AN ANALYSIS OF MEDIATION PROCESSES IN OBSERVATIONAL LEARNING: A COMPARISON OF IMAGINAL AND VERBAL MEDIATION

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The present experiment aimed to compare the roles of imaginal and verbal mediators in observational learning. Elementary school children were assigned for the picture (P) and word (W) card sorting learning. Performances of the observational groups (PO, WO) proved better than those of the non-observational groups (PNO, WNO), and the PO was more effective than the WO. Then each of the 4 groups were divided into conceptual (c) and non-conceptual (nc) groups and these 8 groups were compared with one another. The effects of observation in the PO-c and the PO-nc suggest the functioning of verbal and imaginal mediation, respectively. Superior performance of the PO-c to the PO-nc and the WO-c may suggest the facilitative effect of both verbal and imaginal mediators.

In social situations behavior is very often modified by the information which one receives from others. Behavior, either deliberately or inadvertently, changes through exposure to social models.

It is particularly evident that complex repertoires of behavior are to a large extent acquired not through the observer's own trial and error but rather through observation. This phenomenon, termed the "observational learning", can be frequently seen in our daily life.

Most of the traditional researches in learning, however, have examined the process of learning as a consequence of direct experience. The theoretical interpretations of observational learning and the analyses of the factors influencing observational learning have only just begun. Further studies are needed to investigate the mechanisms which govern observational learning.

For the purpose of the present discussion, an observational learning event should be defined, according to Bandura (1965), as one in which new responses are acquired or the characteristics of existing response repertoires are modified as a function of observing the behavior of others under the conditions where an observer does not overtly perform the model's responses during the acquisition phase, and he is not administered any reinforcer.

Among several interpretations of observational learning, some theorists emphasize that these phenomena cannot be sufficiently explained from the viewpoint of simple reinforcement theories and assume the mediation processes for the occurrence of observational learning (Bandura, 1965, 1972; Berger, 1968; Rosenbaum & Arenson, 1968). There are, however, few studies which directly attempt to analyze the role of the mediation processes in observational learning.

The author believes that the mediation processes in the observer must be one of the most important factors in observational learning. The present paper ana-
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lyzes the basic conditions of observational learning, discussing the mediation processes in the observer.

Haruki and Hayashi (1969), in the matching task of Smoke's conceptual figures, Haruki (1971), and Haruki and Ito (1970), in the right-left discrimination learning, reported that it was necessary for the observer to possess the same kind of conceptual responses among his response repertoires as those which were contained in the modeled response components for the occurrence of observational learning. These studies suggest the basis for presupposing the mediation processes, by showing that observational learning is extremely inferior when the mediator does not function in the observer. For reproduction of matching responses after only observing modeled behavior, it is assumed that during exposure to modeling stimuli some covert responses occur in the observer, and that these responses function as mediators for the observer’s subsequent performances. One of the prerequisites for the occurrence of these covert responses must be that the observer is furnished with the responses which are contained in the model’s response components. In the above-mentioned three studies, the conceptual responses were assumed to constitute the mediation processes because the modeled responses were conceptual ones.

Most of the past studies dealing with the mediation processes in observational learning focused their attention mainly on the role of verbal mediation (Bandura, Grusec, & Menlove, 1966; Coates & Hartup, 1969; Haruki, 1971; Haruki & Hayashi, 1969; Haruki & Ito, 1970; van Hekken, 1969) and there are very few studies which have attempted to analyze the role of imaginal mediation (Gerst, 1971; Ito, 1972). However, the question arises whether or not nonverbal mediators have any effect on observational learning.

Bandura (1965, 1972) assigns a prominent role to representational mediators. According to him, observational learning involves two representational systems—an imaginal and a verbal one.

The purpose of the present experiment was to determine how the mediation processes in the observer can function in observational learning: Especially comparing the role of the imaginal mediators, as one of the nonverbal mediators, with the role of the verbal mediators. It was examined from the viewpoints of the stimuli given and the subject’s capability, that is, to investigate how observational learning is influenced by the material differences and their interactions with the observer’s concept formation which is assumed to function as mediators.

**Method**

**Subjects**

The subjects were 223 children: 76 second graders, 68 third graders and 79 fourth graders, from three elementary schools in Tokyo. Boys were 114 and girls 109.

**Pretest**

The pretest was conducted in order to examine to what extent the making of a conceptual abstraction was possible, in other words, how much the subjects has already acquired the superordinate concept.

**Task.** The pretest consisted of five problems. In each problem subjects were asked to point out the similarities of three objects. The pretest consisted of five categories (such as fruit, vehicles, animals, clothes and musical instruments) which were used in the experiment, but none of the objects (such as loquat, bus, rabbit, raincoat and xylophone) were repeatedly used in either the observational stage or the test stage of the experiment. The objects were familiar to all of the children and the similarities of the three objects in each problem could be pointed out at three levels of abstraction, conceptual, pre-conceptual and perceptual. The problems were as follows: 1. loquat, pear, Chinese citron. 2. bus, cable car, sports car. 3. rabbit, horse, tiger. 4. raincoat, sweater, school uniform.
5. xylophone, pipeorgan, piano.

**Procedures.** The subjects were told, “I am going to write the names of three objects on the blackboard. They are all alike in some way. On the paper which has been given to you, list no more than the three most important reasons why you think these three objects are similar to one another.” After the procedure has been explained, the experimenter wrote the names of the three objects of each problem on the blackboard. The subjects then began to write. They had 2 minutes to answer each question.

**Criteria for estimation and estimation procedures.**

The subjects’ answers were distinguished by the following criteria, making reference to Shinomiya (1967):

- **Conceptual abstraction**—Subjects pointed out the similarities in the form of the superordinate concept, that is, in the form of the words such as fruit, vehicles, animals, clothes and musical instruments.
- **Pre-conceptual abstraction**—Subjects pointed out the similarities on the basis of the formation, construction, use, components, or processes of formation.
- **Perceptual abstraction**—Subjects pointed out the similarities on the basis of immediate qualities such as color, shape, partial similarity, or on the basis of position in time or space.
- **Incorrect and / or omitted.**

If the subjects wrote more than two answers, the one which most satisfied the above mentioned four criteria was adopted.

The answers were rated by the author and two other students of psychology. We were in perfect agreement on 96 per cent of the answers. Disagreements were resolved by discussion and the result of a majority opinion.

**Experiment**

The experimenters were the author and other female undergraduate students of psychology.

The interval between the pretest and the experiment was about one week.

**Materials.** Observation cards—The 15 objects were selected according to the same criteria as the problems for the pretest. The cards were of two kinds: “picture cards” had illustrations of the objects drawn linearly and “word cards” had their names written in Japanese syllabary (hiragana and katakana letters), each on a white cards which measured 5 × 7.5 cm. Both picture and word cards consisted of 15 objects respectively.

The objects were as follows: Fruit—watermelon, orange, cherry. Vehicles—jeep, bicycle, electric car. Animals—dog, deer, bear. Clothes—overcoat, white shirt, jumper. Musical instruments—organ, accordion, iron xylophone.

Test cards—These cards, both picture and word cards, were the same as the observation cards in respect to the criteria for selection, size, and make up. However, the objects included in each of the five categories differed from the objects on the observation cards.

The 25 objects for the test were as follows: Fruit—apple, grape, peach, walnut, melon. Vehicles—passenger car, train, monorail, motorcycle, baby carriage, trolley bus. Animals—cat, rat, squirrel, giraffe, elephant, lion. Clothes—business suit, sailor’s suit, blouse, one-piece dress. Musical instruments—grand piano, harp, harmonica, **koto** (Japanese harp).

A screen—It was sheet of white cardboard; of the size of 32 × 47 cm. It was used for screening the experimenter’s arrangement of the cards from the eye of the subjects.

**Task and design.** The task was the card sorting learning in which subjects were asked to classify the randomly-presented cards into five groups. The experimental treatments consisted of the observational (O) condition and non-observational (NO) condition, and furthermore each condition was divided into the picture (P) group and word (W) group. Children of each grade and each sex were assigned to four groups so that the mean standard score of the intelligence test and the mean number of the conceptual abstraction in the pretest might not make any difference under these four groups. The intelligence test used were the A-S intelligence test of University of Tokyo for the second and fourth graders, and the New B Tanaka Intelligence Test for the third graders. In order to control any possible influences caused by the experimenters, each of them was always assigned to the same particular
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TABLE 1
Median card sorting time as a function of observational and material conditions

<table>
<thead>
<tr>
<th>Material</th>
<th>Observational condition</th>
<th>Non-observational condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N$</td>
<td>$Mdn$</td>
</tr>
<tr>
<td>Picture</td>
<td>53</td>
<td>1 min 19 sec (0 min 38 sec-over 10 min 00 sec)</td>
</tr>
<tr>
<td>Word</td>
<td>59</td>
<td>2 min 28 sec (0 min 49 sec-over 10 min 00 sec)</td>
</tr>
</tbody>
</table>

† Values in parentheses indicate range.

number of the subjects from each of the four groups.

Procedures. Stage I: The experimenter sat down, to the left of the subject, facing at right angles with him. The subjects were instructed as follows: "I will now show you various picture cards (or various word cards for the subjects in the word group). They can be put into groups based upon similarity. The cards should only be grouped in a certain way, and the number of groups which can be made is also fixed. Select the same kind of objects and/or the objects which resemble one another and put them into groups. Tell me when you have finished."

Stage II: This stage was divided into the observational condition and the non-observational condition.

The subjects in the observational condition observed the model (experimenter) who demonstrated how to classify the cards. Behind the screen she arranged 15 observation cards into three rows and five columns which could be viewed by the subject. The objects belonging to the same category were not displayed side by side. Then the experimenter gave the following instructions: "Before you begin to classify, I will demonstrate how many groups the cards should be classified into and how the objects should be classified. You will then have to make the same kind of classifications and groupings yourself: So watch carefully what I do," After taking away the screen the experimenter classified the cards into five categories and presented them for 30 sec after completion.

For the subjects in the non-observational condition, Stage II was skipped. Stage III immediately followed Stage I.

Stage III: The experimenter arranged 25 test cards into five rows and five columns which could be viewed by the subject behind the screen and said, "Now, you have to classify the cards. Select the objects which are the same or which resemble each other and put them into groups," and then took away the screen. The experimenter used a stopwatch and recorded the subject’s card sorting time within the limit of 10 min.

When the subject had finished all of his card grouping, he was asked to explain the reason for each grouping, though the data are omitted in this paper.

RESULTS

Card Sorting Time

Comparisons among the four groups. Table 1 presents the median card sorting time needed by the children in the above noted four groups. The subjects who finished card sorting within 10 min but failed in correct sorting were taken into account equally with those who could not accomplish the sorting within the limited time.

In order to test the effects of observation, the observational condition was compared with the non-observational condition. The differences between the results of the groups had been established by means of the $U$ test. The median sorting time taken by the picture-observational (PO) group was significantly shorter than that of the picture-non-observational
Median card sorting time as a function of observational and material conditions in the c and nc groups

<table>
<thead>
<tr>
<th>Material</th>
<th>Concept</th>
<th>Observational condition</th>
<th>Non-observational condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>Mdn</td>
</tr>
<tr>
<td>Picture</td>
<td>conceptual group</td>
<td>11</td>
<td>1 min 09 sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0 min 38 sec-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>over 10 min 00 sec)</td>
</tr>
<tr>
<td></td>
<td>non-conceptual group</td>
<td>15</td>
<td>2 min 10 sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0 min 48 sec-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>over 10 min 00 sec)</td>
</tr>
<tr>
<td>Word</td>
<td>conceptual group</td>
<td>16</td>
<td>2 min 02 sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0 min 49 sec-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>over 10 min 00 sec)</td>
</tr>
<tr>
<td></td>
<td>non-conceptual group</td>
<td>14</td>
<td>3 min 40 sec</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1 min 07 sec-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>over 10 min 00 sec)</td>
</tr>
</tbody>
</table>

† Values in parentheses indicate range.

In order to test the effects caused by material differences, the picture group was compared with the word group. The card sorting time of the PO group was significantly shorter than that of the WO group (z=3.50, p<.001). On the other hand, under the NO condition there was no difference between the PNO group and the WNO group in the card sorting time (z=1.57, p>.05).

Comparisons among the groups divided into the conceptual and the non-conceptual groups. The subjects who answered all the problems in the pretest by conceptual abstraction formed the conceptual (c) group. The non-conceptual (nc) group consisted of the subjects who answered none of the five problems in the pretest by conceptual abstraction. The subjects who belonged to the c group and the nc group were picked up in each of the four groups. Consequently the experimental groups came to eight in all. Table 2 presents the median card sorting time of the eight groups.

In order to test the effects of observation, the O condition and the NO condition were compared separately with regard to the c group and the nc group. In the c group, the card sorting time under the PO condition (the PO-c group) was significantly shorter than that of the PNO condition (the PNO-c group) (U=21, p<.05). The difference between the WO-c and WNO-c groups was not so significantly great (U=91, p>.05). In the nc group, the card sorting time under the PO condition (the PO-nc group) was also significantly shorter than that of the PNO condition (the PNO-nc group) (U=58, p<.05). There was no difference between the WO-nc and WNO-nc groups in the card sorting time (U=51, p>.05).

In order to test the effects of the conceptual abstraction upon the observational learning, the c group was compared with the nc group in each of the four groups. The PO-c group took shorter card sorting time than the PO-nc group did (U=43, p<.05). On the other hand, in the WO, the PNO, and the WNO groups, there was no difference between the c group and the nc group (PNO; U=46, WO; U=75.5, WNO; U=67, p>.05).

In order to test the effects caused by
material differences, the P group and the W group were compared. The card sorting time in the PO-c group was shorter than in the WO-c group ($U=34.5, p<.01$). But, comparisons of the other three pairs of groups—PNO-c and WNO-c ($U=57$), PO-nc and WO-nc ($U=69$), and PNO-nc and WNO-nc ($U=79$)—showed no difference ($p>.05$).

Standard Score of the Intelligence Test

Comparisons among the four groups. Table 3 presents the mean and standard deviation of the standard score of the intelligence test in the four groups.

Comparisons of pairs of treatment conditions, which corresponded to the previous comparisons in the card sorting time, by the $t$ test revealed no difference in the standard score of the intelligence test ($p>.05$).

Comparisons among the groups divided into the conceptual and the non-conceptual groups.

<table>
<thead>
<tr>
<th>Material</th>
<th>Observational condition</th>
<th>Non-observational condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{X}$</td>
<td>$SD$</td>
</tr>
<tr>
<td>Picture</td>
<td>55.66</td>
<td>7.07</td>
</tr>
<tr>
<td>Word</td>
<td>55.19</td>
<td>7.72</td>
</tr>
</tbody>
</table>

Table 4 presents the mean and standard deviation of the standard score of the intelligence test in each group.

Comparisons were made between the pairs of treatment conditions, which corresponded to the previous comparisons in the card sorting time, that is, which tested the effects of the observation, the conceptual abstraction and the material, by the $t$ test, and the results were as follows: Only between the PO-c group and the PO-nc group there was a difference in the standard score of the intelligence test ($t=2.233, df=23, p<.05$). Other 11 pairs revealed no difference ($p>.05$).

DISCUSSION

Comparisons among the Four Groups

The card sorting time of the observational condition was superior to that of the non-observational condition both in the picture grouping and the word grouping. This shows that observational learning occurs both in the picture and the word groups.

Material differences of picture and word in the observational condition show that observational learning using picture materials is more effective than word materials. On the other hand, the fact that there was no material difference in the non-observational condition shows that observational learning using word materials is more effective than picture materials.

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One subject in the PO-nc group lacked the data of his intelligence test.
tional condition may suggest that the material differences have a great importance in observational learning. It is likely that the mediation processes differ in the picture-grouping observational learning and the word-grouping observational learning.

In the card sorting learning using picture cards, perceptual cues for classification must be clearer because the concrete object is presented as a figure. Above all, because the similarities of the objects in the present study can be pointed out on the perceptual level, it seems easier for the observer to use the perceptual similarities as cues, while in the word card sorting there are no perceptual cues. Therefore the imaginal mediators produced by perceptual cues function more probably in the picture-grouping observational learning. And in the word card sorting learning the possibility that the verbal mediators should serve for the occurrence of observational learning must be greater. It might be possible, of course, that the subjects coded the pictures into words, one by one, and vice versa. Relatively, however, the above-noted assumptions may be fairly permissible.

Pavio (1971) compared the effects of pictures with those of words in paired-associate learning and found that pictures facilitated learning as stimuli, suggesting that they readily evoke images that can function as mediators of associative learning. Bruner, Oliver, and Greenfield (1966) compared verbal materials with picture materials in their studies on equivalence, and interpreted their data as signifying that a greater reliance on perceptible properties in the picture material task reflects a basis in imagery. These explanations might not exactly apply to observational learning, but these studies also suggest that the card sorting learning using picture materials in the present experiment tends to be influenced by the function of imagery.

Comparisons among the Groups Divided into the Conceptual and the Non-conceptual Groups

As mentioned above, it can be assumed that mediation processes in observational learning differ according to the materials. However, is this the only possible basis for predicting the role of the mediation processes in observational learning? It is necessary to investigate not only from the viewpoint of the stimuli given, but also from the viewpoint of the subject's own capability.

Haruki (1971), Haruki and Hayashi (1969), and Haruki and Ito (1970) found that observational learning was much influenced by the same conceptual responses as were contained in the model's responses when the tasks were conceptual ones. It is assumed that the mediation processes cannot function and therefore observational learning will not occur or seldom occur if the observer himself is not furnished with the capability under which mediators can function for response retrieval and reproduction. Although it is difficult to prove which mediator functions in the observer, examination of the mediators formed in the course of development seems to be one of the effective methods.

In the present experiment one of the essential conditions for the occurrence of observational learning was that the observer could covertly acquire the similarities of grouped cards, through the modeled responses. It is because in the test cards the objects included in each category differed from those of the observation cards. Besides, each category of observation cards contained three objects, while the test cards contained from four to six objects. Therefore, in the test for the acquisition the subjects were asked whether they had learned the modeled responses, not in the form of specific stimulus-response associations, but on the basis of similarities of some kinds. The similarities may be acquired in verbal or imaginal form. And the characteristics
of the mediation processes may differ according to the means of abstraction.

The verbal mediators can be examined in the form of words which represent the superordinate concept, and for this reason they can be more clearly demonstrated than the imaginal mediators are. Therefore, in the pretest it was examined whether or not the concept had been already formed in the observer, that is if he had been able to make conceptual abstraction or not.

The card sorting time was shorter under the PO condition than under the PNO condition. This suggests the effects of observation both in the c group and in the nc group. When the c group and the nc group were compared under the PO condition, faster learning was achieved in the PO-c group than in the PO-nc group. Apparently observational learning is facilitated when the superordinate concept is formed in the observer. On the other hand, the effects of observation in the nc group suggest that the superordinate concept is not always an essential condition for observational learning in picture grouping.

These results are related to the mediation processes as follows. First, the subjects who can make conceptual abstraction are able to use verbal mediators. Furthermore, imaginal mediators can also function when using picture materials. Those who cannot make conceptual abstraction are not able to use verbal mediators; at least the mediators they can use are not the ones connected with the words, such as "fruit", "animals", etc.

Nevertheless, the effects of observation in the PO-nc group suggest the possibility that some nonverbal mediators, or mediators which are less influenced by verbal ones, may serve for the occurrence of observational learning. In this case the mediation processes must be influenced by imaginal mediators because of the use of picture materials.

Therefore, facilitative effects on observational learning in the PO-c group, when it was compared with the PO-nc group, may suggest that the subjects in the PO-c group used both verbal mediators and imaginal mediators. This must be also supported by the card sorting time of the PO-c group which was shorter than that of the WO-c group.

In summary, the effects of observational learning differed depending first on the material differences, as it had been assumed that different mediation processes would function, and secondly on the observer's capabilities, as it had been presupposed that different mediators would function in those who could make conceptual abstraction and those who could not. This suggests that the mediation processes play a prominent role in the occurrence of observational learning.

Some Other Comments

On the "intelligence level". The fact that there was no difference in deviation in the intelligence test shows that the difference in the card sorting time must result owing to the experimental conditions. The only exception was a difference between the PO-c and the PO-nc groups. It is likely that not only the superordinate concept but also the intelligence level are concerned in the occurrence of observational learning of this kind. These factors, however, do not seem to be alternative, because the question forms such as the content of the pretest in the present study are often included in the intelligence test as a subtest. Although the two groups were picked up operationally on the level of conception, it might be possible that the intelligence level is basically concerned with the conceptual level. Anyway, it apparently needs to examine further in this respect.

On the observational learning with word materials. It had been expected that in the word grouping observational learning would be facilitated when the superordinate concept was formed in the observer,
because the verbal mediators seemed to be more important in the word card sorting learning. Contrary to the expectation the effects of observation in the WO-c group were not remarkable. One of the causes may be too short for the observer of the ages, 7 to 9, to read every word on the card. These possibilities should be examined further.

On the "effects of observation". Now we will discuss the "effects of observation," or what was learned through observation. There might be a suspicion that the shortening of sorting time resulted not because the observer had learned the conceptual responses presented by the model but because he had only learned the model's movements of classifying. The movements themselves, however, are not so important in the whole conceptual responses, and furthermore the remarkable differences in the sorting time were shown between the PO and the WO groups in which the movements themselves did not virtually differ. It may be assumed, after considering the characteristics of the task in the present experiment, that the conceptual responses have learned through observation.

On the "imaginal mediation". As mentioned above, the effects of observation in the PO-nc group can be said to result from the role of the imaginal mediators. However, although the subjects in the non-conceptual group could not answer in the form of conceptual abstraction, some could point out the similarities in the form of pre-conceptual or perceptual abstraction. In these cases, some verbal mediators—for example, not in the form of words which represents the superordinate concept such as "fruit", but the word "round"—could be assumed to have functioned. Therefore, in order to clarify the role of nonverbal mediators more exactly, it is necessary to examine the criteria in which at least any verbal mediator did not function. It must be an effective means to compare PO and PNO groups with the subjects whose answers were all incorrect and/or omitted. The number of the subjects, however, was too small that we cannot declare we concluded an exact assumption (the number of the PO group was 2, the PNO group 6). Further investigation will need a large number of the subjects.

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