPERIMENTAL ANALYSIS OF SET:
THE EFFECTS OF INSTRUCTIONS ON THE PERCEPTION OF VISUAL OBJECTS

By

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The experimental analysis of perceptual sets was attempted by inducing different instructions. The findings are: 1) In a perception of impoverished stimuli, which are generally perceivable as the belongings to a certain category, the perception of the subjects will be controlled by those instructions. 2) The more subject-dominant (or stimulus-bounded) a perceptual set of a subject induced by the instructions is, the more the perception of the subject deviates from that category. 3) As to the perception of the ambiguous stimuli as in the present experiment, it is possible to inhibit (or facilitate) such perception by instructions as belonging to a cetain category. 4) Some subjects have subtle visual sets, and often they utilize some visual clues that could not be predicted by the experimenter.

INTRODUCTION

Since the concept of "set" was introduced by the Würzburger to the experimental psychology, it has been discussed from various viewpoints and has been refined along with the development of the experimental psychology.

In the past, Gibson, J.J. (1941), and recently Allport, F.H. (1955), reviewed the concept of set in perception. According to them, in most of the literature dealing with this concept, the accuracy of the descriptions or discriminations of the impoverished stimuli, could be changed by forming a set in the subject. But, concerning the effects of the change, we have got no clear informations. For exmaple, some who hold their ground of "selectivity of perception" stress that in an experimental situation, the subject would accept a certain aspect of the given instruction, and perceive the characteristics of a percept corresponding to this aspect. Others, however, who lay more emphasis upon response than reception of stimulus, consider that retentions or memory traces are more important factors in perceptual behavior.

In the present paper, it was intended to study the effects of the instructions upon the perception of the same visual stimuli.

EXPERIMENT I

Procedure

Before the presentation of the experimental stimuli, three kinds of instructions were given to three groups in order to examine the effects of the different instructions upon

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the perception of the same sort of stimuli. The instructions to each group were the following.

The first group was told: "11 cards will be serially exposed for a moment. Please put down what you see on pieces of paper." The second group was instructed: "A series of 11 cards will be momentarily shown one after another. This is a test of your memory. Please keep in your mind what you see and describe just what you see on sheets of paper."

While these two groups were verbally instructed, the third group was presented a visual clue. That is, each subject of this group was instructed: "10 cards will be serially exposed for a moment. The cards presented are like this". And an alphabet letter with clear contour was exposed by the tachistoscope.

Now, it is assumed that the effects of such three types of instructions upon the perception of the experimental stimuli will assumably be as follows. The first group was our control group. In this group, the instruction could not induce any particular set, and therefore, by such instruction, we may get the objective information as to how the experimental materials could be generally perceived as alphabet letters under such a free or neutral set. In the second group, it is supposed that the instruction will make the subjects take an analytical visual set. Under such instruction, the subjects will be possessed by the idea that the experimentation is a test of memory of the figure itself on the card. Hence, the more firmly the subjects want to fix it in their memory, the more they will attend to the constellation of the points and lines of the figure, because the stimulus figures look like geometrical and meaningless patterns. Such an analytical set, which may be also called as stimulus bounded set, will inhibit the subject from perceiving the material figure as a whole, namely, as alphabet letters. In the second group, we could also examine as to how the analytical set induced by the instruction would affect the perception of an object. The instruction to the third group was given to study a role of the facilitating effect of a certain set (integrating set) which leads the subject to perceive the experimental material as a whole. In other words, the presentation of a visual clue to the subject may help him to recognize the figures as alphabet letters in the figures on the cards.

Fig. 1 illustrates one of 11 cards of our experiment. It was pictured only with adumbration. Besides Fig. 1, the letters of "T", ',P", "M", "W", "G", "V", "E", "F", "R" and "S" were adopted as the experimental figures.

In each condition above mentioned, these cards were exposed at random for 300 sigma to each subject of the three groups by the tachistoscope.

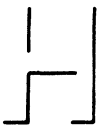

Fig. 1. Alphabet letter H, which is drawn in adumbration only.

The subjects of each group consisted of 10 male and female undergraduate and graduate students, and so, the total number of them was 30.

Results and Discussion

Comparatively speaking, the subjects gave various responses to each card, but these responses could be classified in 4 categories as shown in Table 1.

Table 1. Percentage of responses of every category and every group.

Group \ Categories	I		II		III		IV		Total
		%		%		%		%	
Free set gr.	25	22.7	55	50.0	5	4.5	25	22.7	110
Analytical set gr.	9	8.2	101	71.8	0	0	0	0	110
Integrating set gr.	43	43.0	47	47.0	9	9.0	1	1.0	100

I: Total number and percentage of the cards perceived as alphabet letters
II: Total number and percentage of the cards perceived as geometrical patterns
III: Total number and percentage of the card perceived as other letters than alphabet letters.
IV: Total number and percentage of the cards given some other meanings.

Category (I) contains all of the cases in which the presented cards were recognized as alphabet letters. Category (II) includes all of those in which the subjects took the cards for some geometrical patterns or the scattering of the meaningless lines and curves. Category (III) consists of the cases in which the subjects took the cards for some other letters than 'alphabet'. For example, the card "E" was read as a Chinese character "三". The sets to these kinds of responses were subtly made by utilizing a very small part of the clues. Category (IV) includes all of the cases in which the cards were regarded as some concrete objects. For example, the subjects in the neutral set took the figure, which appeared as a letter "V", for a funnel, and they also took the figure of "M" for a picture of the space between the roofs of two houses drawn in outline. The responses in this category were made in disregard of the instruction. The subjects regarded the experiment as those of association, perceptual defense etc., in their particular ways. That is to say, these responses were of subject-dominancy.

As seen in Table 1, the percentage of Category (I) is 22.7 in the free set group, while the percentage of the same cateogry is 8.2 in the analytical set group. And the percentage of Cateogry (II) is 50.0 in the free set group, while the same (II) is 91.0 in the analytical set group.

Accordingly, the result of the free set group forms a contrast to that of the analytical set group. Moreover, in the free set group, the percentage of Category (IV) is 22.7, that is the same percentage as in the cases of Category (I), but no such cases are found in the analytical set group. All the results obtained above may afford sufficient evidence in support of that effect of the instruction which inhibited the letter-

seeing set, and induced the analytical set.

Statistically, the condition difference between the neutral set and the analytical set groups was significant (by t-test, $0.1>P>0.05$ on the Cateogry (II), and $P<0.025$ on the other categories).

In the free set group, however, only 22.5 percent of the whole response was perceived as Category (I). This fact is supposed to show the low probability of the materials to be perceived as Cateogry (I). Therefore, it must be considered that the hypothetical condition excessively affects the percentage of Category (II) in the analytical set group. This is also indicated in the integrating set group, e.i., the percentage of recognition as Category (I) increased only to 43.0 even when the subjects were presented a visual clue which would facilitate the perception of Category (I).

Table 2. Response contents of every card and every subject.

Gr. / Ss / Card	Free set gr.										Analytical set gr.										Integrating set gr.									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
T	○	○	○	○	×	×	×	×	○	•	×	×	×	×	×	×	×	×	×	×	○	○	○	×	○	×	×	×	○	×
M	×	○	○	○	×	×	×	×	•	•	×	×	×	×	×	×	×	×	×	×	×	○	○	×	×	×	○	×	○	×
P	×	○	○	○	×	×	×	×	•	×	×	×	×	×	×	×	×	×	×	×	○	○	○	•	○	×	○	×	○	•
F	×	○	×	○	•	×	×	×	•	×	○	×	×	×	×	×	×	×	×	×	×	○	○	•	×	×	×	×	○	•
S	•	•	○	×	×	•	×	×	•	•	○	×	×	×	×	×	×	×	×	×	○	○	○	×	×	×	×	×	○	×
W	×	•	•	○	×	×	×	×	•	•	○	×	×	×	×	×	×	×	×	×	×	•	○	•	×	×	•	•	○	×
H	×	•	•	•	×	•	×	×	○	•	○	×	×	×	×	×	×	×	×	×	×	○	○	×	×	×	×	•	○	×
E	×	○	•	○	×	×	×	×	•	•	○	×	×	×	×	×	×	×	×	×	×	○	○	×	×	×	×	•	○	×
V	×	×	×	○	×	•	×	×	•	•	○	×	×	×	×	×	×	×	×	×										
R	×	○	○	○	×	×	×	×	•	•	○	×	×	×	×	×	×	×	○	×	○	○	○	○	○	×	○	×	○	○
G	×	○	○	○	×	×	×	×	•	•	○	×	×	×	×	×	×	×	×	×	○	○	○	×	×	×	×	×	○	×

○: Cards perceived as alphabet letters.
×: Cards regarded as geometrical patterns
•: Cards belonging to the categories (III) and (IV)

So far, we have discussed the effects of the different instructions upon the three groups, namely in the three conditions. Here, we will bring forward the problem of the individual differences of the responses among subjects of each group. Table 2 shows the reasponses classified in three categories of every subject and every card. From this table, it is indicated that 5 subjects out of 10 in the free set group did not perceive the experimental cards as Category (I), and (similarly,) 8 subjects in the analytical set group and 2 subjects in the integrating set group out of 10, did not perceive them as (I), either. It is also found that one who perceived the cards as Cateogry (I), did not always regard all of 11 cards as belonging to such category as (I) in each group.

Each subject had a different cognitive structure about the experiment and received the instructions in his particular way. For exmaple, according to sub-

jects' retrospections in the free set group, some thought all the cards were of geometrical patterns but others took the present experiment for that of figure-ground relation, association, perceptual defense, and alphabet letters or some picture drawings. In the analytical set group, 9 subjects out of 10 truly took all of the cards for some meaningless geometrical patterns; in the integrating set group, the majority had the cognitive structure that all of the cards were alphabet letters.

Generally speaking, it seems that the subjects have their own cognitive structure, though vague, about the experiment, but it is more or less affected by the instruction.

Experiment II

Introduction

In the experiment I, the effects of inhibition and facilitation induced by the instructions upon the perception were experimentally studied, but the material features were too impoverished to testify the hypotheses. For that reason, the perceptions of the experimental cards of subjects were various, and accordingly, the hypotheses of each condition could not be fully examined.

So, in this experiment, materials with such traits were designed, so that subjects could easily catch a particular object in a general visual set (free set or netural set). And it was exmained whether or not the special instruction made those particular objects unrecognizable as they are. This experiment is more refined than the experiment I.

Procedure

The general procedure was the same as in the experiment I. The subjects consisted of two groups. The first group was instructed: "10 cards will be serially shown for a moment. Please put down what you see on pieces of paper". This group was our control group. The second was told: "This is a test of your memory. A series of 10 cards will be exposed for a moment. Several lines were drawn on each card. Please remember the number of them and put it down on pieces of paper." The second group is the inhibited set group, and the subjects in this group were tested as to how the instruction could inhibit their perceptions of particular visual objects.

As illsutrated in Fig. 2, the materials in the present experiment were the Japanese cursive syllabories which were pictured by the same technique as those of the experi-

Fig. 2. Japanese cursive syllabory drawn in adumbration.

ment I. Besides, in Fig. 2, the materials consisted of 9 cursive syllabories.

Compared with the adumbrated alphabet letters, the adumbrated cursive syllabories are particularly abundant in curves, but have so unstable visual structures, that they are easily apprehended as a whole. Moreover, it will be expected that cursive syllabories would be more recognizable than alphabet letters in the experiment I.

Each card was shown at random for 300 sigma to each subject by the tachistoscope. The subjects of the two groups were 20 undergraduate and graduate male and female students. Of course, these groups did not include the same subjects that had joined in the former experiment.

Results and Discussion

Table 3 shows the response content obtained by presenting 10 cards to 20 subjects. In the experiment I, the responses which recognized alphabet letters amounted to only 22.7 percent of the whole and, besides, the responses were various. However, in the present experiment, it was characteristic that the response content was devided into only two categories: Category (I) contains all of the cases in which the cards were perceived as the cursive syllabories, and Category (II) includes all of the cases in which the subjects took the cards for some meaningless geometrical patterns.

Table 3. Percentage of responses of every category and every group.

Categories \ Group		Percentage	Mean per 10 cards	SD
(I)	Free set gr.	83.0%	8.3	2.93
	Inhibited set gr.	32.0	3.2	0.75
(II)	Free set gr.	17.0	1.7	0.90
	Inhibited set gr.	68.0	6.8	0.75

(I): Cards recognized as Japanese cursive syllabory.
(II): Cards perceived as geometrical pattern.

In the control group, 83.0% recognized (I), while only 17.0 percent were the rest, and therefore, it would be reasonable to consider that the materials in the present experiment were suitable to be presented in the control group. And in the second group (inhibited set group), (I) amounted to 32.0 percent and (II), 68.0 percent, namely, the results of two groups form a striking contrast. This would afford abundant evidence that the inhibitory effects of the instruction was well indicated.

Statistically, the condition difference between two groups is significant (by X^2-test, $X_0=66.0$, $df=3$, $P<0.01$).

Now, in this experiment, we shall analyze the intra-group relations, too. As seen in Table 4, in the second group, Category (I) showed the percentage of 32.0, namely, it will be seen that the instruction could not affect perfectly enough to inhibit the percep-

Table 4. Response contents of every card and evey subject.

Gr. / Vp. / Card	Free set group										Inhibited set group									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
い	○	○	○	×	○	○	○	×	○	○	×	○	○	×	×	×	×	×	○	×
さ	○	×	○	×	×	○	○	×	○	○	×	×	○	×	×	×	×	○	○	×
か	○	○	○	×	○	○	○	○	○	○	×	○	○	×	×	×	×	○	○	×
す	○	○	○	×	○	○	○	○	○	○	×	○	○	×	×	×	×	○	○	×
も	○	○	×	×	○	○	○	○	○	○	×	○	×	×	×	×	×	×	○	×
え	○	○	○	×	○	○	○	○	○	○	×	○	×	×	×	×	×	×	○	×
と	○	○	○	×	○	○	○	○	○	○	×	○	○	×	×	×	×	○	×	×
き	○	○	○	×	○	○	○	○	○	○	×	○	○	×	×	×	×	○	○	×
け	○	○	○	×	○	○	○	○	○	○	×	○	○	×	×	×	×	×	○	×
ち	○	○	×	×	○	○	○	×	○	○	×	○	○	×	×	×	×	○	○	×

tion of Cateogry (I). But, this was true of only 4 subjects. For them the task was very difficult, and they perceived at first the cards as a whole with an impression of them and, according to it, reproduced the characteristics-the spatial arrangements of curves or points. In other words, they had subjective visual set. In these subjects, the instruction did not affect them strongly enough to build a stimulus-bounded set. In the first group, only one subject failed to take the cards for Category (I). He could not see the cards subjectively, and imposed the stimulus-bounded set on himself during the experimentation.

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