

MODIFICATION OF PROBLEM-SOLVING BEHAVIOR
OF IMPULSIVE CHILDREN

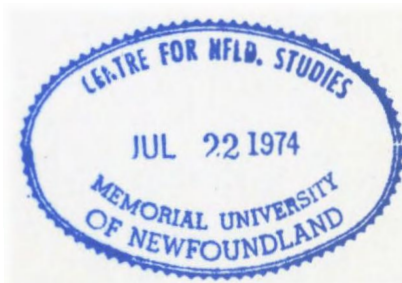
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MODIFICATION OF PROBLEM-SOLVING BEHAVIOR
OF IMPULSIVE CHILDREN



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ABSTRACT

This study was designed to assess the relative effectiveness of two verbal rehearsal techniques in modifying impulsive behavior of grade two subjects. Both techniques required rehearsing directions designed to facilitate solution of ongoing tasks by controlling impulsivity. One technique involved rehearsing the directions out loud during all six trials of a task; the other involved initial overt rehearsal followed by covert rehearsal over a six trial fading sequence. This latter technique is similar to Meichenbaum and Goodman's (1971) self-instructional guidance procedure.

Short latencies and high error scores on the Matching Familiar Figures test were adopted as criteria for the selection of impulsive subjects. Forty chosen subjects were assigned to four groups comprising two experimental and two control groups each having five males and five females. One experimental group received the overt rehearsal training while the other received the covert (fading) practice. Both groups rehearsed while completing a variety of perceptual and cognitive tasks during three twenty-minute sessions. A control group and an attentional-control group provided estimates of baseline change. This latter group was given practice on the tasks, but did not receive the verbal rehearsal training.

The overt and covert experimental methods effectively altered the impulsive response style by lengthening response latencies and decreasing error scores on the Matching Familiar Figures test. However, the predicted superiority of the overt method to the covert method was not substantiated. The significance of both these findings for educational purposes is discussed.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENT.....	i
ABSTRACT.....	ii
TABLE OF CONTENTS.....	iv
LIST OF TABLES.....	v
LIST OF FIGURES.....	vi
INTRODUCTION.....	1
METHOD.....	13
RESULTS.....	17
DISCUSSION.....	27
REFERENCES.....	30
APPENDIX A.....	35
APPENDIX B.....	41

LIST OF TABLES

	Page
TABLE 1	Summary of Analysis of Variance on Latency Difference Scores..... 19
TABLE 2	Newman-Keuls Multiple Comparison of Group Mean Latency Difference Scores..... 21
TABLE 3	Summary of Analysis of Variance on Error Difference Scores..... 23
TABLE 4	Newman-Keuls Multiple Comparison of Group Mean Error Difference Scores..... 25
TABLE 5	Direction of Error Score Difference Between Pre- and Posttesting..... 26

LIST OF FIGURES

	Page
FIGURE 1 Mean Latency Difference Scores as a Function of Treatment.....	20
FIGURE 2 Mean Error Difference Scores as a Function of Treatment.....	24

INTRODUCTION

Some elementary school children habitually demonstrate a careless approach toward solving criterion-referenced tasks. Frequently, errors are caused by offering answers rapidly, without apparent consideration for the probable accuracy or appropriateness of the solution. During the last decade, a considerable amount of both applied and theoretically oriented research has revealed the importance of individual differences in cognitive tempo style. The following is a review of those variables deemed functionally associated with a particular impulsive response style. After introducing the impulsive dimension, the review will consider its significance to cognitive processes and attentional variables during problem solving. In addition, the role of overt and covert verbalization and its relation to response style will be presented. This information will be integrated into a procedure designed to modify the impulsive response style.

Reflection-Impulsive Dimension. Kagan, Rosman, Day, Albert, and Phillips (1964) conceptualized the "Reflection-Impulsive" dimension of cognitive style and defined it as a decision-time variable, measured by response latency. Latency refers to the time a subject (S) takes to consider alternative solutions before committing himself to one of them in a problem situation with response uncertainty. Primary school children's response style, when measured by Kagan's Matching

Familiar Figures test (MFF), has demonstrated stability over time and is predictive of success on a variety of problem-solving tasks (Kagan, 1965a, 1965b; Kagan et al., 1964).

An MFF item requires the child to find from among six almost identical stimuli, the one familiar figure that exactly matches the standard. The test consists of 12 such items.

MFF results show a consistent inverse relationship (correlation, $-.30$ to $-.69$) between frequency of recognition errors and response latency (Eskra & Black, 1971; Kagan, 1965b).

Thus, those who typically display short latencies and high error rates are termed impulsive; reflectives are those who delay before responding and consequently make fewer errors.

An impulsive tempo style was shown to be a handicap during recall, reading, inductive reasoning, and visual discrimination tasks (Kagan, 1965a, 1965b, 1966). Performance of reflective Ss was superior to that of impulsive Ss in some aspect of each type of task. For example, impulsive grade one children made more recognition errors while reading sample selections orally than did reflective children of matched age and verbal skills (Kagan, 1965a). The most frequent error occurred when substitution of the original word was made for one which was structurally similar (e.g., "nose" for "noise", "truck" for "trunk"). Impulsivity was regarded as the contributing factor to this partial identity substitution; had the child reflected longer on his

choice, his error could have been avoided. Also, reflective Ss performed differently from impulsive Ss during a serial learning task (Kagan, 1965b). Results indicated that reflective Ss were superior in recalling more words than impulsive Ss, and that the latter group made more "intrusion" errors (i.e., reported words not present in the original list). As a result of persisting longer, reflective Ss produced better products, whereas impulsive Ss were more apt to generate words not on the list, without considering the probable accuracy of their product. Generally, the impulsive child has difficulty in sustaining attention to a task over a long period of time (Zelniker, Jeffrey, Ault, & Parsons, 1972).

Since reflection during decision making is related to success in various cognitive tasks, considerable effort has been focused on modifying the impulsive style (Debus, 1970; Heider, 1971; Kagan, Pearson & Welch, 1966; Meichenbaum & Goodman, 1971; Ridberg, Parke & Hetherington, 1971; Yando & Kagan, 1968; Zelniker, et al., 1972). The initial success of some of the techniques described in these studies encourages an attempt at further investigation, especially with the aim of designing a viable procedure having educational use. Designing such a procedure involves considering dimensions other than cognitive tempo style which also affect successful problem solving, namely, cognitive processes and attentional variables.

Cognitive Processes and Attentional Variables.

Meichenbaum and Goodman (1971) emphasized the importance of considering the following cognitive processes required during problem solving: comprehension of the problem; production of appropriate mediators to direct the solution strategy; and implementation of subsequent mediation. Two generalizations can be made about these cognitive processes: (1) adequate comprehension, production, and mediation determine success on a task, and (2) the verbal mode of communication and guidance, whether covert or overt, is common to all these processes. A potentially useful relationship exists between modification techniques and either of these two generalizations.

The aforementioned cognitive processes are exercised during the decision-time interval. Short intervals, such as those exhibited by impulsives, likely prevent or interfere with the completion of these processes. If an abrupt termination occurs before the required minimal information has been processed, failure on the task would seem inevitable. Thus, retarding the tempo during the presumed cognitive activity, through direct or indirect reinforcement, may sustain attention and allow for uninterrupted comprehension of the problem, production of appropriate mediators, and implementation of subsequent mediation. However, training impulsive children to increase their latencies on the MFF did not result in their performing with fewer errors (Debus,

1970; Heider, 1971; Kagan et al., 1966). Presumably then, poor performance is caused not only by impulsive tempos but also by inadequate problem-solving skills. Deficiencies at each of the three problem-solving phases have been well investigated.

Bem (1970) emphasized the probability of a comprehension deficiency as being antecedent to poor performance. Training aimed at providing an internal representation of the desired outcome of the problem facilitated its solution (Bem, 1970).

Reese (1962) attributed failure on a task to a child's inability to use relevant words in an intra-directive manner, that is, he was not able to verbally mediate his problem-solving behavior adequately.

Another group of researchers (Daehler, Horowitz, Wynns, & Flavell, 1969; Flavell, Beach & Chinsky, 1966; Moely, Olson, Halwes & Flavell, 1969) have indicated that deficient production of verbal mediators is the cause of poor performance. Despite the availability of words or instructions in his cognitive repertoire, the child does not spontaneously produce them to mediate task behavior. This assumes that the young child, by age five, does have the ability to use verbal mediating responses (Cook & Smothergill, 1971)..

Deficient production and use of appropriate attentional and scanning strategies during the solution of tasks similar

to the MFF have been identified as being detrimental to impulsive Ss. Drake (1970) and Siegelman (1969) indicated that impulsive Ss ignore more alternatives than do reflective Ss when scanning them before choosing. While not discriminating among minor differences, impulsive Ss seem to be in search of some variant that globally resembles the standard.

Thus a compensatory training program designed to improve performance of impulsive Ss must aim not only at retarding latency but also at overcoming possible cognition deficiencies. As a component of all three cognitive processes, appropriate verbalization could be instrumental in the completion of each one. It is now necessary to examine the specific role of verbalization in problem-solving relative to cognitive processes and response style.

Role of Verbalization. Kohlberg, Yaeger, and Hjertholm (1968) cite considerable support for Vygotsky's (1962) theory. Vygotsky believes that the older child and the adult are capable of linguistic self-guidance and self-control in a covert fashion. Since the younger child cannot direct his actions in this way, he vocalizes his self-direction overtly. This overt self-directing speech declines with age, continuing as verbal thought. The supporting evidence of Vygotsky's contention derives from the work of Flavell, et al. (1966), Jensen (1963), Klien (1963), and Luria (1961).

These studies

...support the postulated age increase in cognitive self-guiding private speech, the postulated increase in its internalization with age, and the postulated functional role of private speech in task performance.

...The findings reviewed indicate the truth of Vygotsky's contention that (some) private speech in task settings serves self-guiding functions and that such speech has a curvilinear course of age increase and then of interiorization.

Kohlberg, et al. (1968), p. 697

A further study indicated that for a specific finger-tapping task, overt self-verbalizations of pupils in kindergarten had greater functional control over nonverbal behavior than did covert verbalizations. However, for first graders, covert self-verbalizations had maximal control (Meichenbaum & Goodman, 1969).

Thus, generation of either overt or covert speech as an effective mediational and attentional guide during task performance appears to be determined by age or the stage which cognitive development has reached. Generally speaking, younger children up to approximately age six employ overt speech while older children generate covert speech. It may be possible to utilize this general finding in the area of teaching (i.e., youngsters might learn best with the mode suited to their developmental level). Implementing the use of overt and covert rehearsal with younger and older children respectively, might provide the most effective teaching

strategy in the acquisition of problem-solving skills and of increased self-control. This statement can be partially supported from research findings but with some enlightening reservations.

In the context of Kendler and Kendler's (1961) research, an optimal reversal shift subsequent to discrimination learning provides an example of a dependent variable which can be assumed to be an indication of learning, transfer, and the extent of relevant covert (verbal) mediation. The proportion of children who make reversal shifts increases with age, probably because as children get older they are more likely to respond to a discrimination learning situation by making covert verbal mediating responses which facilitate transfer from a stimulus + to a stimulus - (Kendler, 1964). Kendler determined that instructing younger (kindergarten) children to overtly label stimulus + and stimulus - (i.e., to make overt verbal representation) significantly increases their tendency to make reversal shifts. Thus, overt verbalization for younger children produced a function similar to that assigned to the covert mediating response for older children.

As well as supporting the aforementioned suggestion that overt rehearsal is beneficial for younger children, Kendler's research attributes the beneficial effect to facilitated mediation. However, results of other studies indicate a related but apparently alternate role of

facilitating attention.

Weir and Stevenson (1959) predicted that overt verbalization would be less effective in facilitating the learning of a relatively simple task for older (ages seven and nine) than for younger (ages three and five) Ss. However, the results indicated facilitative learning at all sampled ages. Similar results were obtained by Gross (1972) who found that overt verbalization upon initial presentation facilitated concept labeling and use of complex solutions with six to eleven year olds. Although different tasks were used, authors of both studies concluded that since the overt verbalization directed a S's attention to relevant stimulus cues, a solution strategy was made more facilitative than the one produced by nonverbalization for both older and younger Ss.

Both these studies had predicted a differential effect of overt verbalization across ages with the following hypothesis: by about age seven, overt verbalization during solution would have an interfering effect on the already internalized covert mediating processes. Although this hypothesis was not substantiated, the rationale is partially supported by Murray's (1967) study using a short term memory task with adults. His results indicated that overt rehearsal was less efficient than was covert rehearsal, as measured by recall. With this type of task, attention

devoted to the speaking act may have interfered with rapid subvocal rehearsal, a covert process.

Overt and Covert Training Effects. An integration of the above findings suggests that the observed developmental interaction effect between overt-covert rehearsal and age does not apply to all tasks. The essential determinant is the amount and type of attention demanded by the task. However, impulsive children characteristically lack efficient attentional skills. Therefore, when sustained attention and scanning strategies are more important than mediational activity in the successful completion of a task, an overt verbal rehearsal pattern would appear to be more effective than a covert one in teaching these skills to impulsive children, regardless of age. Since overt verbal practice of self-directed commands designed to improve attending behavior was successful in facilitating voluntary control of hyperactive nine-year olds, (Palkes, Steward, & Kahana, 1968) perhaps a similar technique would be effective with impulsive school children.

An equivalent balance of importance between attention and mediation was recognized by Meichenbaum and Goodman (1971) who incorporated them in a cognitive self-instructional training procedure designed to alter the behavior of impulsive children aged seven to eight years. Their mode of instruction was a verbal fading procedure (i.e., while completing various tasks the S was required to talk to himself, initially overtly and then covertly, over a five-trial

fading sequence). The S was given practice in rehearsing directions designed to facilitate problem-solving by controlling impulsivity. The content of the verbalizations demanded attention and supplied appropriate mediational strategies to complete the tasks. Posttest results for the experimentally trained group indicated longer MFF latencies than did the results for control groups but there was no significant difference in error scores. However, results on a variety of other measures of motor behavior and Performance IQ supported the success of this technique in controlling the disadvantageous consequences of the impulsive style. (In the same article Meichenbaum and Goodman report a subsequent study where the technique was successful in decreasing error scores with kindergarten and grade one subjects).

Thus, although Meichenbaum and Goodman's fading procedure (i.e., overt to covert) was minimally successful in reducing MFF error scores, a solely overt rehearsal procedure could be instrumental in producing more substantial effects on MFF results. Attention, both sustained before responding, and that devoted to the proper cues of the situation, should be a crucial factor in altering the impulsive response style. Overt rehearsal would then be most effective in attaining these attentional strategies.

An uncontrolled variable among the constituents of the fading procedure further warrants the superiority of the solely overt procedure. Meichenbaum and Goodman's technique consisted of:

...First, Experimenter (E) performed a task talking aloud while Subject (S) observed (E acted as model); then S performed the same task while E instructed S aloud; then S was asked to perform the task again while instructing himself aloud; the S performed the task while whispering to himself (lip movements); and finally S performed the task covertly (without lip movement).

(Meichenbaum & Goodman, 1971, pp. 116-117)

Among the purposes of this procedure, one was to teach the S to generate covert verbal mediation which would provide guidance in his overt behavior. Luria (1961) proposed that the acquisition of covert verbal control was characteristic of the last of three stages that children undergo when developing the skill of mediational responding. During the "first stage" the child's verbalizations do not exert control over behavior; during the "second stage" self-provided overt verbal mediation directs overt behavior as does covert mediation during the "third stage". The fifth trial of the above fading procedure presumably allows for practice in covert mediation of task behavior by instructing the S to think of the verbalizations while performing the task. However, it is possible that some children would not necessarily obey instructions through unwillingness or inability. Since the procedure of this fifth trial provides no assurance that the internalized mediational process is actually occurring, then this trial would not necessarily be instrumental in teaching the general skill of covert mediational responding. Having Ss approximate Luria's "second stage" by overtly rehearsing during the fourth and fifth trials would improve the procedure

By allowing observation of overt task behavior which in turn would provide some assurance that the mediation was occurring. Moreover, practice at this "second stage" may facilitate a greater spontaneous transfer to Luria's "third stage" after training.

The validity of this reasoning will be assessed using a research design which allows comparison of the effects of both overt and covert rehearsal with grade two Ss. Control groups will be included to provide a baseline estimate of change. It is predicted that an overt self-verbalization procedure will be more effective than will a covert fading technique in increasing latencies and decreasing error scores on the MFF.

METHOD

Subjects. Fifty-eight boys and thirty-six girls attending the second grade in two Corner Brook schools were given the MFF by a male experimenter (E). Sample MFF items and instructions appear in Appendix A. The Ss' latency was measured with a Meylan-Brenet #15 stopwatch. From the initial sample, twenty impulsive Ss from each sex were selected for the modification procedure on the basis of two criteria. Latency scores of chosen Ss had to fall below that of their respective sample mean (male or female) and error scores of these Ss had to fall above that of their respective sample mean. These criteria were enforced to ensure that chosen Ss were characteristic of Kagan's impulsive syndrome (i.e.,

fast-responding, high-error) and not of a "quick" group (i.e., fast-responding, low-error) identified by Eska and Black (1971).

The age range of the selected Ss was 90 months to 105 months with a mean of 96.8 for males and 96.3 for females. Use of a group with a narrow age range made it possible to use training tasks of optimal difficulty for all.

Both schools were situated in similar socio-economic areas.

Ss of each sex, matched with the counterbalancing technique on MFF latency scores, were assigned to four groups of ten each (five males, five females). The Ss were distributed in this manner to minimize inter-group mean differences. The resultant groups had at least two males and two females from either school, approximating equal representation.

Procedure. The four groups were comprised of two treatment groups, one attentional-control group, and one control group. The essential difference between the two treatment groups is discussed in detail below. The attentional-control group provided an estimate of change due to attention given by adults and to practice on the tasks. These factors are supposedly independent of the verbalization and strategy training. The control group underwent pre- and posttesting only.

The experimental and attentional-control groups participated in three 20-minute tutorial sessions during a two-week period with the same male E who had administered the pretests. These tutorials involved practicing tasks which

impulsive children find most difficult, namely, visual motor tasks requiring fine motor coordination, and tasks requiring prolonged attention before responding (Douglas, 1972). The ten different tasks included: (1) two relatively simple ones involving the completion of visual motor exercises which require sustained attention and fine motor coordination; (2) four tasks requiring sustained attention and careful scanning strategy, for which perceptual information is sufficient for solution; and (3) four tasks which require cognitive reasoning for solution. This last group of tasks included various activities such as categorization and sequential reasoning which require verbal mediation for their performance.

The tasks, illustrated in Appendix B with their respective instructions, consisted of the following: selected exercises from Reading-Thinking Skills (Continental Press, 1971); years VII and VIII of the Porteus Maze-Vineland Revision (Porteus, 1950), the Porteus Maze Extension (Porteus, 1955), and the Porteus Maze Supplement (Porteus, 1959); the Visual Closure subtest of the Illinois Test of Psycholinguistic Abilities (Kirk, McCarthy, & Kirk, 1968); and visual-motor exercises similar to those found in the Developmental Test of Visual Perception (Frostig, Maslow, Lefever, & Whittlesey, 1964).

Both experimental groups underwent verbalizing, which took place before and during the task, to enable the control of impulsiveness and the use of appropriate problem-solving strategies. The verbalizations emphasized slowness so that

the S would have adequate time to determine what to do and how to do it. These directions supposedly compensated for comprehension, mediation and production deficiencies.

The covert experimental group participated in the following fading paradigm:

- (1) E performed task while talking aloud, acting as model as S observed.
- (2) S performed same task while E instructed S aloud.
- (3) S asked to perform task while instructing himself aloud.
- (4) S performed task while whispering to himself.
- (5) S performed the task covertly (while asked to think of the instructions).
- (5a) S is asked to repeat the directions without doing the task.
- (6) S performed the task covertly.

The verbalization paradigm of this covert group is similar to that of Meichenbaum and Goodman (1971) with the addition of trials #5a and #6. Trial #5a was added to provide assurance that S could recall the verbalizations. Although remembering them overtly does not mean to say that he had actually used them before on trial 5 in a mediational manner, (i.e., Luria's "third stage"), at least the probability of this occurring was increased if the possibility of forgetting was eliminated.

The overt experimental group underwent a similar verbalization paradigm to the covert group with the following

exceptions: trials 4 to 6 were rehearsed out loud, thus alleviating the necessity of trial 5a.

The following is an example of a verbalization which was rehearsed.

Okay, what do I have to do here? I have to draw a line between the two X's along this road, without touching the sides. Remember, if I go slowly I can make sure I don't touch the sides. I'll start at this X and make my way slowly towards the other one. I'll be careful around the corners. By doing it slowly and looking ahead to see where to go next, I'll be sure to get it right. Good, I did it.

Ss in the attentional-control group were not provided with, and were not asked to repeat, the detailed instructions. After having shown him how to perform the task, E asked S to complete the remaining five trials. At times it was necessary to provide some help in identifying objects in certain pictures.

Two days after the completion of the tutorial sessions, a female E, unknown to all Ss, administered the MFF once again. This was done to eliminate experimenter bias, as the male E who performed the training was aware of the group to which each S belonged.

RESULTS

For the total sample tested with the MFF, a Pearson product moment correlation between latency and number of errors was $-.53$ ($N=94$, $p<.01$). This is consistent with correlations of $-.30$ to $-.69$ for samples of school children reported by Eska and Black (1971) and Kagan (1965).

Latency. To minimize error-contributing variance, while assessing the extent of the treatment effect, pre-post difference scores were calculated. These latency difference scores were analyzed by a 4 (Treatment) x 2 (Sex) analysis of variance design. The only significant effect was the Treatment effect, $F(3,32)=12.27, p<.01$ (Table 1). Accordingly, male and female scores were combined in the subsequent mean comparison test.

Mean latency difference scores representing the main treatment effect are depicted graphically in Figure 1. A Newman-Keuls mean comparison test (Winer, 1962) showed a significant difference between experimental and control groups ($p<.01$). Differences between the two experimental groups were not statistically significant ($p>.05$; Table 2).

Since there was no significant difference between experimental groups, this suggests that maximal effect of the verbalization rehearsal method in modifying impulsive latencies was gained through use of either the covert fading sequence or the continual overt method. Since the effects of modelling and practice on the tasks were not substantial enough to warrant a significant increase in the attentional-control group's latency, verbalizing could be assumed to have played an important role in the control of impulsive tempos.

Errors. Pre-post difference scores were analyzed by a 4 (Treatment) x 2 (Sex) analysis of variance design.

TABLE 1

Summary of Analysis of Variance on Latency
Difference Scores

Source of Variation	df	MS	F	p
Treatments (A)	3	130.38	12.27	<.01
Sex (B)	1	.45	.04	
A x B	3	3.60	.33	
Error	32	10.62		

FIGURE 1

Mean Latency Difference Scores as a Function of Treatment

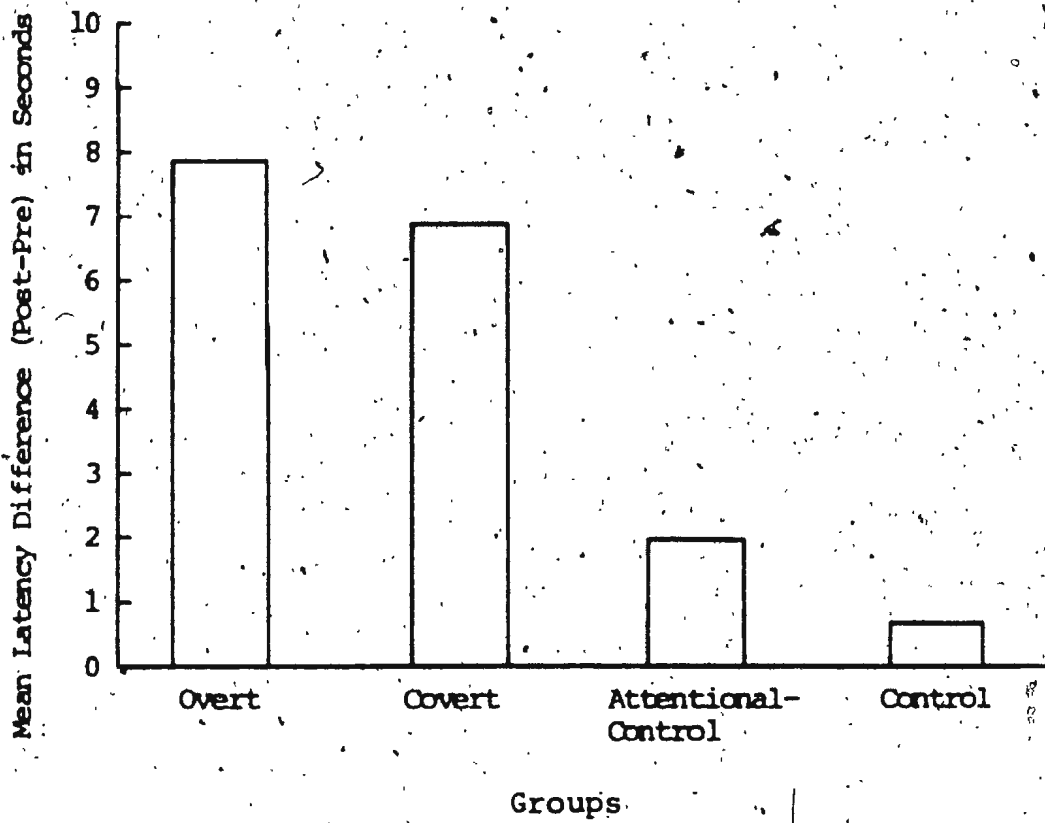


TABLE 2

Newman - Keuls Multiple Comparison of Group
Mean Latency Difference Scores

GROUPS	Control	Attentional- Control	Covert	Overt
Means	0.55	2.02	6.90	7.92
Control		1.47	6.35**	7.37**
Attentional- Control			4.88**	5.90**
Covert				1.02
Overt				

**
p < .01

As with latency scores, the only significant effect was the Treatment effect, $F(3,32)=4.96$, $p<.01$ (Table 3). Thus, male and female scores were combined for the subsequent analysis.

Error difference scores representing a reduction of errors as a function of the main treatment effect are shown in Figure 2. A Newman-Keuls mean comparison test (Winer, 1962) showed a significant difference between experimental groups and one of the control groups ($p<.05$). Differences between the experimental groups and the attentional-control group as well as differences between the overt and covert experimental groups were not statistically significant ($p>.05$; Table 4).

Although the difference in means between the experimental groups and the attentional-control group was not great enough to achieve statistical significance, a frequency count of the number of Ss in each group whose error score was reduced after treatment supported the superiority of both experimental groups over the attentional-control group. Every S (10 of 10) in both experimental groups achieved a positive difference value (i.e., pre minus posttreatment), while only 7 of 10 Ss did so in both the attentional-control group and control group. According to the Chi-Square statistic, the former frequency (10 of 10) is significant ($\chi^2=10$, $p<.01$) while the latter frequency (7 of 10) is not significant ($\chi^2=1.6$, $p>.05$; Table 5). Thus the superiority of both overt and covert procedures relative to the attentional-control and control groups was evident.

TABLE 3

Summary of Analysis of Variance on Error
Difference Scores

Source of Variation	<u>df</u>	<u>MS</u>	<u>F</u>	<u>P</u>
Treatments (A)	3	103.23	4.96	< .01
Sex (B)	1	4.89	.23	
A x B	3	20.16	.96	
Error	32	20.81		

FIGURE 2

Mean Error Difference Scores as a Function of Treatment

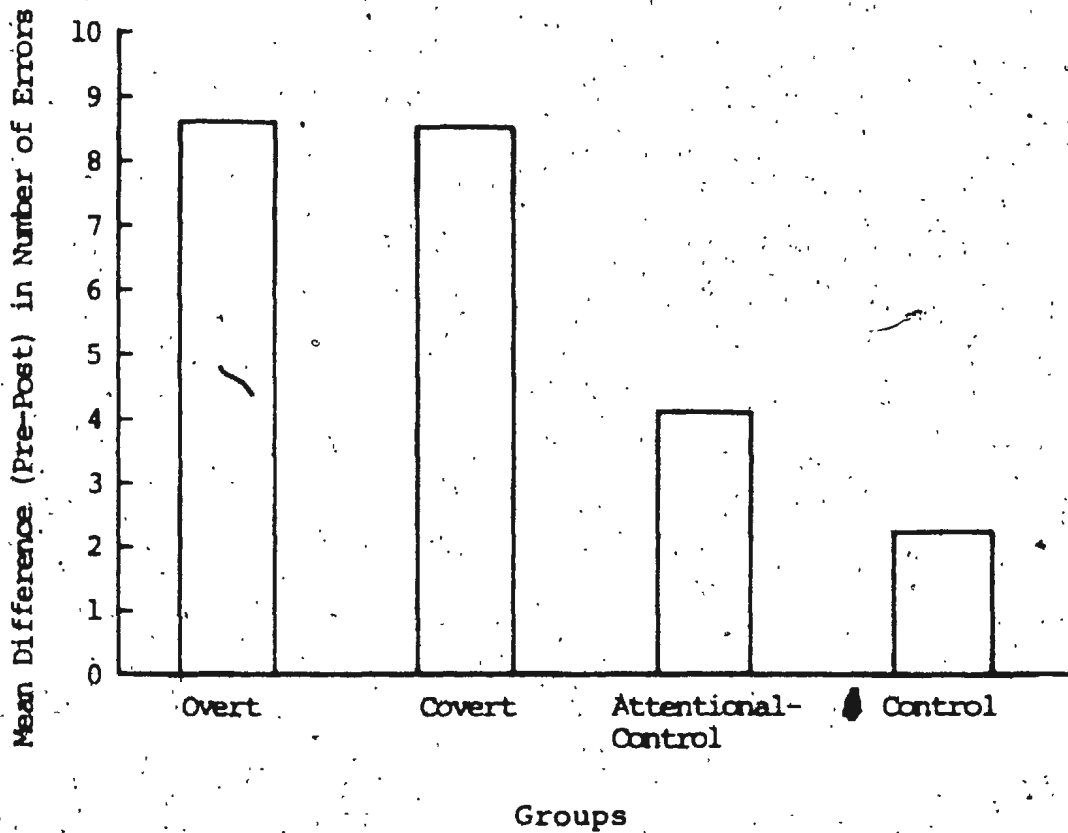


TABLE 4

Newman - Keuls Multiple Comparison of Group
Mean Error Difference Scores

GROUPS	Control	Attentional- Control	Covert	Overt
MEANS	2.2	4.1	8.5	8.6
Control		1.9	6.3*	6.4*
Attentional- Control			4.4	4.5
Covert				0.1
Overt				

* $p < .05$

TABLE 5

Direction of Error Score Difference Between Pre- and Posttesting

GROUPS	NUMBER OF DIFFERENCE SCORES	
	Negative ¹	Positive ²
Overt	0 (5)	10 (5)
	$\chi^2 = 10 \quad p < .01$	
Covert	0 (5)	10 (5)
	$\chi^2 = 10 \quad p < .01$	
Attentional- Control	3 (5)	7 (5)
	$\chi^2 = 1.6 \quad p > .05$	
Control	3 (5)	7 (5)
	$\chi^2 = 1.6 \quad p > .05$	

¹ increase in errors² decrease in errors

Summary. The covert (fading) rehearsal procedure and the overt rehearsal procedure of self-directive task strategy did not differ in their relative effect in lengthening latency and decreasing errors.

DISCUSSION

Generally, the results of this study support the notion that strategy training of one form or another is necessary to effectively modify the impulsive style (Heider, 1971; Kagan, et al., 1966; Meichenbaum and Goodman, 1971; Ridberg, et al., 1971; Zelniker, et al., 1972). The success of both verbal procedures further supports Vygotsky's general contention that verbalizing assists control over nonverbal behavior.

The results did not support the prediction that overt rehearsal would be instrumental in producing more substantial effects than would covert rehearsal. A reexamination of both the rationale and the design of the training procedure clarifies this finding. The studies from which the initial prediction was made were concerned with specific learning tasks. Overt rehearsal during training was seen as beneficial or as interfering, during posttraining tasks, depending on whether the more important determinant of success was attention or mediation, respectively. It was presumed that such a distinction would apply to other less specific tasks, Although attentional variables are purported to be important

during solution of MFF items, the tasks employed during the training phase differed in nature and complexity and thus in the relative importance of either mediation or attention. Since both mediation and attention were exercised frequently during training, the initial advantage of considering them separately was diminished. Also, the partial similarity of the rehearsal patterns of both experimental groups may have contributed to the lack of posttest differences, since the covert experimental group also exercised some overt rehearsal.

An equally important indirect finding of this study is that even though overt rehearsal is likely to interfere with posttraining mediation activity during a specific learned task. (e.g., Murray, 1967), this phenomenon does not apply to more general tasks requiring search strategy before responding.

The experimental groups' improved-response strategy, reflected in the MFF posttest results, suggests that both the overt rehearsal procedure and the improved covert fading procedure were useful in teaching seven and eight-year olds the general skill of generating covert verbal mediation. In addition, it seems likely that the training procedure resulted in increasing general comprehension and this would also make a minor contribution to success during posttesting. Therefore, it appears that overt commands rehearsed during training can be assumed to spontaneously transfer to the covert mode for use after training. This is a valuable

applied finding worthy of further investigation. Use of an overt rehearsal technique with small groups promises to be an economical and useful way of modifying impulsive styles in the classroom. Having pupils repeat materials out loud in unison has frequently proved to be an effective method of teaching academic skills; this method may well be beneficial in teaching subgroups of impulsive children to utilize the advantageous cognitive style evolved in this study.

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APPENDIX A

Directions and Sample Items from
Matching Familiar Figures Test

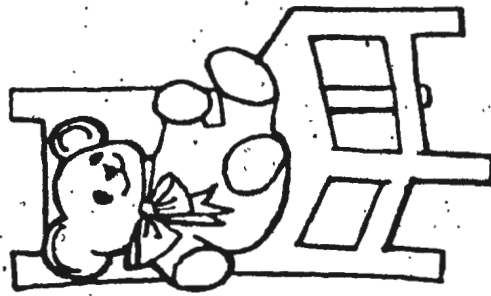
DIRECTIONS FOR MATCHING FAMILIAR FIGURES

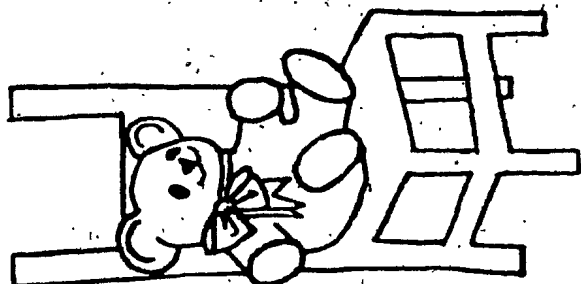
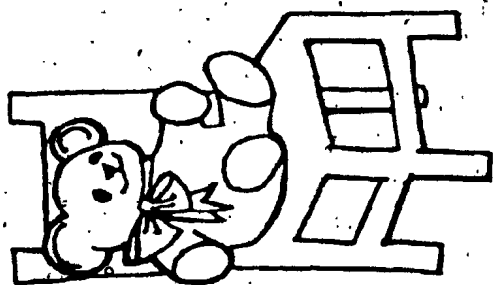
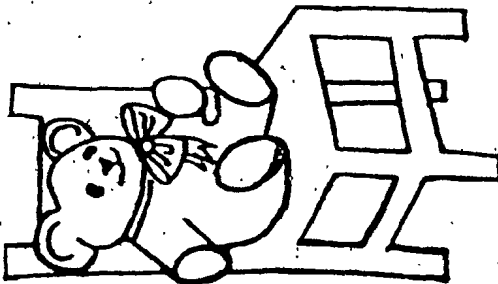
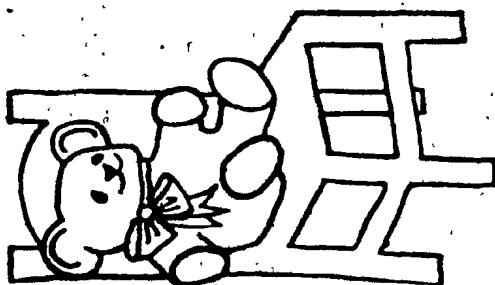
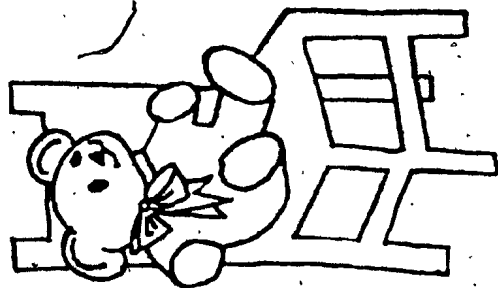
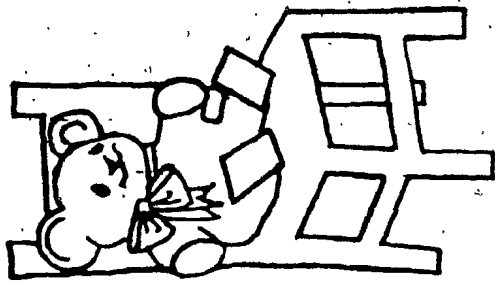
"I am going to show you a picture of something you know and then some pictures that look like it. You will have to point to the picture on this bottom page (point) that is just like the one on this top page (point). Let's do some for practice." E shows practice items and helps the child to find the correct answer. "Now we are going to do some that are a little bit harder. You will see a picture on top and six pictures on the bottom. Find the one that is just like the one on top and point to it."

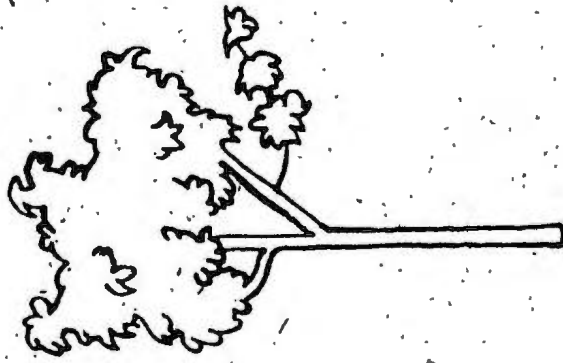
E will record latency to first response to the half-second, total number of errors for each item and the order in which the errors are made. If S is correct, E will praise. If wrong, E will say, "No, that is not the right one. Find the one that is just like this one (point)." Continue to code responses (not times) until child makes a maximum of six errors or gets the item correct. If incorrect, E will show the right answer.

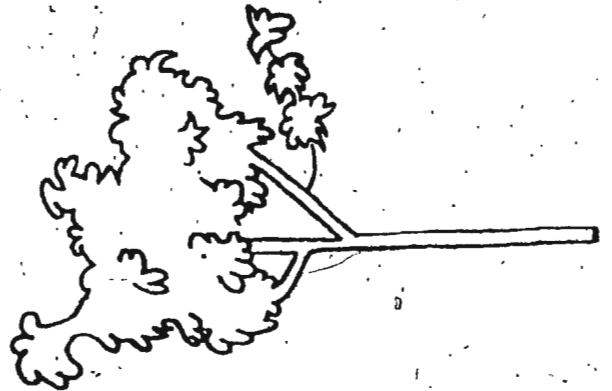
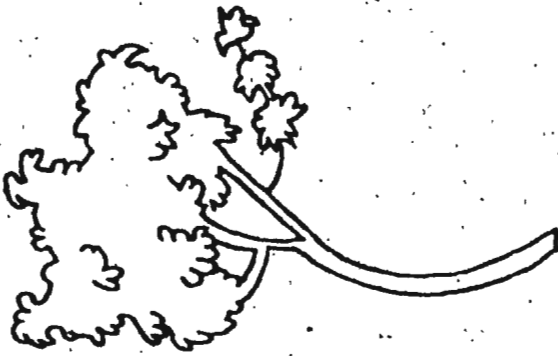
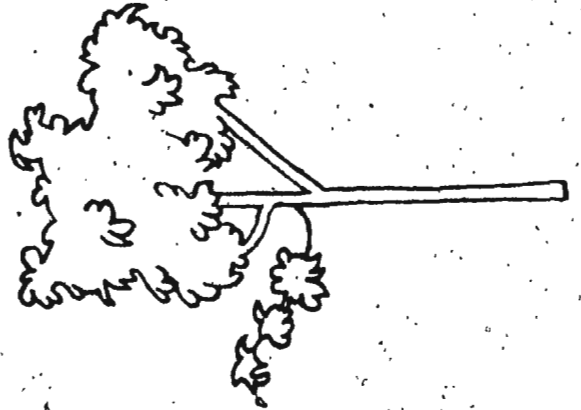
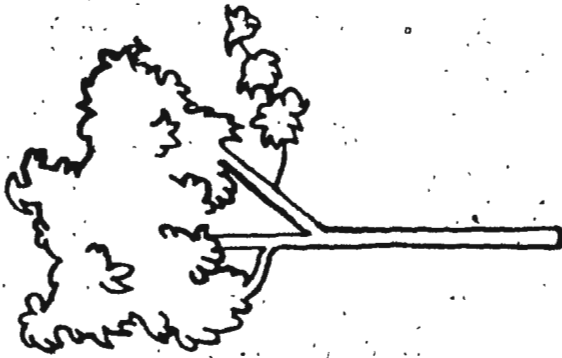
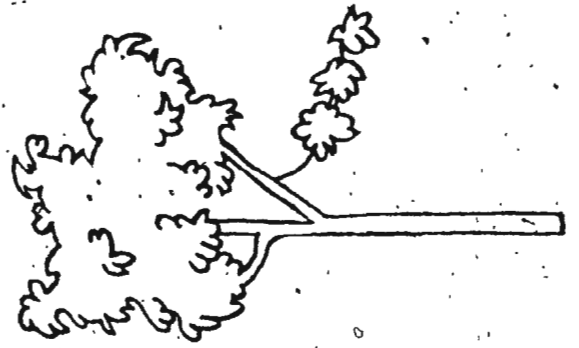
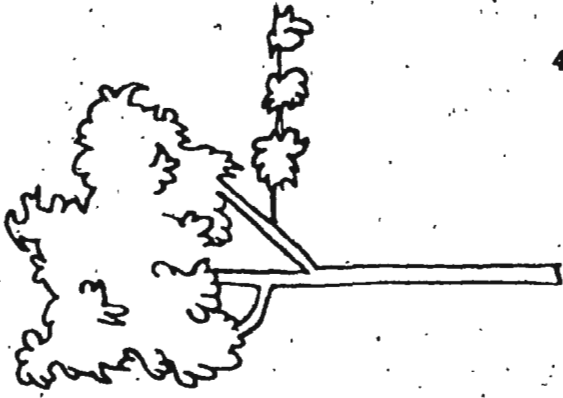
It is necessary to have a stand to place the test booklet on so that both the stimulus and the alternatives are clearly visible to the S at the same time. The two pages should be practically at right angles to one another.

Note: It is desirable to enclose each page in clear plastic in order to keep the pages clean.









APPENDIX B

Tasks and Instructions for
Modification Procedures

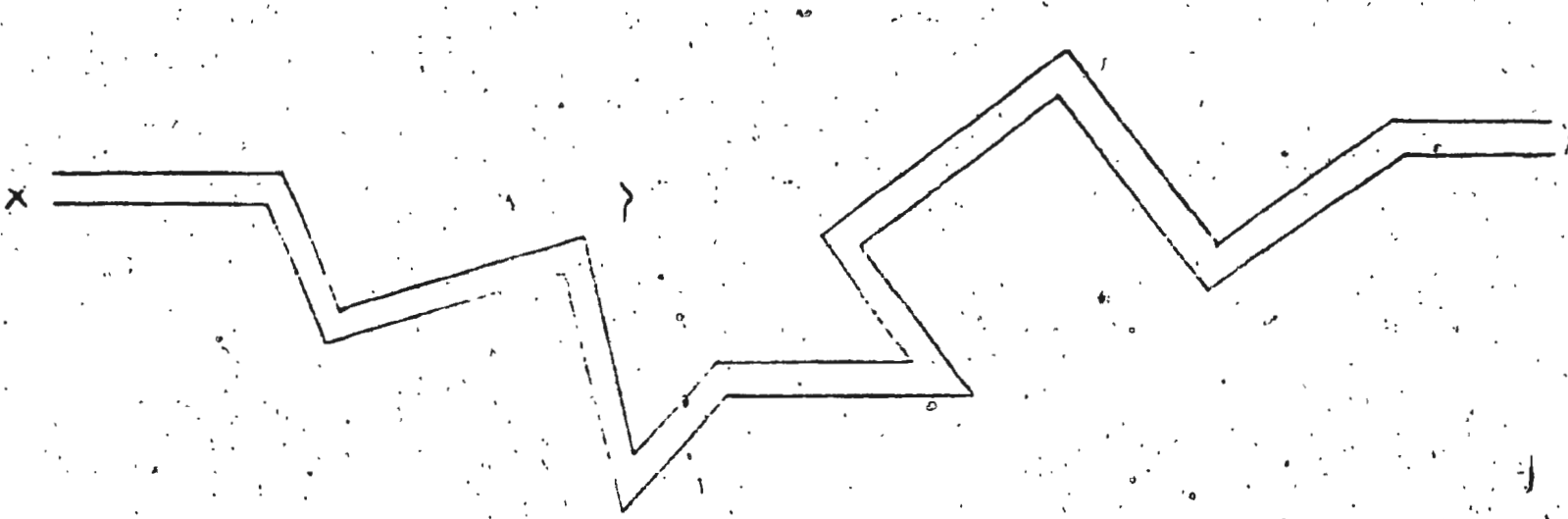
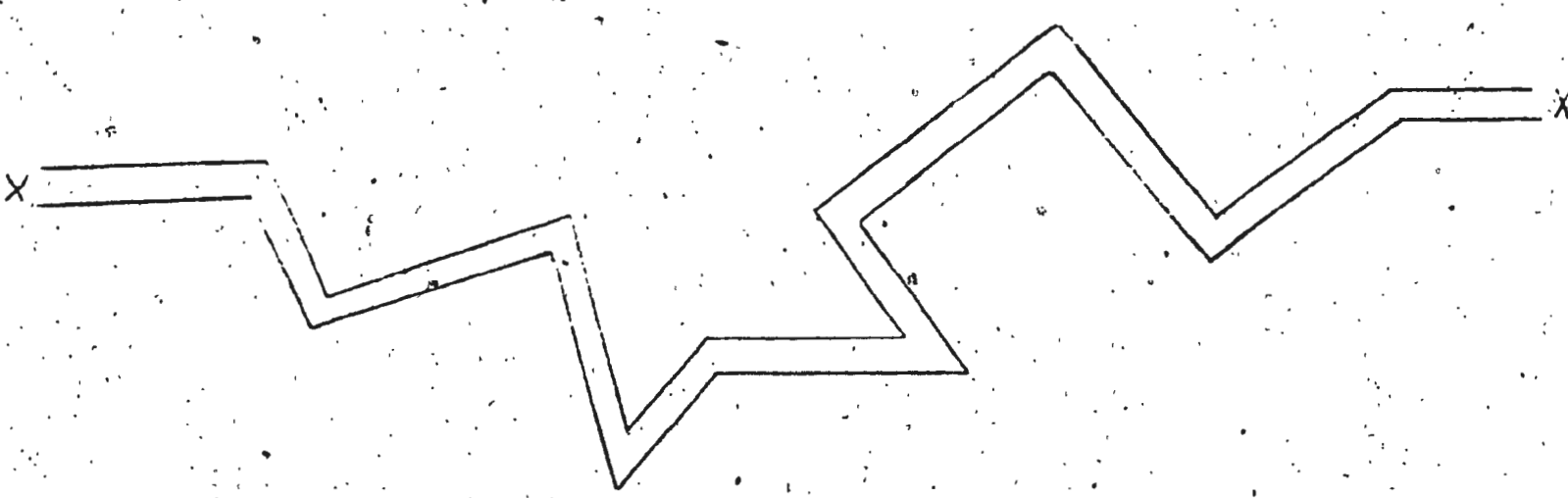
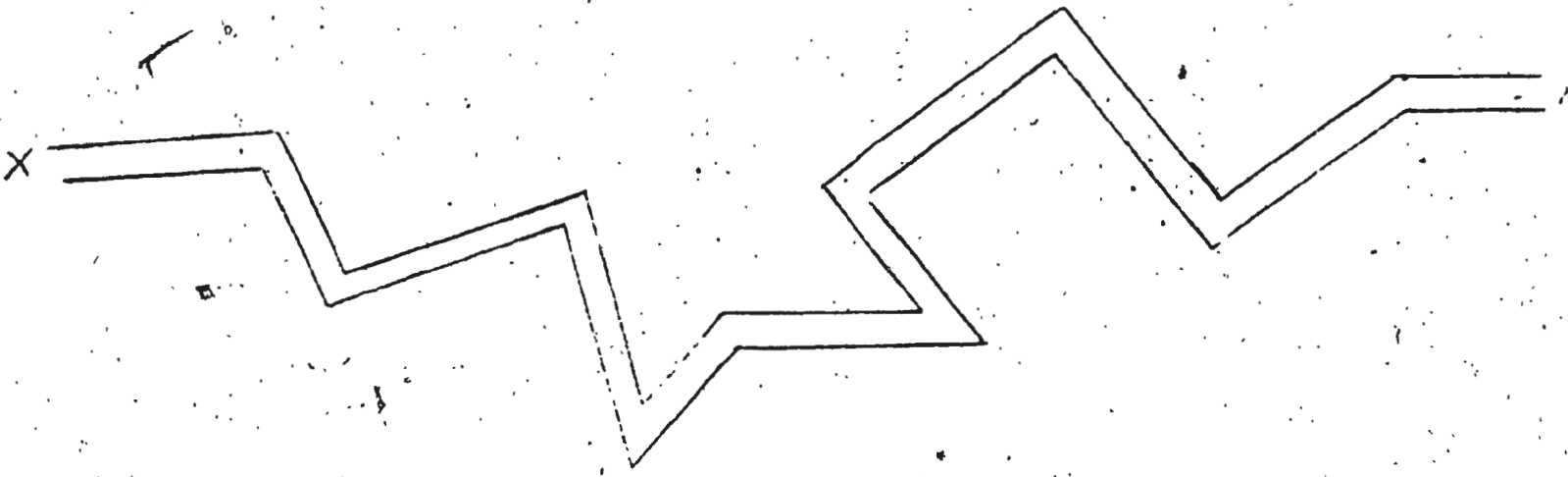
Task 1

Trial 1

Okay, what do I have to do? I am to draw a line between these two X's along this road, without touching the sides. Remember, if I go slowly I can make sure I don't touch the sides. I'll start at this X and make my way slowly towards the other one. I'll be careful around the corners. "By doing it slowly, and looking ahead to see where to go next, I'll be sure to get it right. Good, I did it.

Similar instructions for Trials 2-6.

Accompanying exercise is adapted from the Developmental Test of Visual Perception (Frostig et al., 1964).



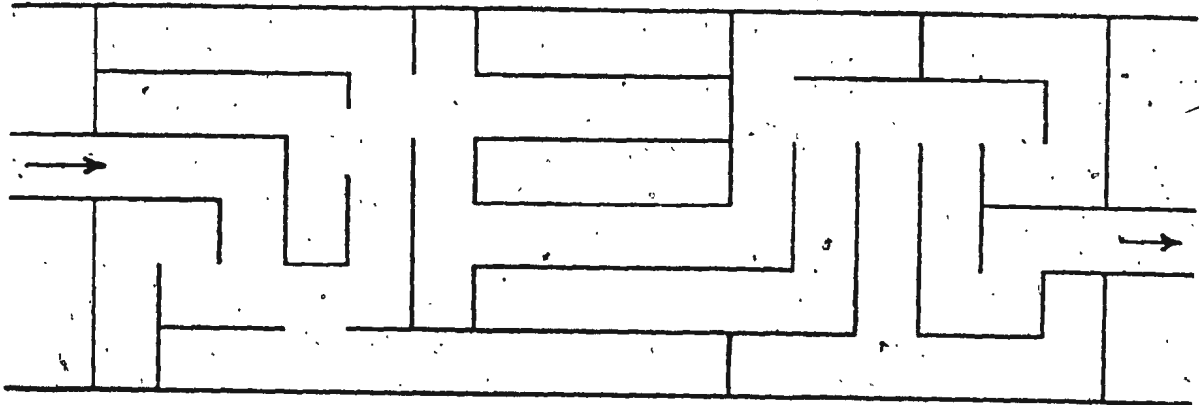
Task 2

Trial 1

Okay, what do I have to do here? I have to draw a line from this arrow over to this arrow, without getting stuck up any blocked roads. Starting with my pencil at this arrow, I'll make my way slowly towards the other one. I have to keep watching where to turn so that I won't get stuck. By going slowly I won't touch the sides of the road and I won't cut any corners. I'll just take my time and keep looking ahead. Good, I did it.

Similar instructions for Trials 2-6.

Accompany exercises are the Porteus Maze Tests.



PORTEUS TESTS — VINELAND REVISION

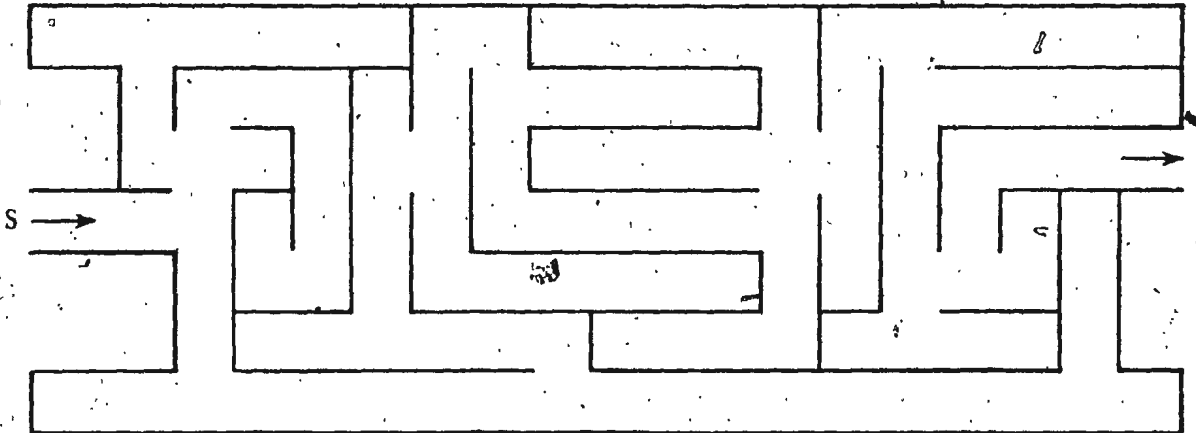
YEAR VII

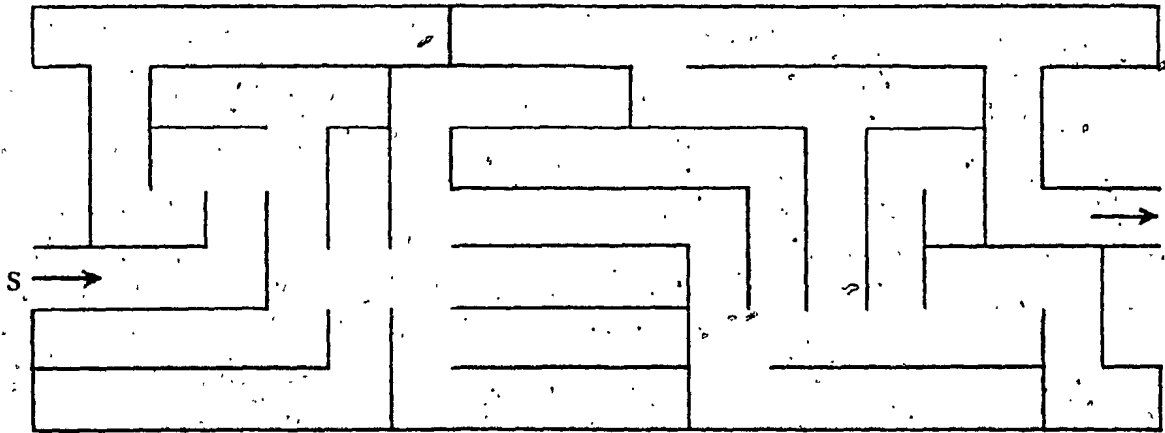
New Series from "The Maze Test and Mental Differences," Copyright 1933,
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59-115T (5/12)

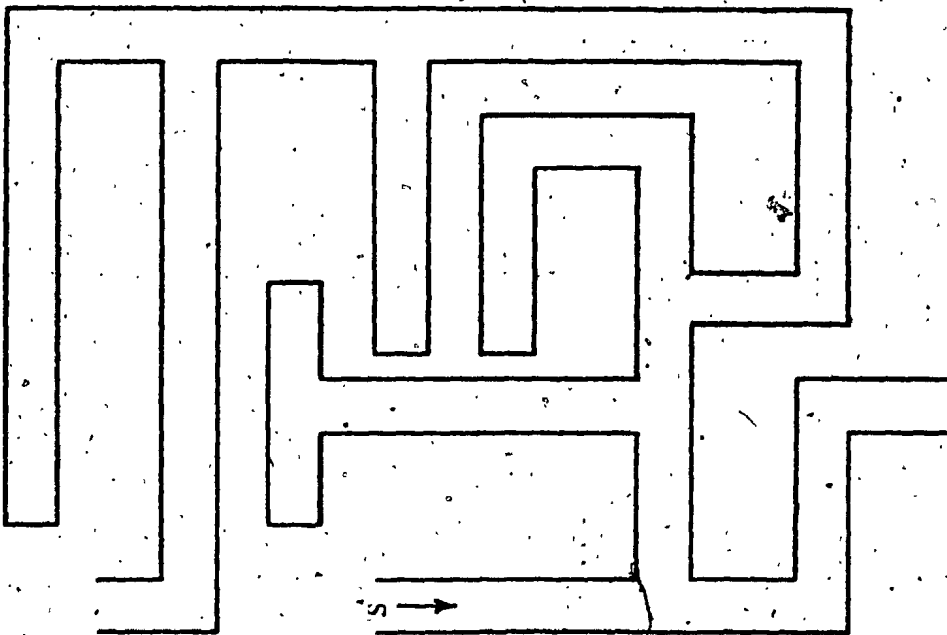




PORTEUS MAZE EXTENSION

VII

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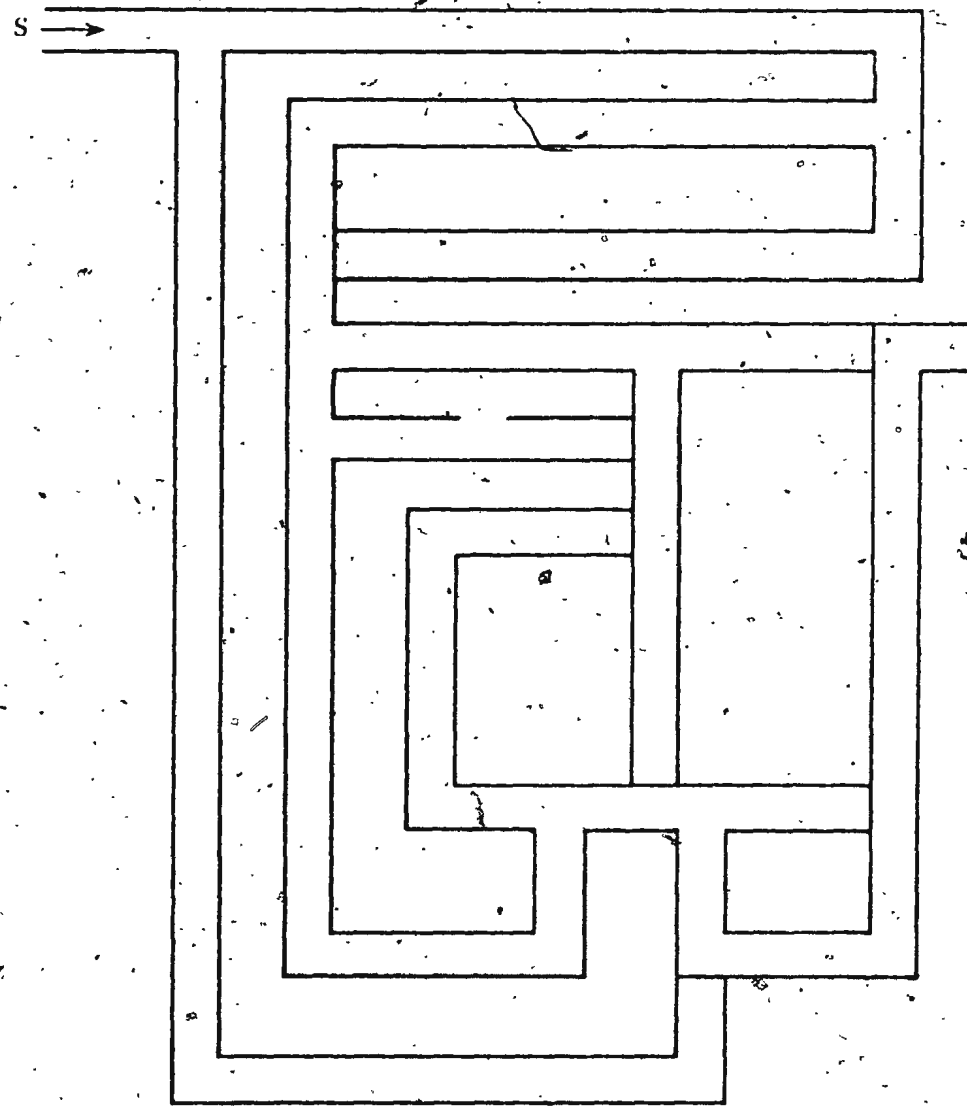
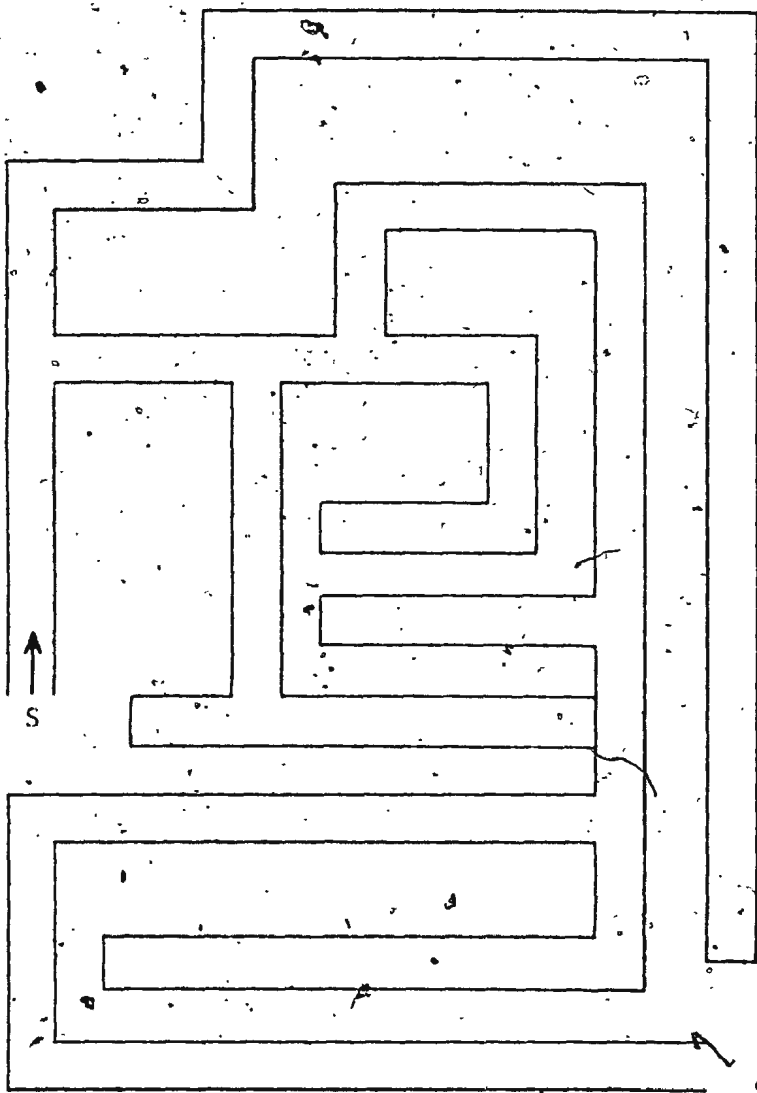
PORTEUS TESTS — VINELAND REVISION YEAR VIII

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47

PORTEUS MAZE EXTENSION

VIII

PORTEUS MAZE SUPPLEMENT

VIII

Task 3

Trial 1

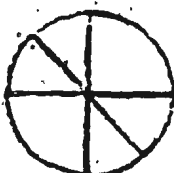
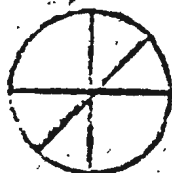
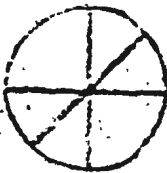
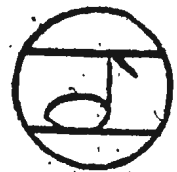
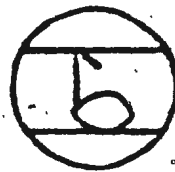
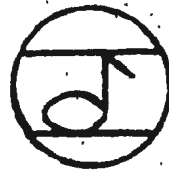
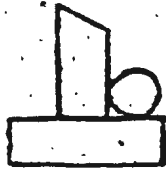
What is it that I am to do? I am to find the one figure that does not belong with the others. Two of the figures are exactly the same and I am to put an X on the third one which is different.

O.K., let's look at each figure slowly and carefully. This figure has (lines, circles, squares) going this way. Let's find another one that looks the same. Remember, by looking at each part of the figure slowly and carefully, I'll be able to find another that looks exactly like it. After I've found the two that are alike I can put an X on the different one.

O.K., remember if I go slowly and take my time, checking my answers, I'll be sure to find the right one.

Similar instructions for Trials 2-6.

Accompanying figure is from Reading-Thinking Skills (Continental Press, 1971).

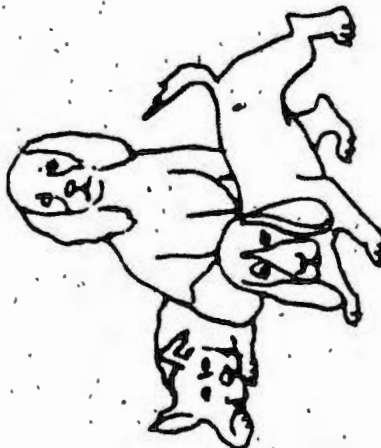


Task 4

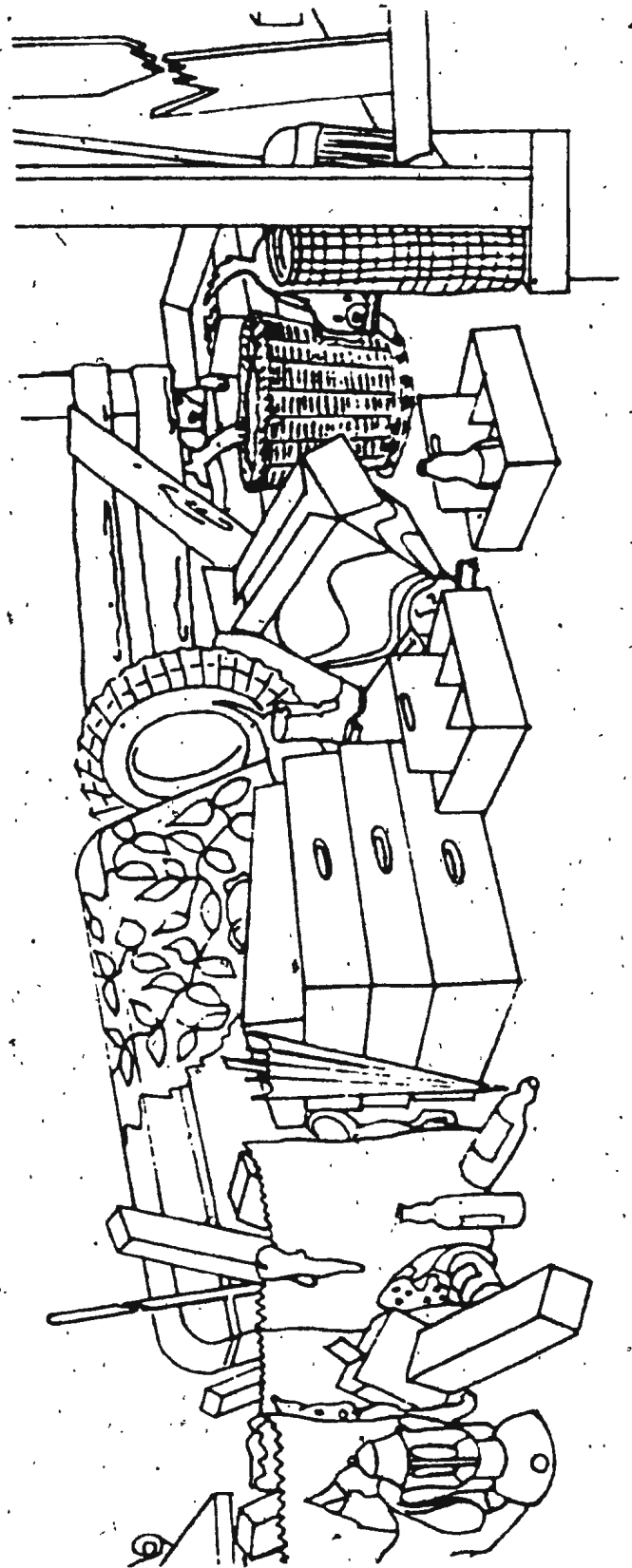
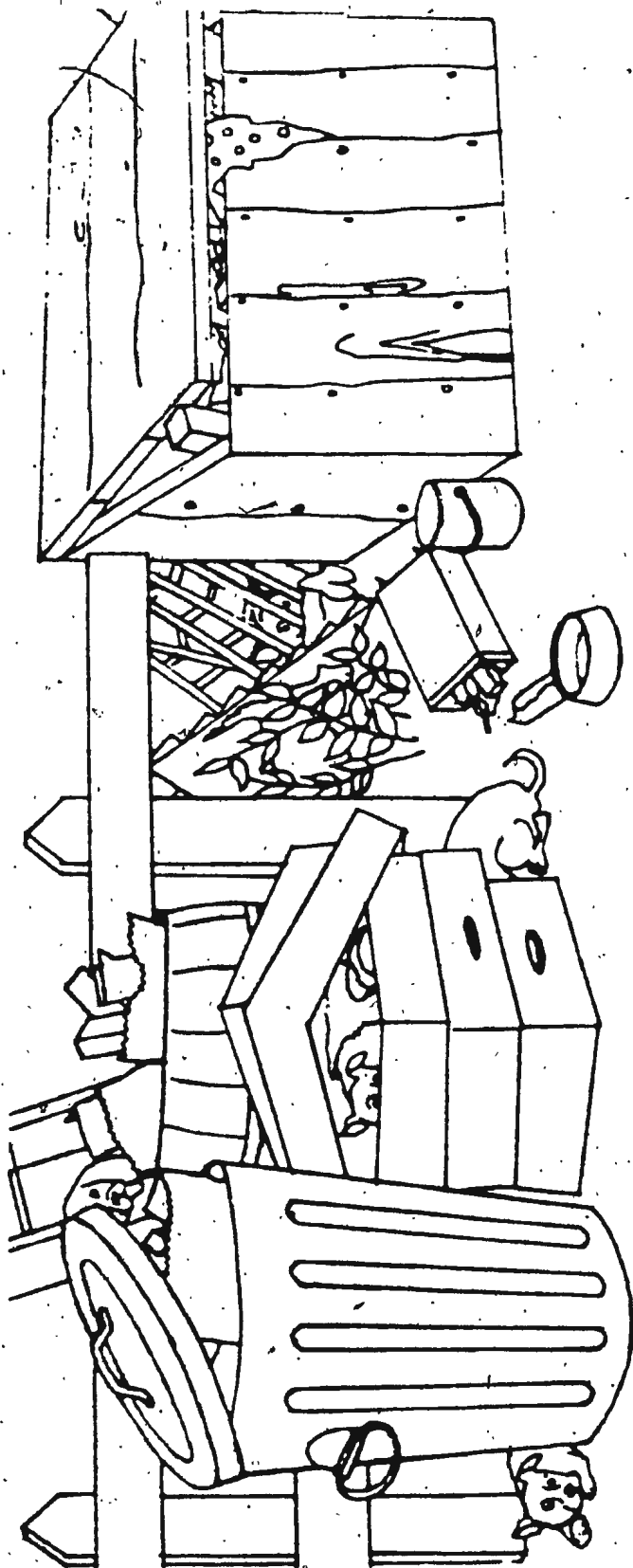
What do I have to do? You see the picture of the dogs on this side of the page? Well, over here are some more just like them but they are hiding so that we can only see parts of them. We have to try and find as many as we can. Before I start, I must remember to go slowly and look carefully at every part of the page so that I can find as many as I can. I'm going to take a good slow look at the whole page before I start pointing.

Similar instructions for the last four trials with pictures of fish, shoes, bottles and tools.

Accompanying figures are from the Illinois Test of Psycholinguistic Abilities (Kirk et al., 1968).



D



Task 5

Trial 1

Do you see these four objects here? One of them does not belong with the others. I am going to look at each one slowly and carefully to find out which three are alike in some way. I have to name something that those three have in common.

Let's see, this is a lawn mower and it is used for cutting grass. This is a paint brush and we use it to paint things. This is a pair of scissors. What does it do? It cuts paper. And this is an ax which cuts wood.

Now which three are alike? Well, the lawn mower, scissors, and ax are alike in that they cut. So the paint brush is the one that does not belong with the others.

Trial 2

Now let's look at these objects slowly and carefully to find out which three are alike in some way. Let's see, this is a vacuum cleaner, and it is used to clean carpets and things. And this is a washer; it is used for washing and cleaning clothes. This is a sewing machine, and it is used to make and mend things. And this is a snow plow; it is used to clean up the snow.

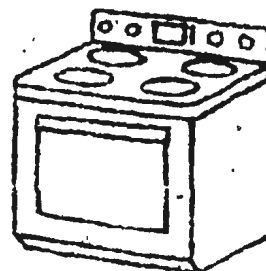
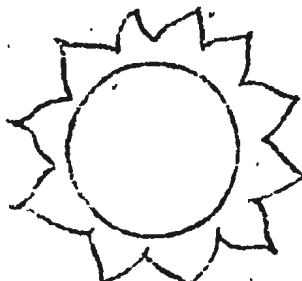
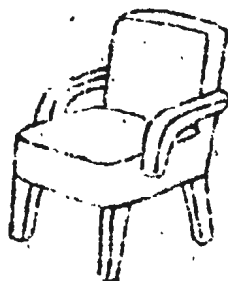
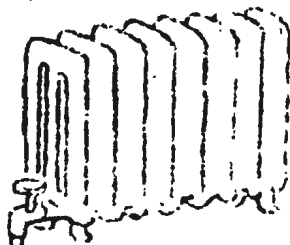
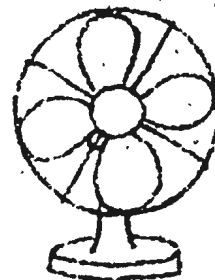
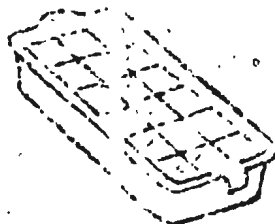
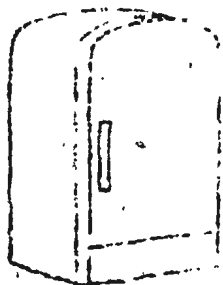
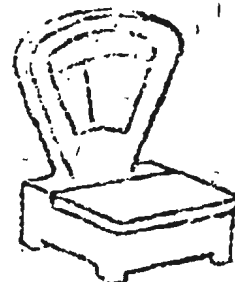
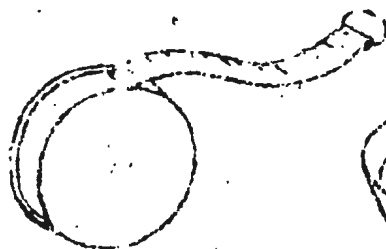
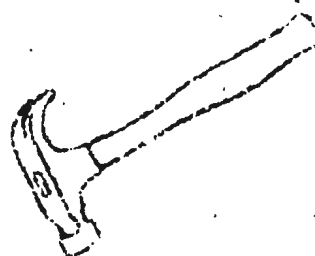
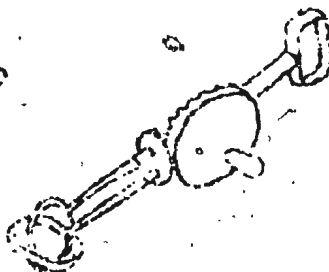
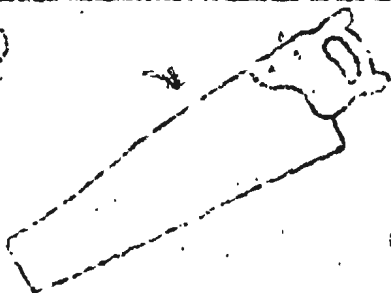
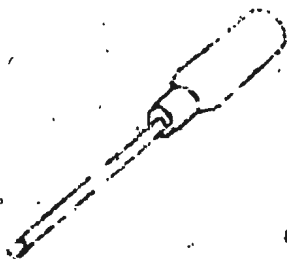
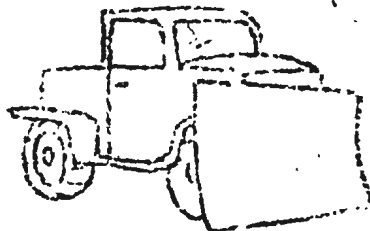
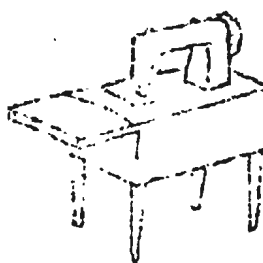
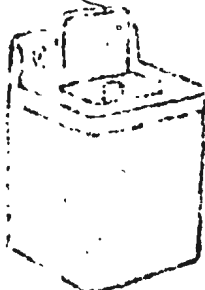
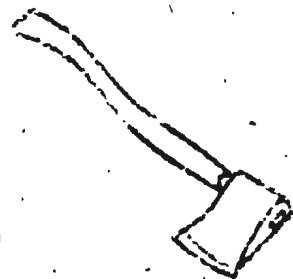
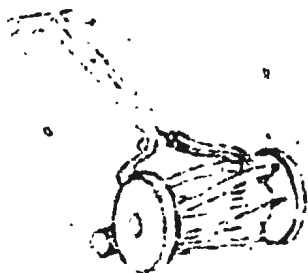
Now which three are alike? Well, the vacuum cleaner, the washer and the snow plow are alike in that they all clean, so the sewing machine is the one that does not belong with the others.

Similar instructions for Trial 3 (the screwdriver, saw, and hammer are all used to build things), Trial 4 (the cup, tape and scale are all used to measure things), Trial 5 (the fridge, ice container and fan are all used to make things cold) and Trial 6 (the radiator, sun, and stove are all used to make things hot).

Accompanying figures are from Reading-Thinking Skills (Continental Press, 1971).

Note: Identical instructions did not apply to all trials.

Thus the covert group's trial #5a consisted of asking S to repeat the learned strategy of examining all of the pictures carefully before deciding on how three of them were alike.



Task 6

Trial 1

Okay, what is it that I have to do? See this figure here, I have to find another figure among these that looks exactly like it.

First, let's look at this figure slowly and carefully to see how it goes (outline the "standard" with pencil point). Now let's look at each of these carefully. Is this one different? Yes, because this part of it goes like this. What about this one? It is different too. This next one looks the same. I'd better check the last one just to make sure. Yes, this third one is exactly the same. Good, by going slowly and carefully and checking each one, I'll be sure to get it right.

Similar instructions for Trials 2-6.

Accompanying figures are from Reading-Thinking Skills (Continental Press, 1971).

Task 7

Trial 1

These pictures are arranged in a mixed-up order. I have to put them in a proper order so that they will tell a sensible story.

Let's look at each one slowly and carefully so that we can see what is happening. In this first one, it seems to be snowing out. All these dots here look like snow. In this second one, the sun looks like it is shining. There seems to be grass on the ground, but no leaves on the bushes. On the third one, there seems to be snow on the ground, and on the top of the fence and also on the trees. So the middle picture should come first before the snow, and then this one, where it is snowing. And finally, this one where the snow has finished falling. See, by looking at each one slowly and carefully, we can arrange them in the right order.

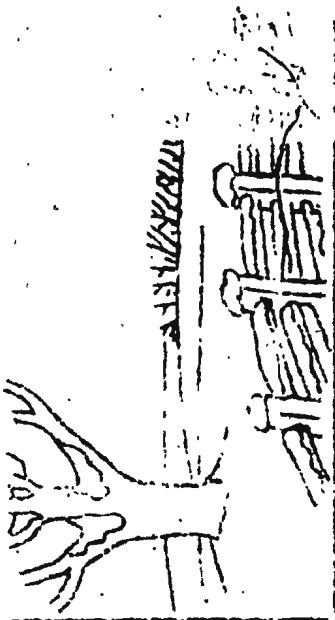
Trial 2

Let's look at these next ones slowly and carefully, so that we can arrange them in the right order. This first one is a picture of some flowers blooming. In the second one, the buds of the flowers are just coming out of the ground. In the third one, someone is planting the seeds in the ground.

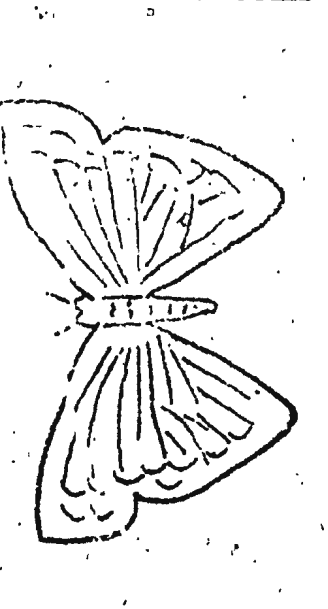
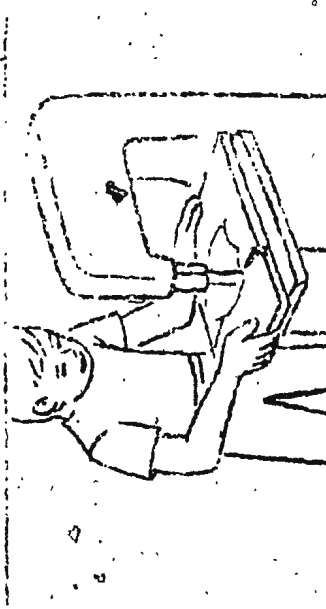
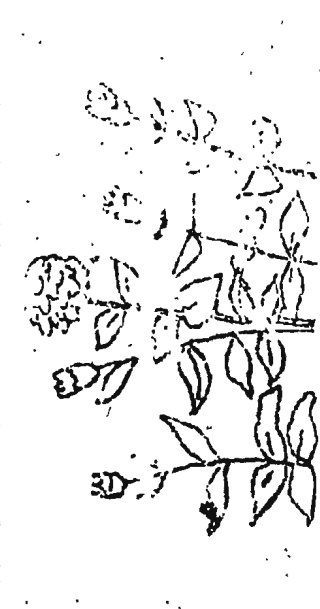
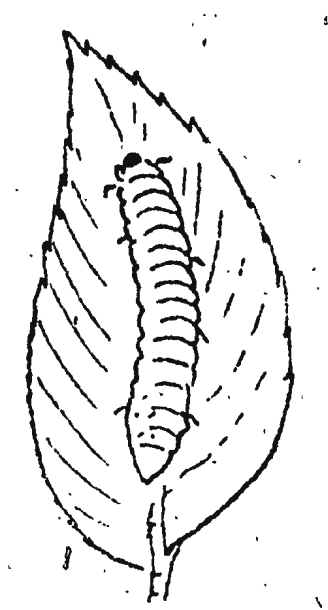
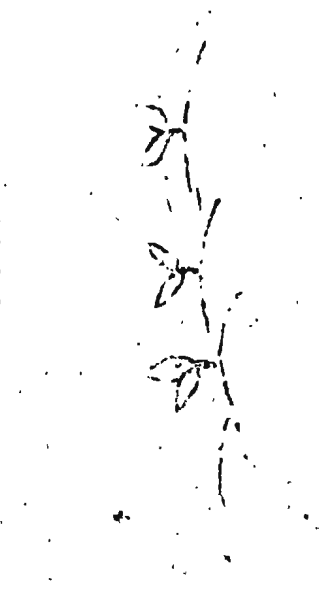
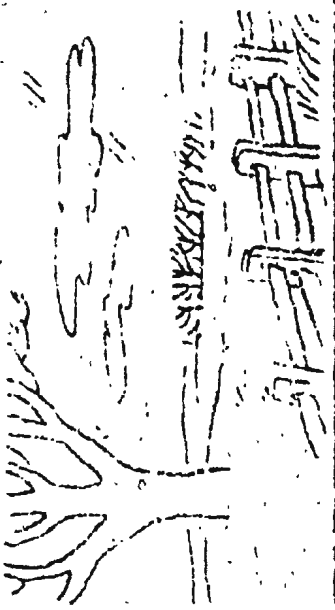
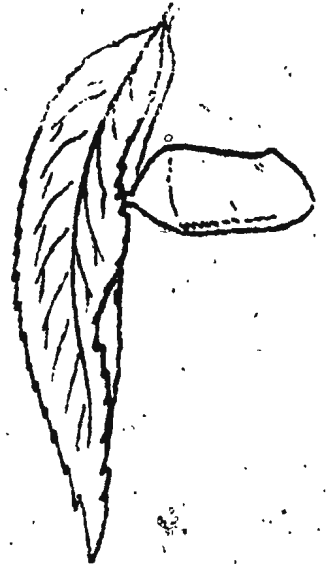
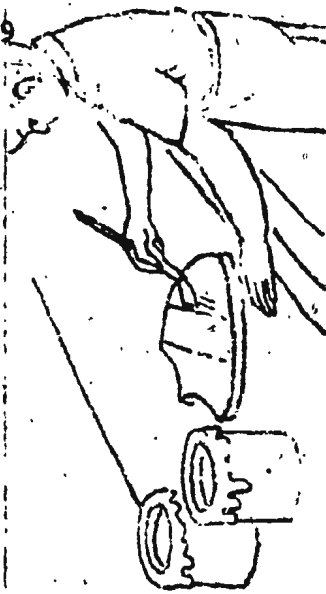
Let's see, this one should come first, and then this one, and finally this one, where the flowers are blooming.

Similar instructions for Trials 4-6.

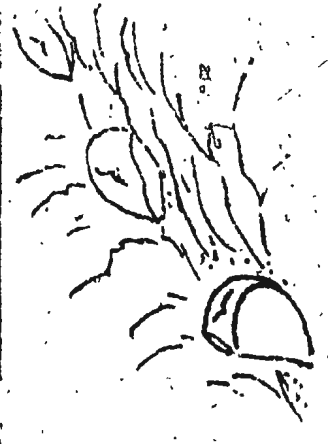
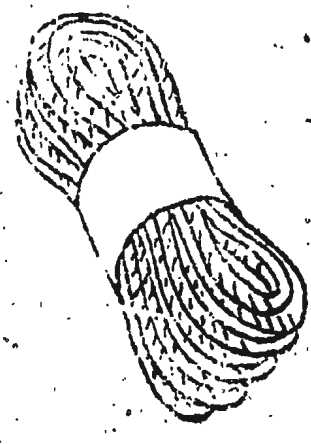
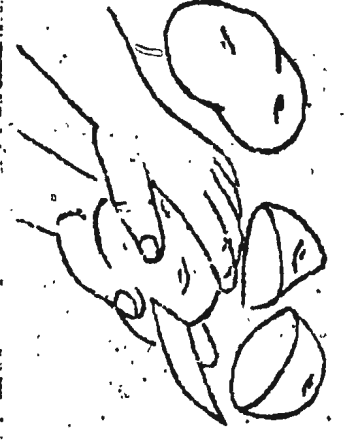
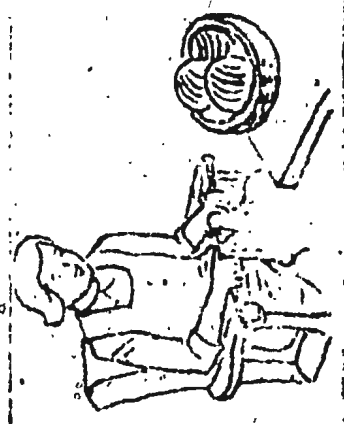
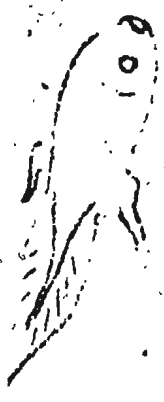
Accompanying figures are from Reading-Thinking Skills (Continental Press, 1971).



59



33



Task 8

Trial 1

You see this thing here? What is it? It is a cone from a tree. It belongs to one of these three things over here. We have to find which one it is. Let's look at each one slowly and carefully.

This first one is a house plant. Look, it is growing in a pot. And this one here is a bushy tree with leaves on it. And this last one is an evergreen tree. Now, which of these does the cone go with? Well, it has to be this one, because the only trees that have cones are evergreen trees.

By looking at each one slowly, we can tell exactly what it is and that way we will be able to find the right one.

Trial 2

What is this thing here, on top of the roof of a house? It is a T.V. antenna. Which one of these does it belong to? Let's look at each one slowly and carefully.

This first one is a television set. And this one is a tape recorder. Do you see the tape reels on the top of it? And this one is a telephone, see the dial and the receiver? Now which one does the antenna go with? Well, it has to be this one, because a tape recorder and a telephone do not have antennas.

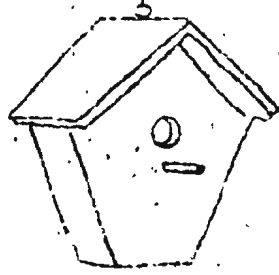
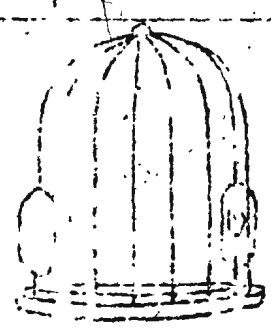
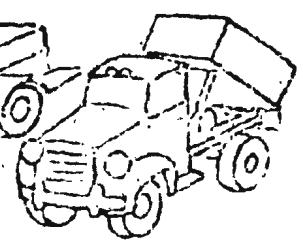
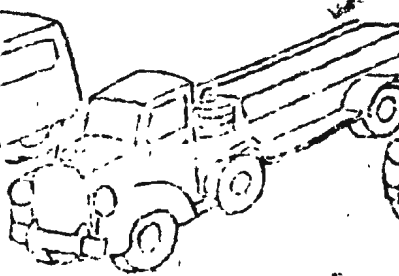
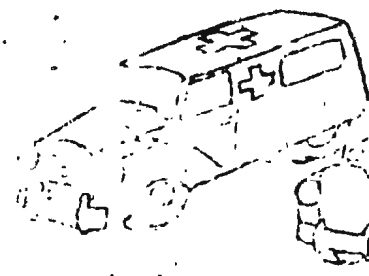
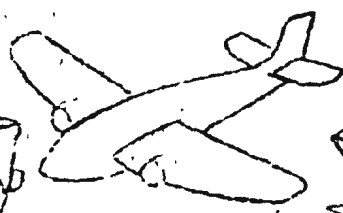
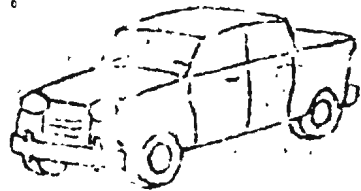
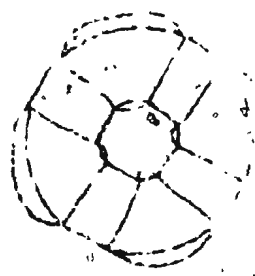
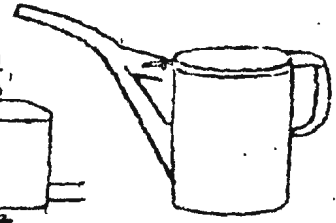
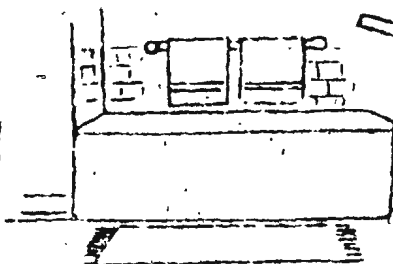
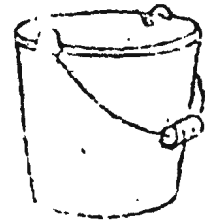
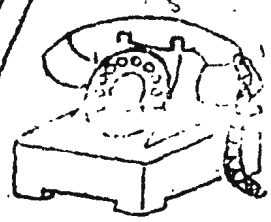
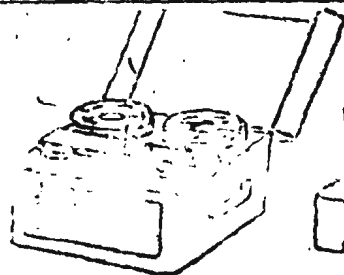
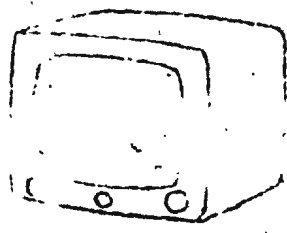
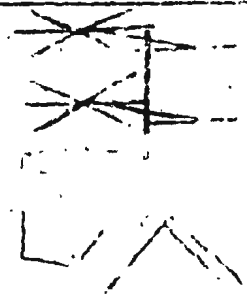
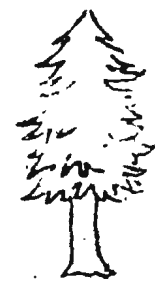
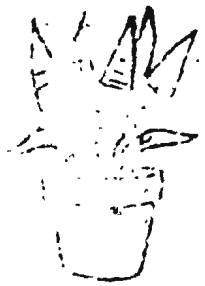
If we go about this slowly and carefully we can get it right.

Similar instructions for Trial 3 (tap belongs to the tub), Trial 4 (life saver goes with the boat), Trial 5 (ladder belongs to the fire truck), and Trial 6 (perch goes with the bird cage).

Accompanying figures are from Reading-Thinking Skills (Continental Press, 1971).

Note: Identical instructions did not apply to all trials.

Thus the covert group's trial #5a consisted of asking S to repeat the learned strategy of examining all of the pictures slowly and carefully before deciding on his choice.



Task 9

Trial 1

What am I supposed to do? Look carefully at the string of beads in the first row. They are strung in a certain order or pattern. First there is a round bead, then a square one, then an oval one, and then a round one again, followed by a square, followed by an oval; then another round one. From these four over here, we have to choose the one that should come next. Let's see...since a square followed a round one here, and also over here, the square should come next right here.

By taking my time, and slowly checking to see what order the beads are in, I'll be sure to get it right.

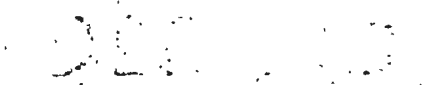
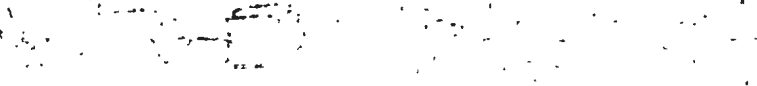
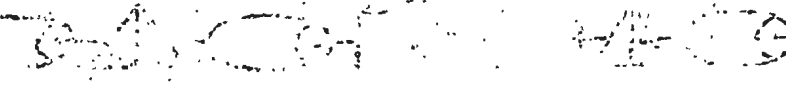
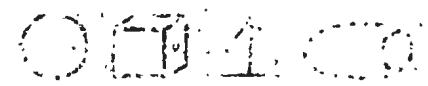
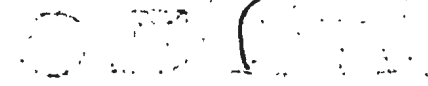
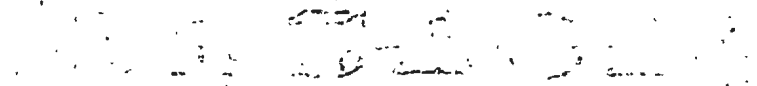
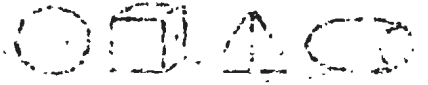
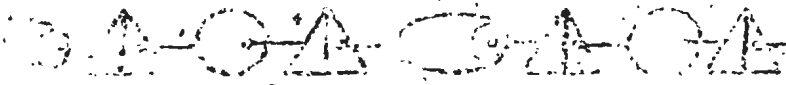
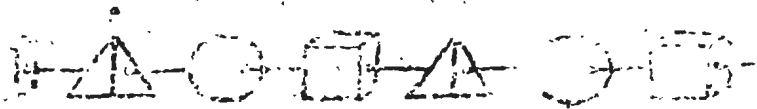
Trial 2

O.K., let's look at this row of beads slowly to see what order they are in. First, there is a square, then a triangle, then a round one. Then another square, followed by a triangle, followed by a round one, then another square. Which one should come next? Let's see...the order of these beads seem to be like this: square, triangle, circle; then another square, triangle, circle. So after the square should come another triangle.

By taking my time, and slowly checking to see what order these beads are in, I'll be sure to get it right.

Similar instructions for trials 3-6.

Accompanying figures are from Reading-Thinking Skills (Continental Press, 1971).



Task 10

Trial 1

What do I have to do here? Something is wrong with this picture. I must look at it slowly and carefully to find out what is wrong, or what is foolish.

What is happening in this one? Here is a cow, and this must be a farmer. He has just finished milking the cow and is now pouring the milk into a ... a basket! Well, that is foolish because a basket does not hold milk.

By looking at the picture slowly and carefully, before I answer, I can be sure to get it right.

Similar instructions for Trial 2 (cutting wood with scissors), Trial 3 (rabbit with a squirrel's tail), Trial 4 (lady wearing a coat in mid-summer), Trial 5 (diving board over a plastic, shallow pool), and Trial 6 ((bill board sign upside down)).

Accompanying figures are from Reading-Thinking Skills (Continental Press, 1971).

