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PERCEPTUAL TRANSFER: THE ROLE OF MEDIATIONAL STYLE,
TYPE OF TRAINING, AND TYPE OF CRITERION TASK

by

BARRY PAUL KARP

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Abstract

PERCEPTUAL TRANSFER: THE ROLE OF MEDIATIONAL STYLE,
TYPE OF TRAINING, AND TYPE OF CRITERION TASK

by

Barry Paul Karp

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In recent years, there has been increasing interest in perceptual transfer effects. Literature has tended to concentrate primarily on task variables (e.g., type of training, type of criterion measure, number of trials, etc.) and had neglected subject characteristics which may affect the transfer process. The purpose of the present study was to assess one such variable, mediational style, which may be related to perceptual transfer. A three-way factorial design (type of mediational style X type of predifferentiation training X type of criterion task) was employed.

180 college students were categorized into three groups on the basis of their characteristic responses in reporting

visual stimuli. Ss who preferred to describe the stimuli in words were designated verbalizers; Ss who preferred to draw the stimuli rather than use verbal descriptions were considered to be visualizers; finally Ss who showed no clear-cut style or preference were labeled "mixed."

Ss in each of these groups were randomly assigned to three experimental conditions. One group (distinctive label training) learned to associate a different verbal label to each of three visual stimuli. A second group (visual training) was asked to judge the successive presentations of two stimuli as either the same or different. A third group (observation condition) was shown the visual stimuli and simply asked to observe them very carefully.

Following each of the experimental training conditions, all Ss were given a perceptual judgment, recognition, and reproduction task. Two orders of administration were employed. The perceptual judgment task required S to look at two tachistoscopically presented pairs of the previously employed stimuli and rate them on a continuous rating scale in terms

of their similarity or dissimilarity. The recognition task required S to look at four visual stimuli and decide whether he had seen any of these figures before. The reproduction task required S to draw from memory each of the previously seen visual stimuli.

The major predictions tested were as follows: (1) verbalizers would be more influenced by label training than other types of training in their subsequent perceptual responses; (2) visualizers would be more influenced by visual training, and (3) "mixed" Ss would be equally affected by distinctive label and visual training in magnitude of perceptual transfer. Thus, an interaction between mediational style and the type of training received was predicted. The possibility that the transfer effects obtained would be differentially reflected in the particular type of criterion task employed (e.g., perceptual judgment, recognition, reproduction) was also investigated, although no specific predictions were advanced.

The results indicated that: (1) on the perceptual judgment task, although not statistically significant, a trend in the

predicted direction emerged. Furthermore, verbalizers and "mixed" Ss judged these stimuli to be more distinctive than visualizers; (2) on the recognition task, the prediction that Ss with no predominant style would be equally affected by distinctive label and visual training was confirmed. For verbalizers and visualizers, however, a relationship opposite to that predicted was obtained between style and type of training. Thus, verbalizers were more affected by visual training, whereas visualizers were more affected by distinctive label training. Furthermore, the observation condition was generally superior to either distinctive label or visual training; (3) on the reproduction task, none of the predictions were confirmed.

Acknowledgements

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Introduction

In recent years, a great deal of attention has been devoted to the effects of language responses (labels) on learning, thinking, and perception. General agreement exists that language responses can both influence the development of perception and cognition, and increase the discriminability of stimuli for adults under certain circumstances. The questions of under what conditions discriminability may be increased, however, and by what mechanisms or processes, still remain unresolved.

The theoretical viewpoints of Dollard and Miller (1950) and Gibson and Gibson (1955) have been especially influential in stimulating research in this area. Dollard and Miller, focusing primarily on the influence of labeling on transfer and discrimination, have advanced the general hypothesis that the labels associated with stimuli mediate responses made to these stimuli. They have hypothesized that:

Attaching the same cue-producing response to two distinctive stimulus objects gives them a certain 'learned equivalence' increasing the extent to which instrumental and emotional responses will generalize

from one to the the other....Conversely, attaching distinctive cue-producing responses to similar stimulus objects tends to increase their distinctiveness. (p.101)

Dollard and Miller's "acquired equivalence and distinctiveness of cues" hypotheses have been supported in a number of studies demonstrating that: (a) common labels applied to similar stimulus objects reduce perceptual accuracy (Ellis, Bessemer, Devine, & Trafton, 1962; Ellis, Feuge, Long, & Pegram, 1964; Jeffrey, 1953; Katz, 1963), and (b) distinctive labels applied to similar stimulus objects enhance perceptual accuracy (Cantor, G., 1955; Cantor, J., 1955; Ellis & Muller, 1964; Gagne & Baker, 1950; Goss, 1953; Goss & Greenfield, 1958; Katz, 1963; Rosenberg, Katz, & Karp, 1972; Segal, 1964; Spiker, 1956). However, support has not been completely unequivocal (Arnoult, 1953; Battig, 1956; Dietze, 1955; Ellis et al., 1962; McAllister, 1953; Robinson, 1955; Vanderplas & Garvin, 1959).

Gibson and Gibson, focusing primarily on the influence of training on transfer and discrimination, have hypothesized that improvement on a perceptual task comes about not as a result of adding response-produced cues to the situation, but

primarily because of practice with the stimuli. Such increased familiarity, according to this view, subsequently increases the differentiation of the stimuli by enabling the individual to respond to variables of physical stimulation not previously responded to. Thus, according to this viewpoint, the effects of labeling on perceptual discrimination can be explained without reference to cue-producing responses, but rather that labeling training provides a procedure which forces the organism to attend to more aspects of the stimulus than he ordinarily would. Labeling per se, then, is viewed as secondary or incidental, and any procedure which could guarantee the same degree of selective attention during pretraining should be equally effective.

Some support for the Gibson and Gibson position has been obtained in several studies which have demonstrated either that: (a) nonverbal pretraining may be as effective as verbal pretraining in increasing perceptual accuracy (Campbell & Freeman, 1955; Ellis et al., 1962), or (b) perceptual judgments are relatively unaffected by verbal labels (Arnoult, 1953; DeRivera, 1959; Robinson, 1955; Robinson,

Brown, & Hayes, 1964). Other studies, however, have demonstrated the superiority of labeling over other perceptual training techniques (Ellis, Feuge, Long, & Pegram, 1964; Ellis & Muller, 1964; Goss & Greenfield, 1958).

The question can be raised, then, as to the meaning of these divergent theoretical positions and inconsistent experimental results. Vanderplas (1963), in a review of the literature in the area of perceptual learning, has noted that these two theoretical positions are at the same time very similar and yet very different. He notes that whereas both viewpoints imply that practice in labeling may bring about changes in discriminative responses, the process by which these changes are brought about may be quite different. Whereas Dollard and Miller maintain that the process is one in which the response generates cues which become added to the stimulus or which serve as conditioned stimuli (Goss, 1955; Osgood, 1953), Gibson and Gibson maintain that the process is one involving learning to distinguish more clearly cues which are already present. Thus it can be seen that whereas Dollard and Miller attempt in part to account for

perception in terms of learning and transfer of training, Gibson and Gibson attempt in part to account for learning and transfer of training in terms of perception. Furthermore, whereas the Dollard and Miller viewpoint implies a dependence on the nature of the response (i.e., identical labels for different stimuli may increase generalization by adding cues which make the stimulus complex less distinct), the Gibson and Gibson position implies no such dependence.

In addition to the theoretical divergence, one of the outstanding difficulties in the area of perceptual research concerns the problem of operationally defining the term "perception." Despite the fact that the term perception has had a long history in philosophy (Hamlyn, 1961) and psychology (Boring, 1942), disagreement still exists regarding the term's proper application (Ittelson, 1962; Postman, 1963). Epstein (1967), in reviewing the theoretical and experimental literature in this area, has noted that many investigators (Allport, 1955; Bartley, 1958; Hochberg, 1956; Prentice, 1956) have generally defined perception either in terms of its immediacy, or in terms of its stimulus dependence.

Bartley (1958), using the criteria of immediacy, defines perception as "immediately following or accompanying impingements upon the sense organs..." and is to be distinguished in all cases from behavior that has "less close temporal connections with external events." Hochberg (1956), on the other hand, using the criteria of stimulus dependence, defines perception in such a way that "the presence of the stimulus, and its excitation of neural processes are necessary for at least certain aspects of that response." In attempting to reconcile these somewhat opposing definitions, Epstein (1967) has noted that if one applies the criteria of immediacy, then from a phenomenological point of view, it is the private or unobservable experience and not the overt response to which the term perception properly applies. If this is the case, then it is difficult to know how an experimenter can determine the immediacy of an event, since the latency of the perceptual experience and the latency of the response may not be in conjunction with one another. Furthermore, if one adheres rigidly to these criteria, there are at the present time very few perceptual tasks that can be performed without a series of comparison responses, thus confounding the response with

either a judgmental or memory component.

On the other hand, if one applies the criteria of a stimulus dependence to the term perception, then one encounters the problem of operationally defining the term "stimulus." If the term stimulus refers only to antecedent conditions, then although the definition is accurate, it is not very useful, since all responses, be they interpretive or perceptual, depend to some extent on antecedent conditions. Several investigators (Allport, 1955; Epstein, 1967; Garner, Hake, & Eriksen, 1956; Goldiamond, 1958) have raised this question in terms of which operational referents shall be employed as appropriate indicators of the perceptual process, and have thus concentrated attention on the response side.

An emphasis upon the nature of the criterion responses has been a characteristic concern of investigators in the area of perceptual transfer. Some (Epstein, 1967; Katz, Karp, & Yalisove, 1970; Vanderplas, 1963) have suggested that certain types of responses may be more sensitive to transfer effects than others. The results of a number of recent studies organized according to the type of task employed are contained in Table 1.

TABLE 1

TYPE OF TRANSFER TASKS: SUMMARY OF FINDINGS

Transfer Task	Study	Effect
Recognition	Arnoult (1956)	Negative
	Brown & Lenneberg (1954)	Positive
	Ellis <u>et al.</u> , (1962)	Negative
	Ellis & Daniel (1971)	Positive
	Ellis & Muller (1964)	Positive
	Kurtz & Hovland (1953)	Positive
	Price & Slive (1970)	Positive
	Vanderplas (1963)	Negative
	Vanderplas & Garvin (1959)	Negative
Judgment	Arnoult (1953)	Negative
	Hake & Eriksen (1955)	Negative
	Katz (1963)	Positive
	Katz & Zigler (1969)	Positive
	Robinson (1955)	Negative
	Robinson <u>et al.</u> , (1964)	Negative
	Vanderplas <u>et al.</u> , (1964)	Positive
Motor	Battig (1954)	Negative
	Battig (1956)	Negative
	Ellis & Muller (1964)	Positive
	Goss & Greenfield (1958)	Positive
	Jeffrey (1953)	Positive
	Rasmussen & Archer (1961)	Negative
	Vanderplas <u>et al.</u> , (1964)	Positive
Identification	Campbell & Freeman (1955)	Negative
	DeRivera (1959)	Negative
	Ellis (1968)	Positive
	Kurtz (1955)	Positive
	Vanderplas <u>et al.</u> , (1964)	Positive

Results with regard to each of the four tasks ordinarily used to gauge perception have been quite ambiguous. Conflicting findings with each task appears to be the rule, rather than the exception.

Clearly, any effort to account for these inconsistent results must invoke additional parameters besides the nature of the criterion task. There are at least four such variables which have been empirically investigated in recent years: (a) the type of predifferentiation training, (b) the amount of predifferentiation training, (c) the nature of the visual and verbal stimuli (i.e., their complexity and meaningfulness), and (d) the developmental level of the organism. Findings concerning each of these will now be reviewed.

Arnoult (1957) has suggested that there are at least four distinct types of predifferentiation training: relevant S-R, relevant S, irrelevant S, and attention. In the first type, relevant S-R, the stimuli used for the pretraining task are identical to those used in the transfer task, and the responses used in the pretraining task are symbolic of, or bear a sign-significate relation to, the responses used in the

transfer task. In relevant S, the second type, the stimuli used in the predifferentiation task are identical to the ones used in the transfer task, but the responses are completely different from those used in the transfer task. The third type, irrelevant S, is most often used in order to obtain a control group having the same performance set as the experimental group. The stimuli used in the pretraining task are different from those used in the transfer task but are equated in difficulty. Finally, in attention training, S is not required to make any overt differential responses to the stimuli during the pretraining period. S is specifically instructed, however, to attend to the distinctive characteristic of the stimuli.

Studies utilizing each of these training procedures have produced conflicting results. By and large, the following generalizations can be made: (a) relevant S-R training is the most effective form of verbal pretraining (Baker & Wylie, 1950; Battig, 1956; Campbell & Freeman, 1955; McAllister, 1953); (b) relevant S pretraining is, in most cases, more effective than any pretraining method except S-R pretraining (Arnoult, 1953; Cantor, G., 1955; Cantor, J., 1955; Gagne & Baker, 1950;

Goss, 1953; Kurtz & Hovland, 1953; Robinson, 1955); (c) irrelevant S pretraining is usually poorer than other pretraining methods (Arnoult, 1953; Cantor, G., 1955; Cantor, J., 1955; McAllister, 1953); and (d) directed attention pretraining is often as effective as relevant S pretraining (Campbell & Freeman, 1955; Cantor, G., 1955; Goss, 1953; Kurtz & Hovland, 1953; Robinson, 1955).

The amount of predifferentiation training received has been a parameter that has interested a number of investigators. The number of training trials have varied from zero to seventy-two in many studies in order to determine whether the transfer effects obtained could be partially accounted for in terms of the amount of exposure the S had with the stimuli. The general expectation here is that degree of transfer should be positively related to amount of training. Some investigators have found this (Arnoult, 1956; Baker & Wylie, 1950; Ellis & Muller, 1964; Gagne & Baker, 1950), but others have not (Cantor, J., 1955; Goss, 1953; Rossman & Goss, 1951; Vanderplas & Garvin, 1959). Arnoult (1957), in reviewing these results, has suggested that transfer may bear a curvilinear relation

to degree of stimulus predifferentiation training. More specifically, he postulates that transfer may be expected after a minimum of four to eight pretraining trials, but may reach a maximum after eight to twelve pretraining trials. However, this remains to be tested. It is clear from the findings that even so seemingly straightforward a variable as number of pretraining trials has far from simple transfer effects.

A third variable of interest has been the nature of the visual and verbal stimuli employed in transfer paradigms. Several investigators have, for example, varied such parameters as stimulus complexity and meaningfulness of labels in order to determine whether the transfer effects obtained could be partially accounted for in terms of their degree of confusion with other stimuli. Results with regard to stimulus complexity have generally obtained a negative relation between stimulus complexity and performance on subsequent perceptual transfer tasks (Ellis, Muller, & Tosti, 1966; Katz, Albert, & Atkins, 1971; Katz, et al., 1970; Vanderplas & Garvin, 1959). Investigations which have varied the meaningfulness of the

verbal label have obtained conflicting results. In some instances, increased label meaningfulness has elicited improved performance on subsequent perceptual tasks (Ellis, 1968; McAllister, 1953), whereas other investigators have demonstrated performance decrements on transfer tasks when meaningfulness is increased (Campbell & Freeman, 1955; Ellis & Feuge, 1966). When investigators have simultaneously varied both the complexity of the stimuli and the meaningfulness of the response labels they have generally found that the learning of responses to forms low in meaning is facilitated by pretraining with meaningful labels (Ellis, 1968; Katz et al., 1971; Pfafflin, 1960).

Of all the numerous parameters which have been the subject of experimental inquiry in this area, only one has been concerned with particular organismic characteristics, namely, the developmental level of the subject. Interestingly, findings with regard to transfer in children have been considerably less contradictory than those obtained with adults, although specific variations of developmental level

within a single study have not been frequent. The general trend, however, raises the possibility that language and/or perceptual responses may operate differently in children than in adults. Numerous developmental theorists (Hebb, 1949; Piaget, 1951; Werner, 1948) have suggested that an individual's early modes of language and perception are generally undifferentiated, global, and passive. These theories predict that in the course of ontogenetic development, both linguistic and perceptual responses become more differentiated, abstract, and active, suggesting that there may be a period of maximal interaction between language and perception. Although the specific details of the developmental process are not clearly delineated, recent experimental findings (Katz et al., 1971; Katz & Zigler, 1969) suggest that the effectiveness of verbal ~~mediators~~ may be related in a curvilinear manner to the level of maturation, so that it is minimal at age three or four, reaches a maximum at six or seven, and then diminishes by nine or ten. These findings may, in part, help to account for the failure to obtain positive results in this

area when employing adults as Ss. It may be that when an individual reaches adulthood, experimentally induced changes in linguistic and perceptual processes may be considerably more difficult ~~to~~ accomplish.

Since linguistic transfer in adults has been demonstrated by some investigators (Ellis et al., 1962; Ellis & Muller, 1964) under certain situations, the issue remains of predicting its occurrence with greater specificity. It may well be, as Vanderplas, Sanderson, & Vanderplas (1964) have suggested, that certain indices of transfer are more sensitive to change than others. It is clear from the earlier findings that other factors must be explored in order to adequately account for the complex patterns obtained.

The present study investigated one such possible factor, namely, the characteristic mode by which adults mediate information. More specifically, it assessed the possibility that certain types of mediational styles are more susceptible to particular types of transfer training than others. The rationale underlying the present study assumed that individuals

may differ in the types of mediators they habitually produce and utilize, and that such differences in style would differentially affect the transfer process. Two major types of mediational styles were postulated: verbalizers and visualizers. Since few researchers have investigated this variable, it was necessary first to find a task to operationalize this construct. Consequently, a task was developed that allowed Ss to either draw or describe ten simple visual stimuli. On the basis of the individual's characteristic mode of responding (i.e., if S drew or described the stimuli), he was classified as either a verbalizer or a visualizer. If no clear-cut mode of responding was evident, the person was classified as "mixed." Thus, an attempt was made to rate the construct of mediational style along a continuum.

Although specific predictions were difficult to generate because of the lack of theory and research in this area, it was assumed that adults would utilize those experimentally induced strategies that most closely resembled their own information processing strategies. In addition, the possibility

that the transfer effects obtained would be differentially reflected in the particular type of criterion task employed was also investigated. Three types of tasks were used: perceptual judgment, recognition, and reproduction.

A three-way factorial design (type of mediational style X type of predifferentiation training X type of criterion task) was employed. The major predictions tested were as follows:

(1) Verbalizers would be more influenced by label training than other types of training in their subsequent perceptual responses.

(2) Visualizers, on the other hand, would be more influenced by visual training in their subsequent perceptual responses.

(3) Mixed Ss (i.e., Ss who show no clear-cut style or preference) would be equally affected by distinctive label training and visual training in magnitude of perceptual transfer

Method

Design. The present study was conducted in three stages. The first stage consisted of categorizing Ss as either verbalizers, visualizers, or "mixed" (i.e., Ss who showed no clear-cut style or preference). The second stage consisted of an experimental manipulation in which either distinctive label training, visual training, or observation training was given. The third stage consisted of administering to all Ss a variety of transfer tasks, including perceptual judgment, recognition, and reproduction. Ten Ss were assigned to each of 18 conditions of the experiment. Three types of mediational style (verbalizers, visualizers, mixed), three types of training (distinctive label, visual, observation), and two orders of task presentation were employed in a 3 X 3 X 2 factorial design.

Subjects. The Ss were 180 college students randomly selected from a two year technical community college in New York City. Students attending this college major in either art, design, business, management, or textile technology. The school is composed of predominately white, middle-class

females. The chronological age of the Ss ranged from 17-27 (mean age 19.71, S.D. 1.86, 31 males, 149 females).

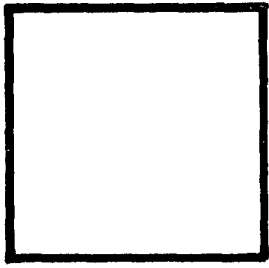
Stimuli.

Stage 1 - Subject Categorization

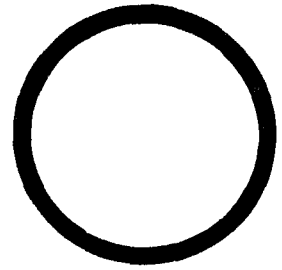
The visual stimuli used to select those Ss who were verbalizers, visualizers or "mixed" consisted of 10 simple geometric designs. An illustration of the figures is presented in Figure 1. They were drawn on transparency paper and projected by an overhead projector onto a screen. They were all the same color (light blue) and approximately the same size (three inches in height).

Stage 2 - Pretraining Stimuli

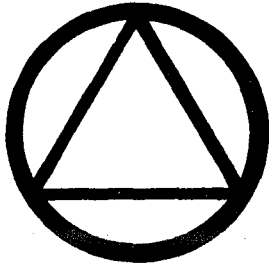
The visual stimuli that were used in the predifferentiation training were chosen from the geometric forms designed by Katz et al., (1971) according to Attneave's (1954) system for the construction of random forms. They were cut from dark shades of gray construction paper and varied systematically along the following attributes: (a) number of projections (6); (b) type of projection (rounded or angular); and (c) general



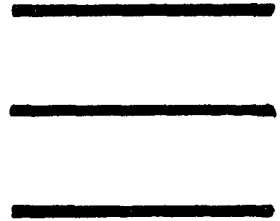
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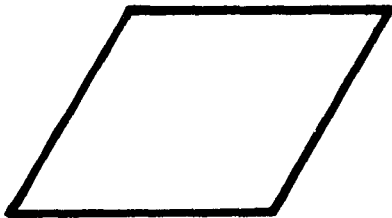
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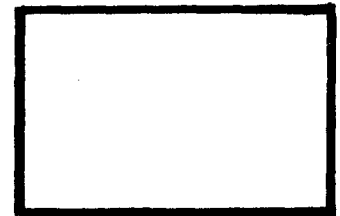
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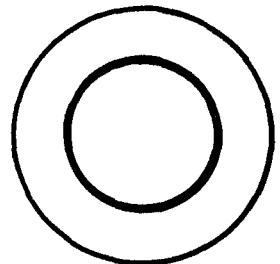
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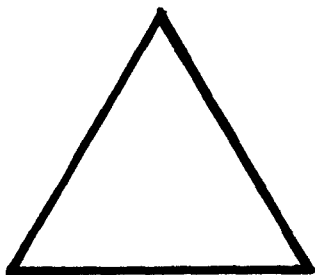
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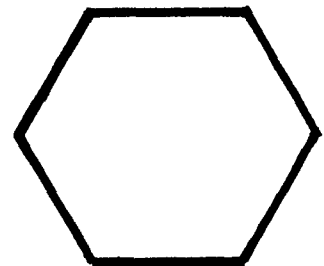
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10

Figure 1. Stimulus figures used for subject categorization.

outline. An illustration of the figures is presented in Figure 2. Photographs were taken both of the individual forms and all possible combinations of pairs.

Apparatus. A Kodak carousel slide projector was used to project the slides of the visual stimuli on the predifferentiation training, judgment, and reproduction tasks. A Graflex tachistoscopic shutter was used to control the duration of the stimuli exposure.

General Procedure.

Stage 1 - Subject Selection

College students were tested in groups of 15 to 20 in a classroom at the college. Ss were seated approximately 9-12 feet away from the screen. The following instructions were given:

I am going to show you some figures on this screen. You should look at each figure very carefully, because after I show you the figure, I want you to either draw what you have just seen or name or describe what you have just seen. (E alternated the order of the instructions so that half the Ss heard the word draw first, while half the Ss heard the word name or describe first.) Remember, for each figure that I show you, I want you to either draw what you have just seen or name or describe what you have just seen. The choice is up to you. Do you understand what you have to do?

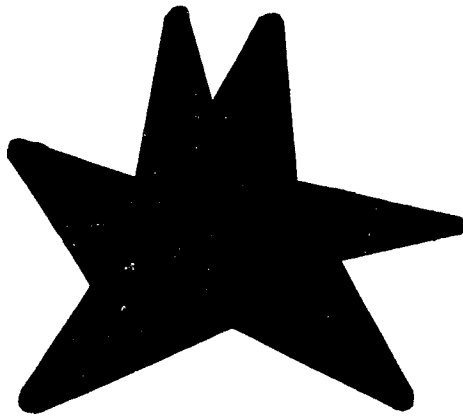
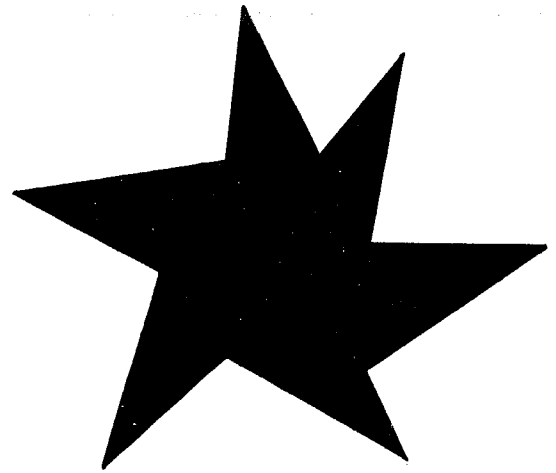
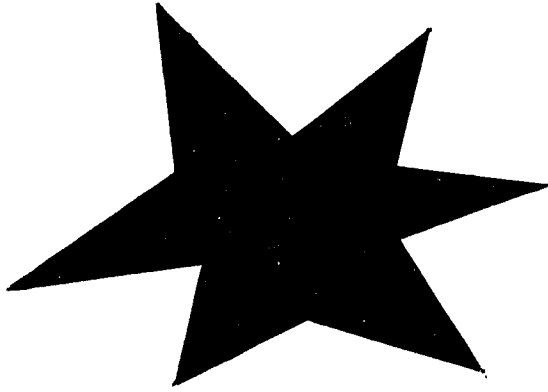


Figure 2. Stimulus figures used for the training conditions.

Each S then underwent a practice training period during which he or she was shown a sample figure (e.g., the visual symbol for male) and asked to make a response on a piece of paper. Following this, each S was then given 10 sheets of paper and asked to record his responses to each of the 10 figures. Each figure was projected for 15 seconds. The order of presentation of the 10 figures was the same for all Ss, this order being randomly determined in advance.

The following criteria were used to categorize Ss: (a) if seven or more of the figures were named or described, S was classified as a verbalizer; (b) if S drew seven or more of the figures, he was classified as a visualizer. All other combinations were classified as "mixed." Split-half reliability on this task was .87. The particular figures used were chosen on the basis of pretesting. Results of the pretest are contained in Appendix A.

Stage 2 - Experimental Manipulations

Ss were individually tested in a classroom at the college. Each S viewed the same three nonsense forms, which are presented in Figure 2. The selection of these particular

forms was made on the basis of pretesting. Details of this are to be found in Appendix B. Ss within each of the three categories were randomly assigned to one of the following three conditions:

1. Distinctive Label Training. This group viewed individually presented stimuli and received the following instructions:

I am going to show you some pictures on this screen. Each picture you will see is a nonsense figure. First I am going to show you the figure, and then I am going to tell you a name for the figure. I want you to learn what each figure looks like and what its name is. Do you understand what you have to do? Now I am going to show you the figure and tell you the name for the figure. I want you to say the name right after me. (E then presented the stimuli for three trials and S was told a distinct name for each figure and asked to repeat it.) Now I am going to keep showing you these figures, and I want you to tell me the name that I told you for each figure. If you're right I'll say right, and if you're wrong, I'll tell you the right name so that you can get it right the next time. Are there any questions? (Each name was counterbalanced across each figure for different Ss.)

The order of presentation of the three forms was the same for all Ss. This order was randomly determined in advance, with the limitation being that within any block of six trials each

figure was presented twice, and that any figure should not appear more than twice in succession. Each slide was presented for two seconds, with an inter-trial interval of three seconds. The names that were employed were nonsense syllables of 95% association value (Hilgard, 1951). They were: RIC, SOL, and JAN. Following this instructional phase, 24 trials were administered to all Ss in which Ss had to provide the label when the stimulus was presented. E recorded each response and corrected S when an incorrect response was made.

2. Visual Training: This group was presented with the same three nonsense forms and the following instructions were given:

I am going to show you some pictures on this screen. Each picture you will see is a nonsense figure. First I am going to show you the figure, which I want you to look at very carefully. Then another figure will come on, and I want you to tell me whether it was the same as or different from the one you saw just before. Do you understand what you have to do?

Each slide was presented for two seconds, with an inter-trial interval of three seconds. A practice phase of three trials was administered to all Ss. Each S was then asked to state whether the present stimulus differed from the previously projected one. Each S observed the individual stimuli 24 times, and made 12 comparisons i.e., each even-numbered

trial was compared to the previous one. Thus, each S had the same number of observations for each stimulus as did the distinctive label group.

3. Observation Condition. In this group, each S was presented with the three nonsense forms in the same order as the distinctive label group. The following instructions were given:

I am going to show you some pictures on this screen. Each picture you will see is a nonsense figure. I want you to learn what each figure looks like, because we're going to do something with these figures in a little while. Do you understand what you have to do?

The order of presentation of the forms was the same as for Ss in the distinctive label group. Each slide was presented for two seconds, with an inter-trial interval of three seconds. A practice phase of three trials was administered to all Ss. Following this instructional phase, 24 trials were administered to all Ss.

Stage 3 - Transfer Tasks

Immediately following the experimental treatments, all Ss were given perceptual judgment, recognition, and reproduction tasks. Two orders of administration were used: (a) judgment, recognition, reproduction; and (b) recognition, judgment, reproduction. It was decided to administer the reproduction

task last because it was anticipated that the longer exposure time required on this task would confound the other tasks. In addition, a reproduction task is a relatively novel dependent measure in perceptual transfer experiments, and its reliability was not known.

1. The perceptual judgment task

consisted of presenting pairs of forms to each S with the following instructions:

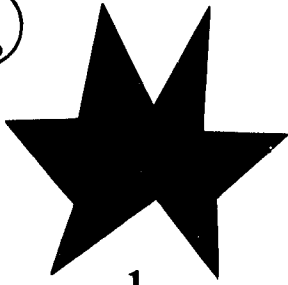
I am going to show you some pictures on this screen. Each picture consists of two figures. Sometimes the two figures will look exactly alike (i.e., identical), and sometimes they will look different. I want you to decide how similar or dissimilar each pair of figures looks to you, and then make a mark along this rating scale to indicate your decision. (E then presented each S with a rating scale with the word "identical" on one side, and "completely different" on the other.) Remember, you can make a check-mark anywhere along this line to indicate how these figures look to you. Do you understand what you have to do?

Following this instructional phase, three practice trials were administered to all Ss. Following this, 18 trials were administered to all Ss. Each slide was shown for .2 second, with an inter-trial interval of three seconds. The slides

contained six identical and 12 different pairs of figures. The 12 different pairs contained all possible combinations of the previously employed three forms. Order of presentation of the forms was the same for all Ss, and was randomly determined in advance.

2. For the recognition task, drawings of the previously employed forms were used. Each S was presented with a booklet containing 12 pages. Each page contained a set of 4 shapes placed in a row. S's task was to select the one he had seen before. A choice of "none" was also given for each group. The prototype (i.e., a shape experienced during pretraining) was actually present on half the items, and the remaining 3 shapes were variations of prototype. On the remaining 6 items, all 4 shapes were variations of the prototype, so that "none" was actually the correct response. The format of this test is illustrated in Figure 3. (See Appendix C for the complete test.) Each S was given the following instructions:

①.



1



2



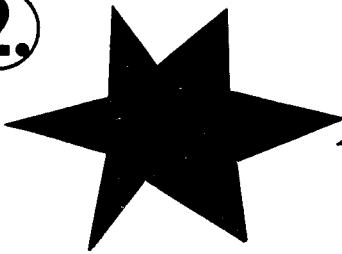
3



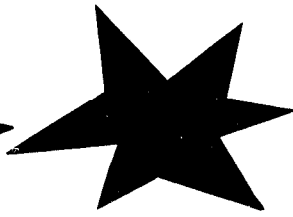
4

NO

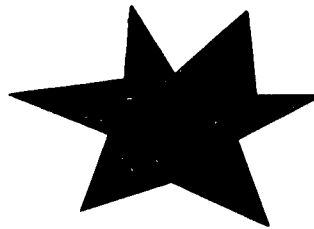
②.



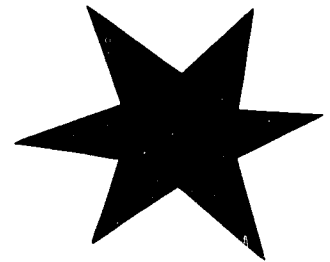
1



2



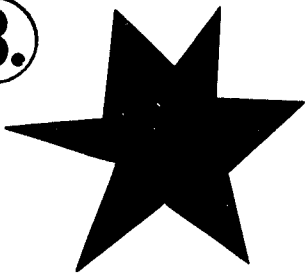
3



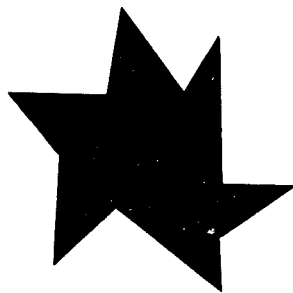
4

NO

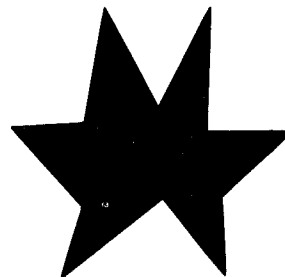
③.



1



2



3



4

NO

Figure 3. Sample of stimulus figures used on the recognition task.

I am going to show you some nonsense figures on this piece of paper. I want you to look at each of these figures very carefully, and decide whether you saw any of these figures before (i.e., during the initial training period). If you think you saw some of these figures before, I want you to write the number of the figure you think it is on this piece of paper. If you think that you did not see any of these figures before, I want you to write the number 5 to indicate "none." Do you understand what you have to do?

Following this instructional phase, 12 items were presented to all Ss. Each S was given a maximum of 30 seconds for each item. The arrangement of the stimuli was determined according to a prearranged random schedule.

3. For the reproduction task, each S was again shown the three figures (one at a time) for a 20 second exposure. The following instructions were given:

I am going to show you some of the same figures that you saw before on this screen. I want you to look at each figure very carefully, because after I finish showing you each figure, I want you to draw what you have just seen. Do you understand what you have to do?

Following this instructional phase, each S received three piece of graph paper on which to reproduce each of the figures. The stimuli were presented according to a prearranged random schedu

Results

Pretraining Tasks

Verbal learning. A two-way mixed analysis of variance (Style X Blocks of Trials) was performed on the total correct verbal learning scores and revealed that the main effect of blocks of trials was significant, $F(2,114) = 9.85, p < .01$. Style was not significant, $F(2,57) = 1.76$. (This analysis is contained in Appendix D.) Thus, all Ss in the label training condition readily learned the labels. The mean correct responses associated with the first, second, and third block of eight trials were 6.38, 7.03, and 7.15, respectively.

Visual learning. A one-way analysis of variance (Style) was performed on the total correct visual learning scores and revealed no significant differences. (This analysis is contained in Appendix D.) Thus, all Ss in the visual training condition performed the task equally well. The mean correct responses associated with the verbalizers, visualizers, and mixed groups were 11.55, 11.75, and 11.50, respectively.

Transfer Tasks

It should be recalled that each S received three tasks: perceptual judgment, recognition, and reproduction. Furthermore, half the Ss received the tasks in Order I (perceptual judgment, recognition, and reproduction), while half the Ss received the tasks in Order II (recognition, perceptual judgment, reproduction). The particular stimuli employed for each S were the same across tasks. On the perceptual judgment task, an average difference score was obtained which could range from zero (identity) to nine centimeters (completely different). Scores were measured to the nearest half-centimeter. Identity scores were ignored. The score used on the recognition task was the total number of correct recognitions, which could range from zero to 12 (all correct). Scores on the reproduction task were based on ratings of the facsimile to the prototype which ranged from zero to nine (best possible). The inter-judge reliability of these latter rating scores was .94. Two college students served as judges. Averages of the three measures employed for each group are presented in Table 2.

TABLE 2

MEAN SCORES ON ALL TASKS

Tasks Order I

Group	Judgment	Recognition	Reproduction
Verbalizers			
Label Training	6.10	3.70	4.50
Visual Training	4.73	4.50	5.40
Observation Training	4.82	6.10	5.00
Visualizers			
Label Training	4.64	5.40	4.00
Visual Training	4.94	3.50	3.10
Observation Training	4.21	6.10	3.60
Mixed			
Label Training	4.75	3.70	4.20
Visual Training	5.10	5.40	4.30
Observation Training	5.39	5.70	3.90

Tasks Order II

Group	Judgment	Recognition	Reproduction
Verbalizers			
Label Training	5.40	4.40	3.60
Visual Training	5.39	5.60	3.20
Observation Training	5.59	6.00	4.60
Visualizers			
Label Training	4.69	6.00	4.10
Visual Training	4.34	4.50	3.40
Observation Training	4.88	6.10	4.90
Mixed			
Label Training	5.65	5.00	5.00
Visual Training	5.43	5.00	4.20
Observation Training	5.12	5.20	5.10

A four-way mixed analysis of variance (Style X Training X Order X Measure) was performed in order to assess the differential sensitivity of the various response measures to the experimental manipulations. This analysis is contained in Table 3. The results indicate that the main effects of Training and Measure were both significant at $p < .01$. The training effect indicates that the observation groups were generally superior to either the label or visual training groups. The mean scores for the observation, label and visual training groups were 5.12, 4.71, and 4.56, respectively. The main effect of measure simply reflects the different averages and ranges of the three measures. It has no substantial meaning beyond this, but is a source of variability which must be excluded to evaluate interaction effects.

In addition to these main effects, three interactions were significant in the above analysis. They included: (1) a Measure X Training interaction, (2) a Measure X Style X Training interaction, and (3) a Measure X Style X Order interact

The Measure X Training interaction indicates that the various tasks were differentially sensitive to the effects of training.

TABLE 3

ANALYSIS OF VARIANCE OF THE TOTAL SCORES ON THE PERCEPTUAL JUDGMENT, RECOGNITION, AND REPRODUCTION TASKS

Source	df	SS	mS	F	p
<u>Between Ss</u>	179	577.14			
Style	2	13.31	6.66	2.23	
Training	2	31.33	15.66	5.26	< .01
Order	1	5.85	5.85	1.96	
Style X Training	4	24.69	6.17	2.07	
Style X Order	2	7.22	3.61	1.21	
Training X Order	2	2.68	1.34	.45	
Style X Training X Order	4	9.66	2.42	.81	
Error (betweenSs)	162	482.40	2.98		
<u>Within Ss</u>	360	1008.06			
Measure	2	88.42	44.21	18.81	< .01
Measure X Style	4	20.40	5.10	2.17	
Measure X Training	4	32.83	8.21	3.49	< .01
Measure X Order	2	3.60	1.80	.76	
Measure X Style X Training	8	37.98	4.75	2.02	< .05
Measure X Style X Order	4	26.40	6.60	2.81	< .05
Measure X Training X Order	4	21.24	5.31	2.26	
Measure X Style X Training X Order	8	14.31	1.79	.76	
Error (within Ss)	324	762.88	2.35		
Total	539	1585.20			

The means involved in this interaction can be seen in Table 4, and would seem to suggest that labeling training is slightly more effective on the judgment task, whereas observation training elicited superior performance on the recognition and reproduction tasks.

TABLE 4
MEAN SCORES ON THE PERCEPTUAL JUDGMENT, RECOGNITION,
AND REPRODUCTION TASKS FOR EACH TYPE OF TRAINING

Type of Training	Type of Task		
	Judgment	Recognition	Reproduction
Distinctive Label	5.20	4.70	4.23
Visual	4.99	4.75	3.93
Observation	5.00	5.85	4.52

In order to further elucidate this Measure X Training interaction, analyses of variance were performed separately for each task. (These analyses are contained in Appendix D.) The results indicate that the effects of training were significant on the recognition task, $F(2,162) = 6.90$, $p < .01$, but not on the

perceptual judgment and reproduction task, $F(2,162) = .53$, $F(2,171) = 2.11$, respectively.

The Measure X Style X Training interaction indicates that the effects of training on the various tasks were not equivalent for the three types of subjects. The direction of this interaction is a complex one as can be seen from the means in Table 5.

TABLE 5

MEAN SCORES ON THE PERCEPTUAL JUDGMENT, RECOGNITION, AND REPRODUCTION TASKS FOR EACH TYPE OF SUBJECT ACCORDING TO TRAINING

Group	Type of Task		
	Judgment	Recognition	Reproduction
Verbalizers			
Label Training	5.75	4.05	4.05
Visual Training	5.06	5.05	4.30
Observation Training	5.20	6.05	4.80
Visualizers			
Label Training	4.67	5.70	4.05
Visual Training	4.64	4.00	3.25
Observation Training	4.54	6.10	4.25
Mixed			
Label Training	5.20	4.35	4.60
Visual Training	5.27	5.20	4.25
Observation Training	5.26	5.45	4.50

The overall pattern of this triple interaction is not completely in accord with the original prediction that an individual's style would be positively related to the type of training received. Thus, when both orders are combined, a negative relationship was obtained on the recognition task between an individual's mediational style and the type of training received. Verbalizers were more affected by observation and visual training than label training, whereas visualizers were more affected by observation and label training rather than visual training. Although there were no significant differences associated with the type of training for mixed Ss, their general pattern resembles the verbalizers more than the visualizers. Individual analyses of variance previously referred to for each task indicate that although the training effect was not significant on the judgment task, style was, $F(2,162) = 5.55, p < .01$. The style effect indicates that verbalizers and mixed Ss judged these stimuli to be more distinctive than visualizers. The mean scores for the verbalizers, mixed, and visualizers were 5.34, 5.24, and 4.62, respectively. For the recognition task, both training,

$F(2,162) = 6.90, p < .01$, and the Style X Training interaction, $F(4,162) = 3.36, p < .05$, were significant. The training effect indicates the superiority of the observation groups to either the visual or label training groups. The mean scores for the observation, visual, and label groups were 5.85, 4.75, and 4.70, respectively. The Style X Training effect indicates that the various subjects were differentially sensitive to the effects of training. For the reproduction task, no significant style or training effects were obtained, $F(2,171) = 2.68, F(2,171) = 2.11$, respectively.

One difficulty in interpreting the Measure X Style X Training interaction in the repeated measures analysis of variance is that the scores are collapsed over both orders of task presentation. Both the overall pattern of means as contained in Table 2, and the significant Measure X Style X Order interaction suggest that the various orders be considered separately. It would appear that there were considerable transfer effects (both positive and negative) that came as a result of repeatedly viewing the same stimuli. Accordingly, in order to ascertain the effects of style and training more

directly, additional analyses were conducted on only the scores made on transfer tasks immediately following training. These scores were unconfounded by other perceptual transfer tasks. Since the reproduction task was always administered at the end of the transfer sequence, it was not possible to evaluate results on this task independently of the others.

It should be recalled that Order I presented Ss with the perceptual judgment task first, whereas in Order II, the recognition task was presented first. Thus, an analysis of variance was performed on only these perceptual judgment and recognition task scores which were presented immediately following the experimental manipulations. This analysis, contained in Table 6, differs from the previous analyses of variance, in that measures (tasks) were treated as a between Ss rather than a within Ss effect. The results of this latter analysis indicate a Training X Style X Measure interaction to be significant at $p < .05$. The means involved in this interaction are presented in Table 7, and suggest that when the judgment task is presented first, verbalizers are more affected by label training, and less affected by observation

TABLE 6

ANALYSIS OF VARIANCE OF THE SCORES ON THE PERCEPTUAL JUDGMENT AND RECOGNITION TASKS WHEN PRESENTED IMMEDIATELY FOLLOWING TRAINING

Source	df	SS	mS	F	p
Style	2	1.68	.84	.32	
Training	2	2.81	1.40	.54	
Measure	1	5.41	5.41	2.10	
Style X Training	4	3.39	.85	.33	
Style X Measure	2	7.93	3.96	1.53	
Training X Measure	2	8.64	4.32	1.67	
Style X Training X Measure	4	31.82	7.96	3.08	< .05
Error	162	417.46	2.58		
Total	179	479.14			

and visual training. Visualizers, on the other hand, seem more affected by visual training, and less affected by label and observation training. For mixed Ss, observation training is the most effective and label training the least effective.

TABLE 7

MEAN SCORES ON THE PERCEPTUAL JUDGMENT AND RECOGNITION TASKS WHEN PRESENTED IMMEDIATELY FOLLOWING TRAINING FOR EACH TYPE OF SUBJECT

Task	Type of Style		
	Verbalizers	Visualizers	Mixed
Judgment			
Label Training	6.10	4.64	4.75
Visual Training	4.73	4.94	5.10
Observation Training	4.82	4.21	5.39
Recognition			
Label Training	4.40	6.00	5.00
Visual Training	5.60	4.50	5.00
Observation Training	6.00	6.10	5.20

When the recognition task is presented first, the pattern is somewhat different. On this task verbalizers are more affected by observation training and less affected by label

training. Visualizers, however, are more affected by observation and label training and less affected by visual training. For the mixed Ss, all three methods were equally effective. Thus, an interference effect of training was shown on the recognition task, and a slight facilitative effect was shown on the perceptual judgment task. The finding that mixed Ss would be equally affected by the method of training was in accordance with the original prediction.

A final proposition originally advanced concerned the relative patterns of intercorrelations between the various response tasks. Table 8 presents these correlations on the three tasks.

TABLE 8
CORRELATIONS OBTAINED BETWEEN TASKS

Correlations			
Group	Recognition & Judgment	Recognition & Reproduction	Judgment & Reproduction
Verbalizers	.00	.08	-.08
Visualizers	.07	.19	.26*
Mixed	.06	.00	.21
All Ss	.02	.09	.15*

* p = .05

Since some investigators have used these response measures interchangeably to determine perceptual transfer effects, it is surprising that most of the correlations are relatively low. In view of this, it would appear that college students' ability to recognize objects may be tapping a different kind of skill than is involved in reproducing these objects or making judgments based upon them.

Discussion

The findings of the present study indicate that the magnitude of perceptual transfer is influenced by a number of factors, including S's mediational style, type of training, and the particular criterion measures employed. Furthermore, these apparently interact with each other in rather complex ways. Thus, on a judgment task, a positive relation was found between type of training and mediational style. On a shape recognition task, however, a negative relationship was obtained between S's mediational style and the type of training received.

The results with regard to mediational style are of particular interest because this is a variable which has not received previous experimental attention. Use of this construct received some empirical support in the present study. On the perceptual judgment task, for example, whether an individual was categorized as a verbalizer or a visualizer had more influence on his score than the

type of training received. Thus, both verbalizers and mixed Ss (i.e., Ss who showed no clear-cut style or preference) judged similar stimuli as more distinctive than did visualizers. It may well be that failure to take this style variable into account has resulted in some of the earlier negative findings with regard to perceptual transfer. Adult subjects undoubtedly supply their own mediational responses in the typical experimental situation, and these may conflict with those supplied by the experimenter. Under such circumstances, a few minutes of experimentally induced training would clearly be less effective in influencing perceptual transfer than the S's own well-established response patterns. The present study suggests, therefore, that individuals may indeed have unique and stable modes of responding which may confound the experimenter's task, and clearly should be considered.

The predicted relation between an individual's mediational style and the type of training administered received some

support on the perceptual judgment task, although the interaction did not reach generally accepted significance levels. Verbalizers were more influenced by label training, and visualizers were more influenced by visual training. Contrary to expectation, however, training in the same mode as an individual's preferred style resulted in a negative relationship for verbalizers and visualizers on a shape recognition task. The findings with regard to this latter task indicated that verbalizers performed more poorly with distinctive label training, whereas visualizers exhibited poorest performance with visual training. Findings for mixed Ss were in accordance with prediction in that the three types of training elicited equivalent effects.

The findings with regard to the verbalizers and visualizers on the recognition task warrant some discussion. One possible explanation is that if verbalizers mediate via their own relevant verbal cues, then any experimenter-supplied verbal cues such as nonsense syllables may interfere with S's own implicit verbal responses. Thus,

the poorer performance of verbalizers may have been due to such possible interference effects. Correspondingly, if visualizers ordinarily mediate via their own preferred visual cues, then any experimenter-supplied cues should again tend to interfere with their unique mode of responding. Verbal cues, on the other hand, which are not ordinarily employed by visualizers, may either be helpful or more easily ignored than conflicting perceptual cues. The results seem to bear this out in that procedures which either allowed S to utilize his unique mediational style (as in the observation condition), or introduced training in a modality different from S's mediational style, seemed to elicit better performance on shape recognition than E-supplied training in the S's mediational style.

At first glance, the finding that the observation condition was generally superior to either label or visual training on the recognition task would seem to offer more support for the Gibson and Gibson position than for the

Dollard-Miller acquired distinctiveness of cues hypothesis. Indeed, one possibility which the discrepant findings on the judgment and recognition task suggest is that each of these two theoretical viewpoints may be correct, depending upon the task employed. The Gibson's view may be particularly applicable to recognition tasks where a memory component is involved, whereas the Dollard-Miller hypotheses may be more appropriate to a task where the stimuli are actually present, as in judgmental or discrimination tasks.

A closer look at the recognition task results, however, suggest another interpretation. The position formulated by the Gibsons generates the prediction that continued observation would be as effective as any training procedure which requires selective attention. Thus, according to this view, all training groups should have performed as well. Observation training, however, was found not merely equal to distinctive label or visual training, but rather was superior to training within S's preferred modality. Thus, in the absence of E-supplied cues, observation group Ss may in fact be freer to

respond to their own cues. It was suggested above that S-supplied cues may be more effective mediators than nonsense syllables or irrelevant labels. Some support for this position can be found in the existing literature (Clark, 1965; Ellis & Homan, 1968). Moreover, it may well be that an adult's own mediational responses are always more meaningful and cogent to him, and are thus more potent (Hagan, Meacham, & Mesibov, 1970). If Ss were indeed employing their own cue-producing responses, then this offers support for the acquired distinctiveness of cues position.

No significant differences were obtained for either the style or training variables on the reproduction task. This finding is contrary to the results of Carmichael, Hogan, and Walter (1932) who demonstrated the positive effect of labels on the reproduction of visually perceived forms. It should be noted, however, that the Carmichael et al., study utilized both more meaningful and simpler visual stimuli as well as more meaningful verbal labels than the present study. It should be recalled, furthermore, that the reproduction task was always

administered at the end of the transfer sequence, and was therefore undoubtedly affected by S's considerable experience with the stimuli. Thus, these methodological differences plus confounding as a result of previous task effects, may explain the discrepant results of the two studies.

The overall findings suggest that except for the reproduction task, the various responses were differentially sensitive to the effects of both mediational style and type of training. The question can be raised then as to why certain tasks are more sensitive to these variables than others. These differential patterns lend credence to the view expressed by several investigators (Ellis, 1968; Vanderplas, 1958; Vanderplas, Sanderson, & Vanderplas, 1964) that the effects of verbal pretraining is contingent upon the nature of the criterion task. Ellis and Muller (1964), for example, found that practice in associating distinct verbal labels to stimuli facilitated the subsequent acquisition of new motor responses, but the same pretraining failed to produce comparable effects on recognition

performance. It may well be that what is required is not so much an analysis of the criterion tasks, but rather of the specific relationship between the demands of the training and transfer tasks.

Within the present investigation, an analysis of these tasks suggests important differences in what is required of the subject. All of the training conditions required S to observe individually presented stimuli for a two second interval. On the judgment task, however, two simultaneously presented visual stimuli were exposed briefly (.2 second) and S had to make a decision, relatively quickly, about the degree of stimulus similarity between the two figures. It remains to be seen whether the divergent exposure times on the training and transfer tasks permit S to observe the same characteristics of the stimuli on the two tasks. It would seem unlikely that the shorter exposure time on the transfer task would allow S to observe either the same amount or type of information. Thus, the distinguishing characteristics of the stimuli on the

training task may actually differ considerably from those on the transfer task. Although it is not possible in the present study to determine whether this is correct, some investigators (White & Plum, 1964) have measured the eye movements of Ss as a more direct and precise method of determining what characteristics are being responded to. Clearly, this technique may enable future investigators to determine the accuracy of this explanation. The demands of the recognition task are also quite different from the training conditions. The S is required here to choose (within 30 seconds) the stimuli he saw before from among a series of similar but different stimuli. Scanning a stimulus array may involve different kinds of informational processing than would observing a singly presented object. Thus, the relationship between the recognition task and the training conditions is likely to require divergent responses. Moreover, since the recognition task involves memory, whereas the judgment task does not, the nature of the memory trace may itself be a significant additional variable (Neisser, 1967; Waugh & Norman, 1965) with regard to transfer effects on

recognition performance.

In conclusion, the present study suggests that perceptual transfer is an extremely complex process. Specific predictions appear contingent upon a number of interacting factors that do not yield simple patterns. On the basis of the results of the present study, it would seem desirable that samples of Ss from other populations be conducted. If these results are replicable with other populations, the construct of mediational style could be presumed to be operative over a wide range of subject populations and tasks, and its role in perceptual transfer could be more precisely delineated.

Summary

The purpose of the present study was to test the hypothesis that the mediational style of an individual would interact with experimentally induced training to influence the perception of visual stimuli. College students were categorized into three groups on the basis of their characteristic responses in reporting visual stimuli. Ss who preferred to describe the stimuli in words were designated verbalizers; Ss who preferred to draw the stimuli rather than use verbal descriptions were considered to be visualizers; finally, Ss who showed no clear-cut style or preference were labeled "mixed."

Ss in each of these groups were randomly assigned to three experimental conditions. One group (distinctive label training) learned to associate a different verbal label to each of three visual stimuli. A second group (visual training) was asked to judge the successive presentations of two stimuli as either the same or different. A third group (observation condition) was shown the visual stimuli and simply asked to observe them very carefully.

Following each of the experimental training conditions, all Ss were given a perceptual judgment, recognition, and reproduction task. Two orders of administration were employed. The perceptual judgment task required S to look at two tachistoscopically presented pairs of the previously employed stimuli and rate them on a continuous rating scale in terms of their similarity or dissimilarity. The recognition task required S to look at four visual stimuli and decide whether he had seen any of these figures before. The reproduction task required S to draw from memory each of the previously seen visual stimuli.

The major predictions tested were as follows: (1) verbalizers would be more influenced by label training than other types of training in their subsequent perceptual responses (2) visualizers would be more influenced by visual training, and (3) "mixed" Ss would be equally affected by distinctive label and visual training in magnitude of perceptual transfer. Thus, an interaction between mediational style and the type of training received was predicted. The possibility that the

transfer effects obtained would be differentially reflected in the particular type of criterion task employed (e.g., perceptual judgment, recognition, reproduction) was also investigated, although no specific predictions were advanced.

The results indicated that: (1) on the perceptual judgment task, although not statistically significant, a trend in the predicted direction emerged. Furthermore, verbalizers and "mixed" Ss judged these stimuli to be more distinctive than visualizers; (2) on the recognition task, the prediction that Ss with no predominant style would be equally affected by distinctive label and visual training was confirmed. For verbalizers and visualizers, however, a relationship opposite to that predicted was obtained between style and type of training. Thus, verbalizers were more affected by visual training, whereas visualizers were more affected by distinctive label training. Furthermore, the observation condition was generally superior to either distinctive label or visual training; (3) on the reproduction task, none of the predictions were confirmed.

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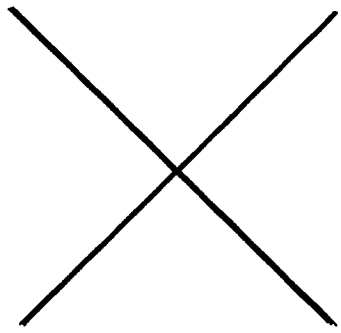
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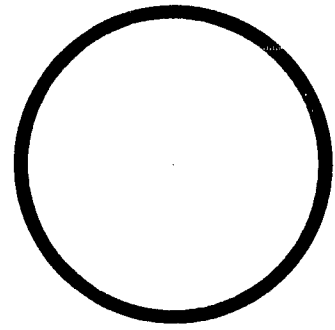
Appendix A. Pretest Results.

Description of Pretest Procedure for Stimuli Used to Classify Ss According to Style.

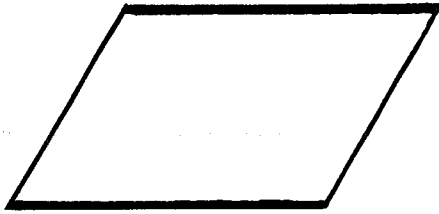
79 Ss (15 males, 64 females) at the Fashion Institute of Technology were shown ten geometric figures and asked to either draw or name or describe each figure. An illustration of these figures is presented in Figure 4. Each figure was presented for two seconds with an inter-trial interval of three seconds. Using the criteria set forth on page 23, the results indicated a considerable diversity of response styles. The frequency distribution obtained with these Ss indicated that 23% could be classified as verbalizers, 38% as visualizers and 19% as "mixed." The remaining 20% of the Ss had responses which included both verbal descriptions and drawings made to the same stimuli. Although it was possible that this latter type of S could be counted in the "mixed" group, it was decided not to include Ss who made combined responses because of the possibility of other factors operating (i.e., failure to follow the instructions). The split-half reliability of



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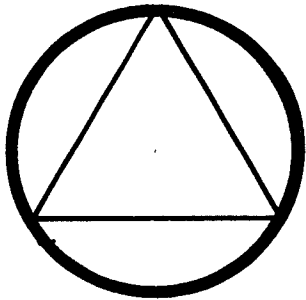
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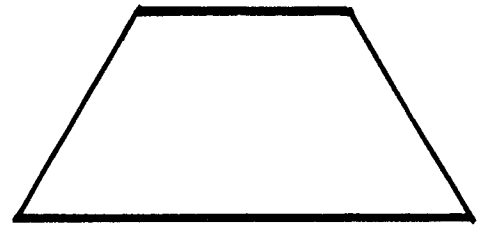
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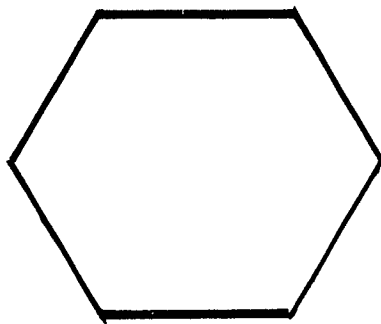
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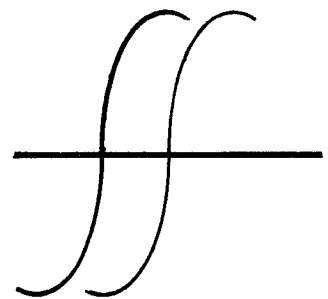
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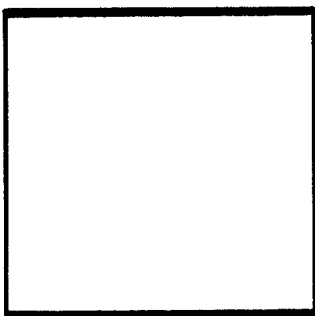
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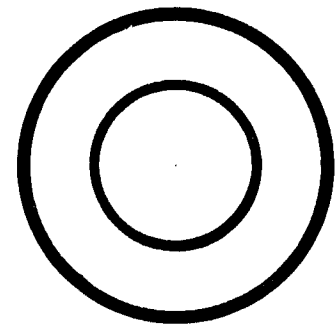
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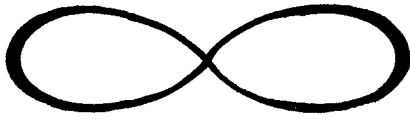
Figure 4. Stimulus figures used on pretest to categorize Ss.

of this test was .96. Since the various figures differed in terms of eliciting either verbal or pictorial responses (See Table 9 for these percentages) , several items were eventually eliminated (i.e., those eliciting only one type of response), and new items were chosen. Figure 5 illustrates these new items. Based upon these results, it was decided to administer both the old and new items to a different sample of Ss. 65 Queens College Ss (18 males, 47 females) were administered this form of the test, and the results are presented in Table 10. The results indicate that although the ranking of the figures was the same as for F.I.T. students, QC students gave more visual responses than F.I.T. students. It should be noted that after administering the test to QC students E asked the Ss why they either drew or named the figures. Their responses indicated that they drew rather than named or described the figures because they felt they didn't have enough time to describe the figures. Thus, on the basis of this information the exposure time was eventually increased to 15 seconds.

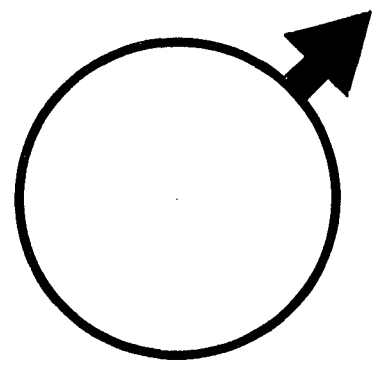
TABLE 9

PERCENTAGE OF VISUAL, VERBAL, AND COMBINED RESPONSES
TO THE PRETEST FIGURES FOR F.I.T. STUDENTS

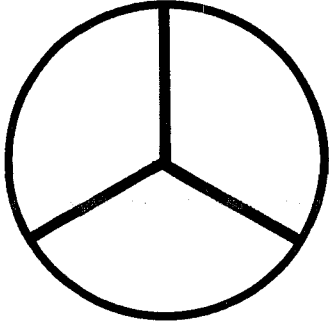
Figure	Visual	Verbal	Combined
1	66	16	18
2	66	20	14
3	51	38	11
4	63	31	6
5	41	48	11
6	41	48	11
7	53	36	11
8	76	19	5
9	80	14	6
10	47	45	8



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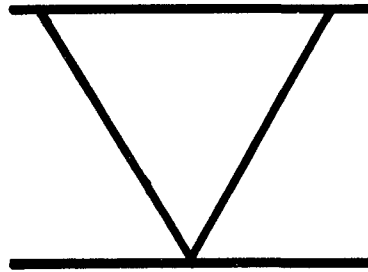
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Figure 5. Additional figures used to categorize Ss.

TABLE 10

PERCENTAGE OF VISUAL, VERBAL, AND COMBINED RESPONSES
TO THE PRETEST FIGURES FOR QC STUDENTS

Figure	Visual	Verbal	Combined
1	83	12	5
2	71	22	7
3	68	23	9
4	85	12	3
5	51	37	12
6	52	37	11
7	68	17	15
8	66	20	14
9	94	5	1
10	64	23	13
11	60	26	16
12	75	18	7
13	68	18	14
14	77	14	9
15	75	14	11

Furthermore, in order to make the items as comparable as possible, only items that had a 41-68% range of visual responses were included in the final test, which is shown in Figure 1. 218 Ss were then tested and 34% were classified as verbalizers, 34% as visualizers, and 32% as "mixed" Ss.

In addition, for the verbalizers, 28% had 10 out of 10 verbal responses, 12% had 9/10, 40% had 8/10, and 20% had 7/10. For the visualizers, 31% had 10/10 visual responses, 21% had 9/10, 32% had 8/10, and 16% had 7/10. For "mixed" Ss, 27% had 4/10 verbal responses, 46% had 5/10, and 27% had 6/10.

Appendix B. Pretest Results.

Procedure Employed to Select Stimuli Used During
Predifferentiation Training.

30 Ss (8 males, 22 females) at the Fashion Institute of Technology were shown four geometric forms (two at a time) for a .2 second exposure and asked to rate them in terms of their similarity or dissimilarity. An illustration of these figures is presented in Figure 6. A total of 77 nonsense form pairs were shown and each S was asked to rate each pair on a five point rating scale (e.g., identical, very similar, some similarities some differences, very different, completely different). For each S there were 65 different pairs and 12 identical pairs. Each figure varied according to the following attributes (i.e., number of projections (6 or 8), type of projection (rounded or angular), and general outline). Following the presentation of the nonsense forms, similarity judgments were analyzed, and only those figures that were judged to show some similarities and some differences were used in the subsequent predifferentiation and response tasks.

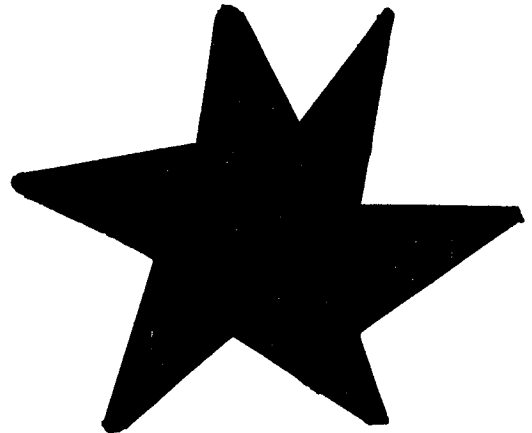
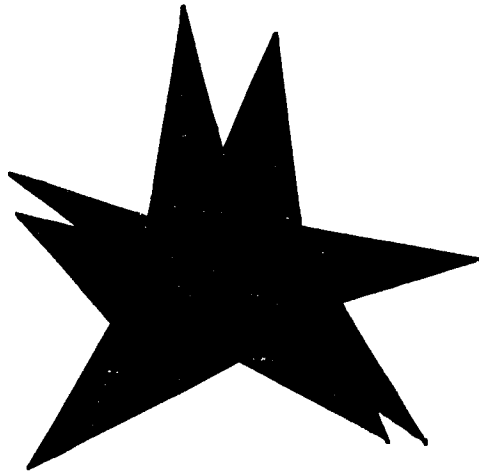
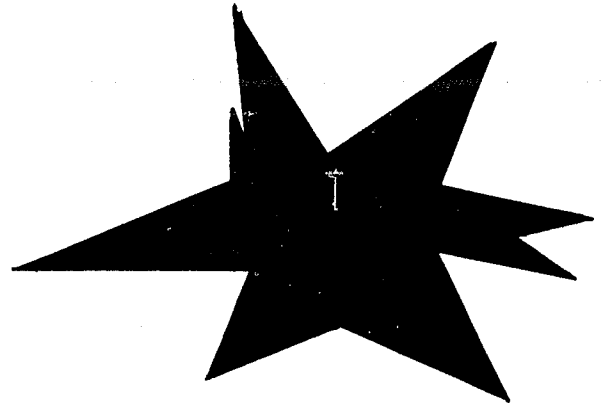
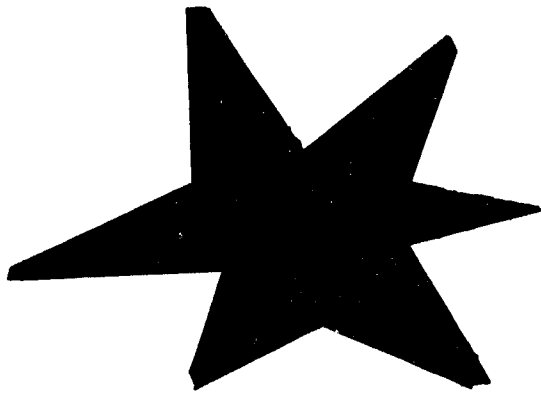
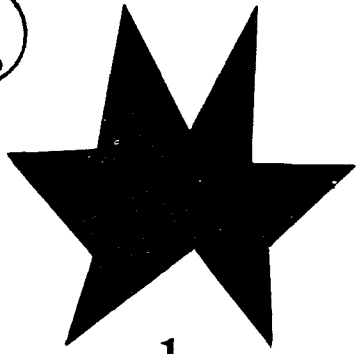
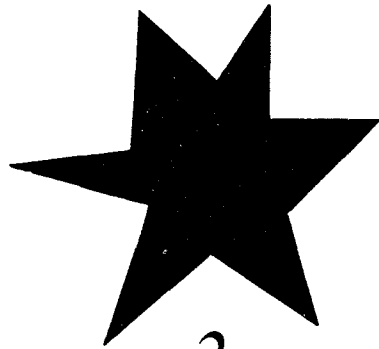


Figure 6. Stimulus figures used to select stimuli for the training conditions.

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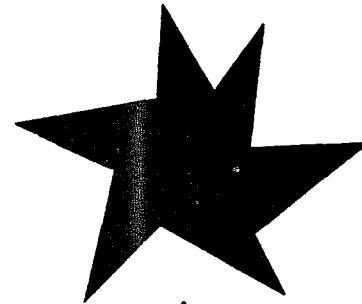
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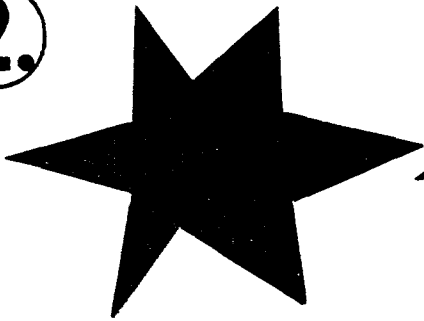


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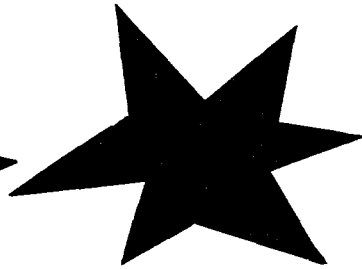
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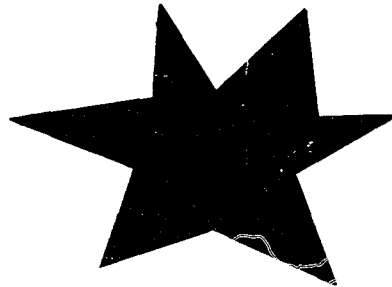
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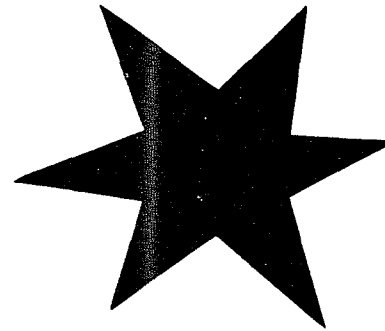
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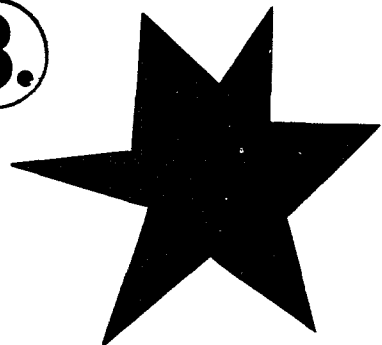


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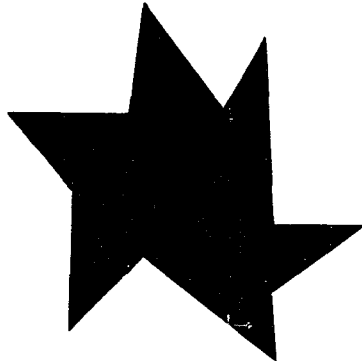
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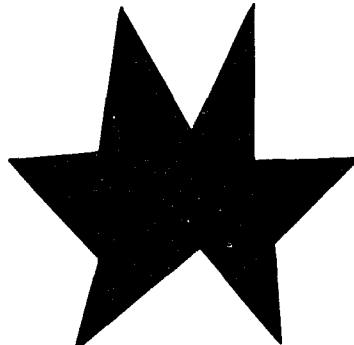
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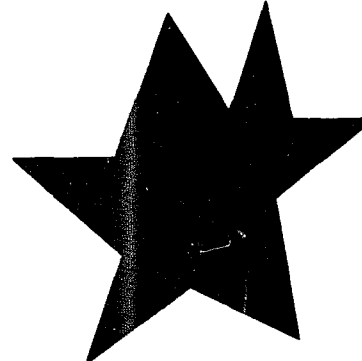
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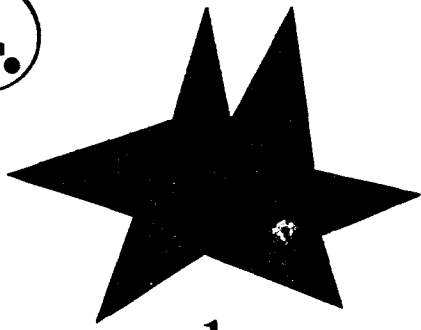


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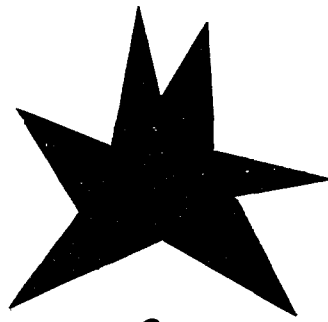
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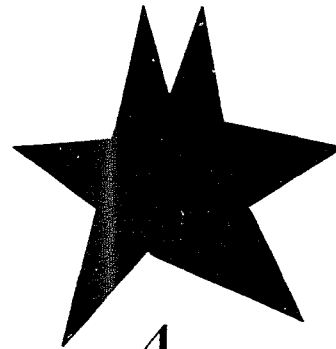
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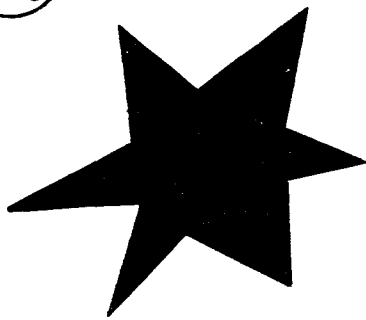


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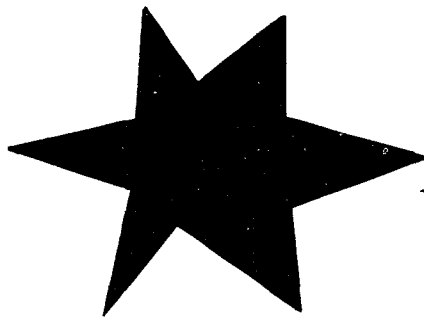
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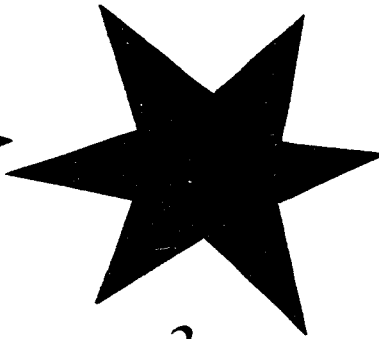
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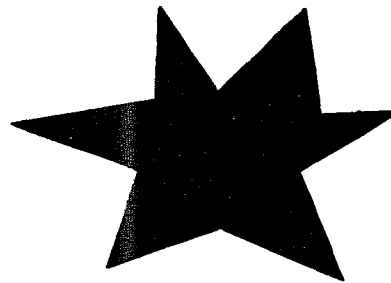
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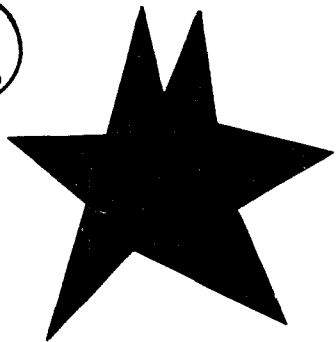
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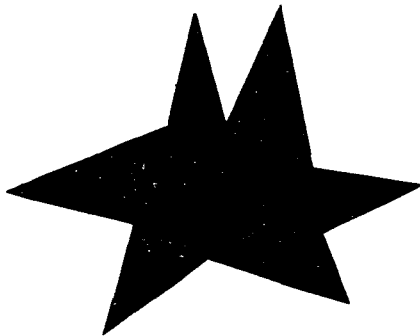
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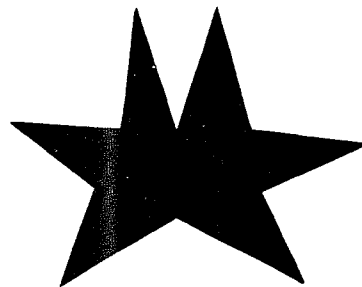
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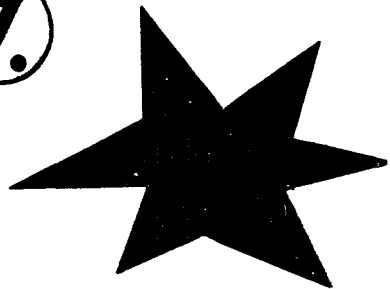


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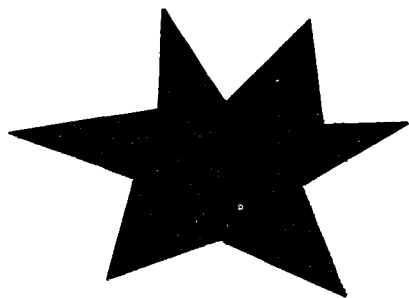
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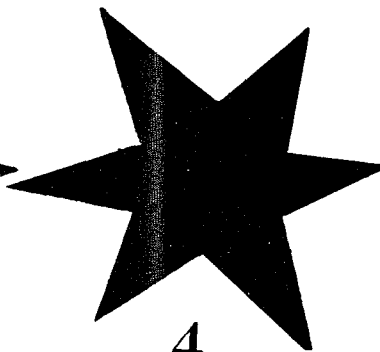
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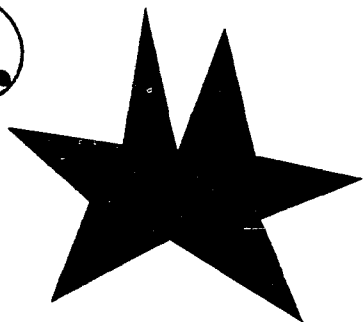


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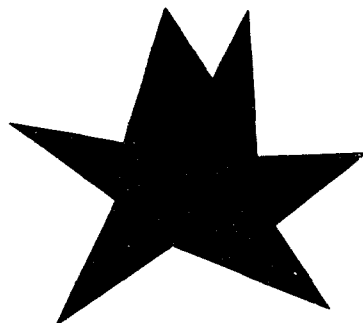
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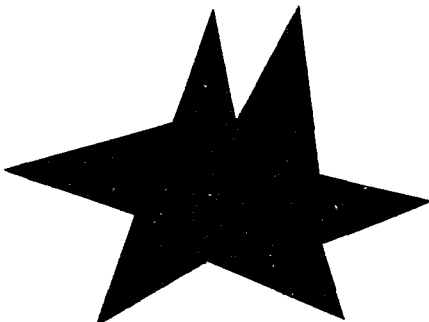
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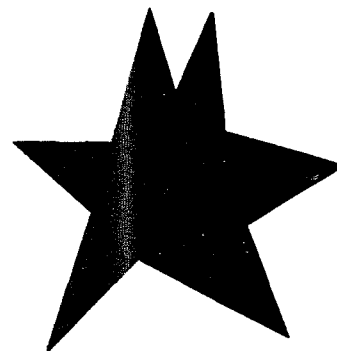
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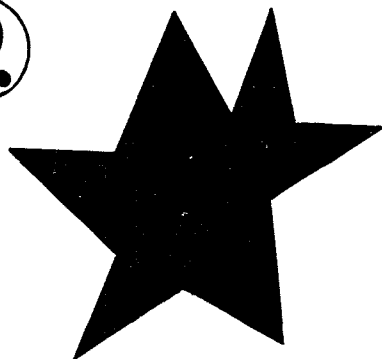


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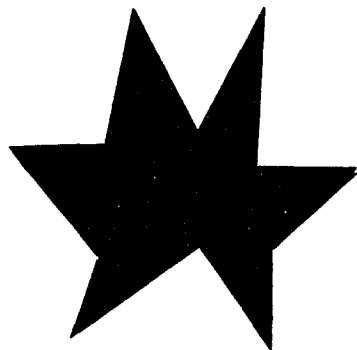
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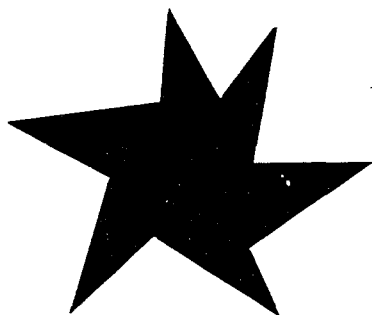
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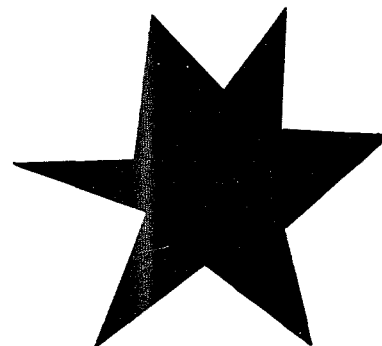
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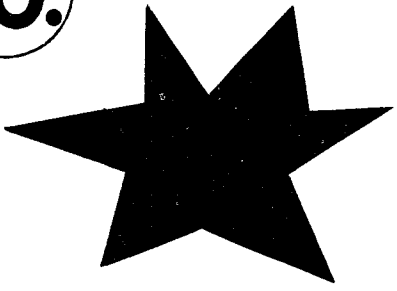


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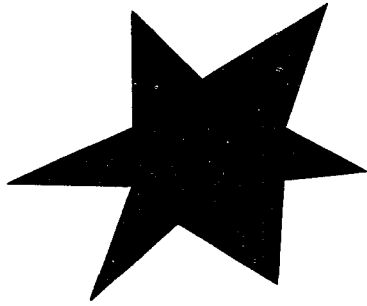
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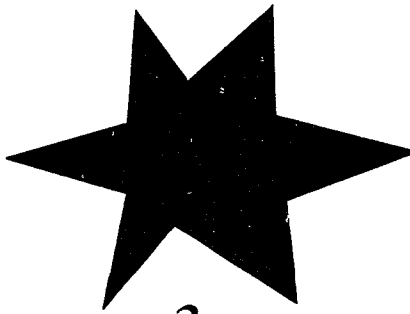
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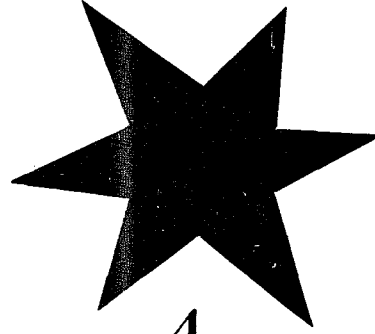
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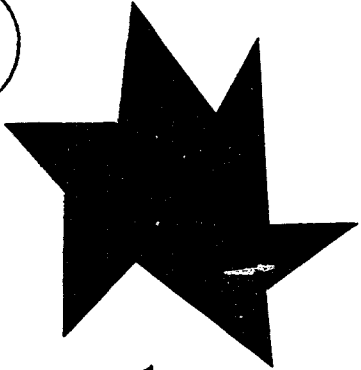
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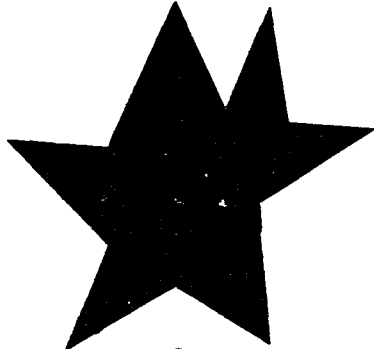
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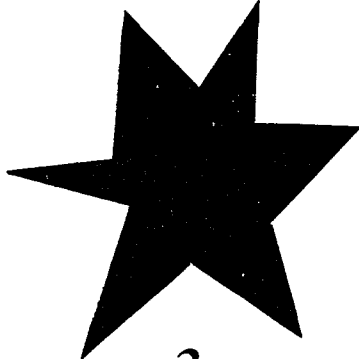
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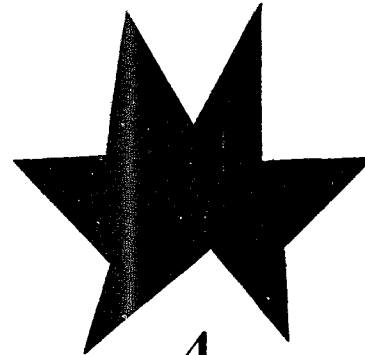
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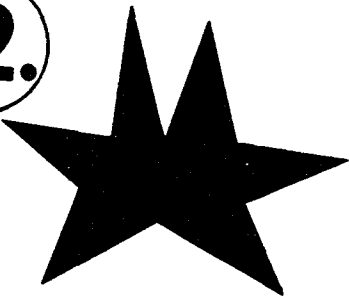
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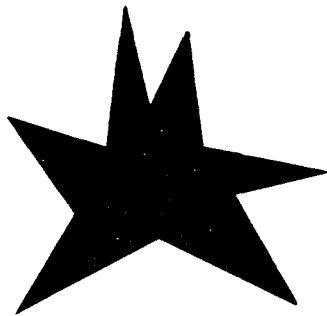
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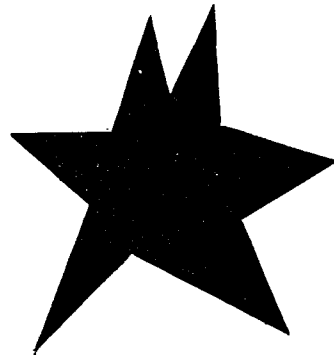
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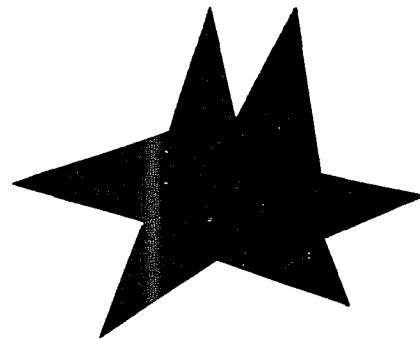
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Appendix D. Analyses of Variance.

TABLE 11

ANALYSIS OF VARIANCE OF TOTAL CORRECT VERBAL LEARNING
SCORES OVER BLOCKS OF 8 TRIALS

Source	df	SS	mS	F	P
<u>Between Ss</u>	59	134.24			
Style	2	7.81	3.90	1.76	
Error (between Ss)	57	126.43	2.22		
<u>Within Ss</u>	120	144.01			
Blocks of Trials	2	20.48	10.24	9.85	< .01
Style X Blocks of Trials	4	5.26	1.31	1.26	
Error (within Ss)	114	118.27	1.04		
Total	179	278.25			

TABLE 12

ANALYSIS OF VARIANCE OF TOTAL CORRECT PERCEPTUAL LEARNING SCORE

Source	df	SS	mS	F	p
<u>Between Ss</u>	59	26.40			
Style	2	.70	.35	.78	
Error (within Ss)	57	25.70	.45		

TABLE 13

ANALYSIS OF VARIANCE OF THE TOTAL NUMBER OF CORRECT RESPONSES ON THE RECOGNITION TASK.

Source	df	SS	mS	F	p
Style	2	2.41	1.20	.32	
Training	2	52.21	26.10	6.90	< .01
Order	1	7.60	7.60	2.01	
Style X Training	4	50.82	12.70	3.36	< .05
Style X Order	2	1.74	.87	.23	
Training X Order	2	9.08	4.54	1.20	
Style X Training X Order	4	7.42	1.86	.49	
Error	162	611.70	3.78		
Total	179	742.98			

TABLE 14

ANALYSIS OF VARIANCE OF THE MEAN SCORE MADE TO OBJECTIVELY DIFFERENT PAIRS OF STIMULI ON THE PERCEPTUAL JUDGMENT TASK

Source	df	SS	mS	F	p
Style	2	18.32	9.16	5.55	< .01
Training	2	1.74	.87	.53	
Order	1	1.84	1.84	1.12	
Style X Training	4	3.73	.93	.56	
Style X Order	2	.64	.32	.19	
Training X Order	2	.83	.42	.25	
Style X Training X Order	4	13.36	3.34	2.02	
Error	162	267.70	1.65		
Total	179	308.16			

TABLE 15

ANALYSIS OF VARIANCE OF THE TOTAL CORRECT SCORES ON THE REPRODUCTION TASK

Source	df	SS	mS	F	p
Style	2	12.98	6.49	2.68	
Training	2	10.21	5.10	2.11	
Style X Training	4	8.12	2.03	.84	
Error	171	414.35	2.42		
Total	179	445.66			
