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Delay of response in problem solving and color response to Rorschach stimuli

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BOSTON UNIVERSITY
GRADUATE SCHOOL

Dissertation

DELAY OF RESPONSE IN PROBLEM SOLVING
AND COLOR RESPONSE TO RORSCHACH STIMULI

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TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION	1
II. BACKGROUND OF THE PROBLEM AND THEORETICAL CONSIDERATIONS	3
The Concept of Delay of Response	3
Experimental Studies of Response Delay	6
Genetic Studies of Color and Response Delay.	11
Color-Form Tests and the Rorschach	14
An Approach to Rorschach Validation: Study of the Single Variable	18
Present Status of Rorschach Validation	20
Derivation of the Hypothesis	23
The Research Hypothesis.	26
III. PROCEDURE.	27
Problem-Solving Task	28
Perceptual Task.	30
Administration of the Problem-Solving Task	32
Selection of the Experimental Subjects	35
Administration of the Perceptual Task.	37
IV. RESULTS.	39
FC Score	40
CF Score	41
C Score.	42
The Research Hypothesis.	43
Supplementary Analysis of the Data	44

Chapter	Page
V. DISCUSSION	46
Perception and the Concept of Response Delay	46
Implications for Rorschach Interpretation. .	48
Implications for Rorschach Validation Research	49
Relationship to Findings of Other Studies. .	50
F Response and Its Relation to FC, CF and C.	52
Perception of Form and Bias of the Problem- Solving Task	52
Reaction to Color on the Rorschach and Other Perceptual Tasks	54
VI. SUMMARY.	57
Introduction	57
Derivation of the Hypothesis	57
Procedure.	59
Problem-Solving Task	60
Perceptual Task.	61
Administration of the Problem-Solving Task .	62
Selection of the Experimental Subjects and Administration of the Perceptual Task. . . .	63
Results.	64
Discussion	65
APPENDICES	67
A. Color Scores of the Two Experimental Groups on the Perceptual Task.	68
B. Locations Used in Administration of the Perceptual Task.	69
C. Accuracy Scores of Experimental Subjects on the Mirror Task	70
D. A Copy of the Mirror Task.	71
REFERENCES	72
ABSTRACT	77
AUTOBIOGRAPHY.	81

LIST OF TABLES

	Page
1. Frequency of C response in the two experimental groups	44
2. Color scores of the two experimental groups on the perceptual task	68
3. Locations used in administration of the perceptual task	69
4. Accuracy scores of experimental subjects on the Mirror Task	70

LIST OF FIGURES

	Page
1. Time taken and score increase achieved on second administration of the Mirror Task	35a
2. A copy of the Mirror Task	71

I. INTRODUCTION

Problems relating to the delay of response have assumed increasing clinical importance as part of a general shift in clinical orientation under the impact of recent developments in psychoanalytic theory. The focus of clinical interest now is not so much the study of instinctual forces as it is the diverse modes of reaction to them. This shift of interest from impulse to defense represents the core of what is now called "ego psychology." Fenichel (1945) states in this connection.

Stimuli from the outside world or from the body initiate a state of tension that seeks for motor or secretory discharge, bringing about relaxation. However, between stimulus and discharge, forces are at work opposing the discharge tendency. The study of these inhibiting forces, their origin and their effect on the discharge tendency, is the immediate subject of psychology. Without these counterforces there would be . . . only reflexes (p. 11).

It is with the study of the relative presence or absence of these "inhibiting forces"--delay of response--that this study is concerned. In this investigation an attempt was made to examine the relationship

between delay of response in problem-solving and ability to integrate color and form on a perceptual task.

II. BACKGROUND OF THE PROBLEM AND THEORETICAL CONSIDERATIONS

The Concept of Delay of Response

It is a common observation that motor development of children progresses from originally undifferentiated, unorganized mass actions to organized, integrated action-patterns, specific and appropriate to the situation. The presentation of a bottle to the infant precipitates a massive, diffuse response involving his whole body. It is only as he matures that his motor responses become gradually localized in specific grasping and sucking movements. Essential to this development is the child's ability to delay his immediate motoric response until reality conditions are more appropriate. Werner (1957) notes in this connection that the younger child is at the mercy of every impulse, that his actions are dominated by vital drives and by the immediate impact of objects in the environment. It is only as the child matures that he becomes able to prevent the direct discharge of an impulse, becomes capable of some delay. He states:

. . .the primitively acting organism is intimately bound up with the concrete situation. Development from a lower to higher type of action--in terms of differentiation--is marked by the appearance of circuitous approaches

....On the level of the most primitive action, object (stimulus) and subject (response) are not separated by the devices of mediation; that is, the interaction is immediate (Werner, 1957, p. 191).

Rapaport (1950) presents one of the best formulations of the concept of delay of response as part of a psychoanalytic theory of thinking based on Freud's earlier works (Freud, 1900; Freud, 1911; Freud, 1917). It is maintained that all thinking is a detour from the direct path toward gratification. When the object of an instinctual drive is present, and the need for it reaches a certain intensity, there is an immediate discharge of tension. However, if the need-satisfying object is not present, the discharge is delayed, giving rise to a hallucinatory image of the need-satisfying object. This original image is fairly undifferentiated and incorporates visual, acoustic, tactile, thermal, cutaneous, kinesthetic, and other stimulations in a diffuse form. In the course of development this attempt at satisfaction by means of hallucination is abandoned, and the original diffuse image differentiates into discrete objects and experiences. According to Freud:

It was only the non-occurrence of the expected satisfaction, the disappointment experienced, that led to the abandonment of this attempt at satisfaction by means of hallucination. Instead of it, the psychical apparatus had to decide to form a conception of the real

circumstances in the external world and to endeavour to make a real alteration in them. A new principle of mental functioning was thus introduced; what was presented in the mind was no longer what was agreeable but what was real even if it happened to be disagreeable. This setting up of the reality principle proved to be a momentous step (Freud, 1911, p. 219).

Meanwhile, there develops an ability to postpone discharge until external reality conditions have been found suitable for discharge. "The delay to begin with was due to external circumstances and is turned into an ability to delay, into an internal control. Thus is a necessity made a virtue" (Rapaport, 1950, p. 164). The establishment of delays and controls results in the development of partial drives. At the same time, there is a progressive differentiation of the objects of these partial drives. The consequence of this two-fold development is that a particular idea is no longer dependent upon the mounting tension of a single drive for its emergence in consciousness. This change paves the way for the new organization of memories replacing the drive organization of memories. In this new organization, the relationship patterns of reality, based on experience, play a major role, so that ideas are organized into memory frames of reference according to their conceptual, temporal and spatial belongingness. In summary, "The general development of psychic structure begins with innate discharge-

regulating thresholds, is fostered by delays of discharge enforced by reality conditions, and progresses by internalization of the delay of discharge caused by reality, establishing an ability to delay" (Rapaport, 1953, p. 194).

Experimental Studies of Response Delay

The concept of delay of response has been experimentally approached with great ingenuity in a number of studies. Misch (1954) reasoned that inhibition of action could not occur before a certain level of development, and that, in adults, inhibited action was accompanied by increased ideational (perceptual-imaginal) activity. These two notions taken together led him to hypothesize that as the organism comes increasingly to inhibit direct motoric gratification of impulses, there develops an increasing displacement of action from the motoric to the ideational sphere. As a test of this general hypothesis, he compared the Rorschach responses of two groups of subjects: (1) a motoric group consisting of chronically assaultive criminals; and (2) a verbal group, consisting of psychiatric patients who had a history of threatening to assault, but who had never in fact carried these threats into action. The results were consistent with the hypothesis when the Rorschach responses of the two groups were analyzed in terms of developmental level, using an index of integrative perceptual activity,

and in terms of displacement to the ideational sphere, using the M score.

Some studies whose primary concern was with the differentiation between the motoric and the conceptual approach to problem-solving could also be considered to be concerned with response delay.

Rosenthal (1954), working with the experience-balance, tested the hypothesis that movement responses reflect a tendency to emphasize mental activity whereas color responses reflect a tendency to emphasize motor activity. Performance on a modified version of the Katona Match Stick Tasks was used as the criterion measure. It was found that the reaction time for the M group was significantly longer than the reaction time for the C group, and that the M group made significantly fewer moves than did the C group. The two groups were demonstrated not to differ in ability on the Katona Match Stick Tasks since the number of correct solutions achieved by them did not differ significantly.

Rosenblum (1955) hypothesized that perceptual preference for form reflected a tendency to emphasize a conceptual, cognitive mode of approach; whereas a preference for color reflected a tendency to emphasize a manipulative, conative mode of approach. Based on this hypothesis, he predicted that individuals who prefer form perception would perform more efficiently than color

perceivers in solving problems which were constructed in such a manner as to emphasize conceptual reasoning rather than manipulative, trial and error methods. Preference for form vs. color was determined by the Thurstone-Schmidt color-form ratio test. A modified form of the Grace Arthur Stencil Design test was employed as the measure of efficiency in problem solving. In the altered version, the subjects were prevented from handling the stencils, and were thus forced toward a conceptual determination of the stencil combination needed to achieve a correct solution. When the problem-solving task was administered under these restrictions, efficiency scores on it showed a significant positive correlation with Form per cent on the Thurstone-Schmidt. That form and color perceptual groups did not differ in problem-solving efficiency when each was permitted its preferred mode of approach, was shown by a supplementary study.

Both Rosenthal and Rosenblum demonstrated that people who are responsive primarily to the color of a stimulus prefer a motoric approach in problem-solving. It is possible to maintain that the motoric approach to problem-solving is a special case of a more general tendency to arrive at decisions without sufficient forethought. The motorically oriented individual views each of his moves as a step in the right direction. Unfortunately, often this is a step taken prematurely, so that

soon he has to make another motor move, often as not again premature. If motoric moves are thus seen as specific manifestations of underlying premature decisions, the relevance of the studies conducted by Rosenthal and Rosenblum to the concept of response delay becomes readily apparent.

Verrill (1958) attempted to differentiate impulsive people from the non-impulsive by using the Rorschach, the Porteus Maze, the Insight Test, the IM Test, and Murray's Impulsion-Deliberation Questionnaire. The criterion measures used for impulsivity were quickness of verbal response, and inappropriateness of verbal response as rated by five judges on a scale specially prepared for the purpose. Of the 31 measures derived from the various tests, 23 differentiated the "impulsive" and "deliberate" groups at the .05 or better level of confidence. Of the eight Rorschach factors which significantly differentiated the groups, four involved the use of color responses.

Harrington (1953) studied the relationship of color responses on the Rorschach to impairment of performance under conditions of frustration. He predicted that interference with the goal-directed behavior of the subjects would result in greater impairment of performance for the C+CF group as compared to the FC group. The prediction was confirmed by the results.

An earlier study by Williams (1947) was the pioneer in the field. It was designed to investigate the predictive value of F+% and form-color integration on the Rorschach as indices of control. He administered the Rorschach to 25 subjects, and had them practice the Digit Symbol subtest of the Wechsler-Bellevue Scale, establishing a basal performance level under optimal conditions. The final step consisted in performance on the Digit Symbol test under stressful conditions, such as physical discomfort, noise, disapproval, etc. The decrement in performance was successfully predicted on the basis of F+% and form-color integration.

Clark (1948) related the color responses on the Rorschach to the scores on the MMPI scales. He found that CF responses were related to impulsiveness and lack of social consciousness, while Sum C was related to hypomanic trends and overconfidence.

Baker and Harris (1949) studied the FC : CF ratio and F+% on the Rorschach as indices of control. They produced stress by laboratory methods and measured loss of control in terms of loss of coordination in speech as indicated by word intelligibility and intensity variation. A correlation coefficient of .45 was found for FC : CF and one of .41 for F+%.

Holtzman (1950) correlated the ratios CF : FC

and $(CF+cF+2C) : (FC+Fc)$ with pooled ratings of impulsiveness made by residence-mates of the subject. Taken separately, both the ratios showed negligible correlations with the criterion. However, when a score was assigned on the basis of a number of different aspects of the protocol, a significant correlation was obtained.

Gardner (1951) also investigated hypotheses referring to impulsivity, checking Rorschach factors against ratings by psychologically trained raters. He was able to obtain significant positive relationships.

Smith and George (1951) investigated $M : FM$ and $F\%$ as indices of control, using as a criterion the decrement in performance on digit symbol and information tests when the tests were repeated after severe criticism of the previous performance. While a significant non-linear relationship was found between $F\%$ and the criterion, the correlation of $M : FM$ with the criterion was not significant.

Genetic Studies of Color and Response Delay

While the experimental studies given above have touched upon the concept of response delay in a rather direct manner, the genetic studies given below are only indirectly linked with delay of response. As it has been observed that with increase in age the ability to delay response increases and the reaction to color decreases,

an inverse relationship between the two is considered likely. Rabin and Beck (1950) compared the Rorschach color responses of 131 children of various ages and concluded: "A constant decline in the use of pure color as a determinant is readily evident. . . This representation of primitive affect shows a drop in its frequency of occurrence from childhood to adolescence. The CF factor, with some fluctuations, shows a similar drop" (p. 597). Other investigators, among them Klopfer & Margulies (1941), Ford (1946), Ames, Learned, & Walker (1952), have also found that in the Rorschach records of very young children, pure C responses tend to predominate; in somewhat older children CF responses occupy a more important role and the pure C responses drop out rapidly; and at a still later age FC responses play an increasing part.

Decrease in color reaction with increase in age has also been observed by use of instruments other than the Rorschach. Rickers-Ovsiankina (1943) reviewed a number of investigations done by means of "the matching experiment." This usually consisted of presenting the subject with two objects differing from a third one in either form or color. The third object was to be placed with the one "just like it." It was the common finding of all the studies reviewed by her that younger children match the objects more often on the basis of color as compared to older children.

Lindberg (1938) found that the tendency to give color responses on his ring test decreases with age. In the ring test, the subject is shown two geometrical figures differing in color, and also in many aspects of form and position. The subject is asked to describe the differences. If he mentions the color difference on the first or second response, he is regarded as having a "color attitude." Lindberg (1938) and also Eysenck (1947) quote many papers demonstrating the decrease of color reactions with increasing age in children. Brian and Goodenough (1929) used 474 subjects from two years to adulthood, and asked them to match a series of geometrical figures of different colors so arranged that either form or color might be matched but never both simultaneously. Their over-all finding was that matching on the basis of form increases with age. Blum and Dragowitz (1947), in studying the developmental aspects of fingerpainting, further confirmed that interest in and use of color decreases with increase in age of the child.

Thus, it is the common finding of Rorschach studies as well as experiments utilizing the color-form tests that the use of color decreases as the child grows older. However, only a few of the investigators have found the various color measures as equivalent in estimating the use of color by a subject. Conflicting findings

have been reported particularly regarding the use of color on the Rorschach and its relationship to the use of color on other perceptual tasks.

Color-Form Tests and the Rorschach

Oeser (1932) acquainted his subjects first with a colored geometric figure. Then he presented them tachistoscopically with eight figures of various forms and colors arranged in a circle, the color and the form of the initial figure being now split between two of the eight figures. He found that subjects who tended to match the figures by color in the tachistoscopic experiment gave CF and C responses on the Rorschach, whereas subjects who matched the figures on the basis of form, gave either no color responses to the Rorschach, or gave only the FC type response. Although Oeser reported a correlation between color types as determined by the tachistoscopic test and Rorschach color responses, Vernon (1933), in summarizing the results of a number of such experiments, concluded that there is not an identity of tachistoscopic form and color measures with the Rorschach scores. He gave three color-form tests to a group of 100 neurotic subjects and found an average correlation of only .24 between the tests. This led him to hypothesize that either these tests were all measuring specific attitudes and abilities, or there was a general factor of reaction to

color running through all these tests and that the particular ones used were rather poor measures of it. Thurstone (1944) found even lower correlations between tests of color and form. Although interested more in the general problem of perception than in color-form attitudes as such, Thurstone did include a few such tests in his larger perceptual test battery.

Clarke (1950) gave Lindberg's Ring Test (Lindberg, 1938) and a color-form sorting test to 49 neurotic and 65 normal subjects. He found no significant correlation between the tests and concluded that the tests were measuring specific attitudes. Eysenck (1947) found that the average correlation between color-form tests is of the order of .20. This led him to conclude that, except in the eventuality of isolating a factor of color-form attitudes, reactions to color-form tests were relatively specific to each test. Keehn (1953a; 1953b; 1955) has pursued the line of work suggested by Eysenck and Clarke. His findings are important for consideration. In order to discover whether or not reaction to color in general does have some correlate in the field of personality, he adopted an approach which he described as internal validation. This involved administering a number of tests involving color as a scorable item and correlating the resultant test scores. Unless significant correlations

were obtained between such tests, color reactivity could not be regarded as having any personality correlate, for if a particular personality attribute were associated with high reaction to color, then this reaction would have to occur on all tests involving color reaction as a scorable response. By a factor analysis of the intercorrelation matrix obtained from a number of color-form tests given to a large group of subjects, he was able to extract a color-form factor. However, the average r between the tests was only .28, showing that results based on different single tests were hardly comparable. Moreover, it was found that the color scores on the Rorschach had no saturation on the color-form factor extracted from the various color-form tests.

However, more recently, Bell (1956), using a fairly refined technique of color-form matching, was able to demonstrate its relationship to color responses on the Rorschach. The correlation between the number of Rorschach color responses and the number of color matchings was positive, of the order of .40, and significant at the one per cent level.

Though the degree of correlation between the Rorschach color scores and the use of color on other perceptual tasks has been disputed and the experimental evidence in this respect is conflicting, the interpretation of color on the Rorschach has given great impetus to

research in the area of personality functioning. Even those studies which used some other perceptual task to estimate the reaction to color have generally derived the rationale for the research hypothesis from interpretation of color on the Rorschach.

Regarding the interpretation of this factor, there seems to be a fair degree of consistency among the Rorschach experts. Hermann Rorschach (1942) considered the pure color response (C) to be "the representative of impulsiveness" (p. 31); and with regard to form-color and color-form responses, he observed: "The greater the preponderance of FCs over CFs the more stable is the affect and the greater is the adaptability and the capacity for the formation of rapport. The closer the number of CFs comes to the number of FCs, the greater the moodiness, instability and egocentricity of the subject" (p. 34). Klopfer (1954) states: "The relationship of FC to CF is an important indicator of control, in this case control over overt expression of emotionality. Preponderance of CF over FC indicates that emotional reactions tend to be expressed in an uncontrolled fashion" (p. 279). Beck (1949b) writes: "The undiluted color reaction, C, is the test's equivalent of the uninhibited feeling experience. . . .The CF or color-form response is characteristic of a less impulsive but still highly labile reactivity.

Developmentally it marks a phase above that represented by C" (Pp. 27-28).

While Rorschach, Klopfer, and Beck, all seem to agree on the interpretation of color response, it has not always been easy to provide adequate experimental checks to the interpretation of this and other Rorschach factors, partly because of a methodological difficulty.

An Approach to Rorschach Validation: Study of the Single Variable

A major methodological question is often raised by clinicians in criticism of the single variable validation studies of the Rorschach. Sargent (1945) states: ". . . factors taken out of context have little meaning, for the reason that it is not the absolute amount of one determinant but its relation to the whole pattern which gives its significance in the individual protocol" (p. 275). It is argued that since the Rorschach test deals with a number of interrelated variables and its interpretation involves description of a dynamic pattern of interdependent functions, one could not legitimately subject to experimental test a single Rorschach hypothesis independent of the configuration in which it appears. According to Schafer (1949), ". . . the psychological significance of any one score depends on the context of scores and verbalizations in which it occurs" (p. 207).

Ainsworth (1954) states in this connection:

The fact that interpretative hypotheses are modified by the context of the configuration in which they appear presents a difficult dilemma in planning validation research. On the one hand it may be argued that if the discrete hypotheses cannot be shown to have some valid basis, a judgment based on the integration of these hypotheses can scarcely be valid. On the other hand, it seems equally justifiable to insist that validation research is irrelevant unless it tests out the hypotheses as they are actually used in practice. There is probably no simple or single solution to this problem (p. 413).

Beck (1942) considers it necessary to subject separate Rorschach factors to experimental tests in order to "solidify the scientific foundations of the test" (p. 103). He resolves the dilemma of validation research as follows:

Insofar as the individual test factors are judged in accordance with stable frames of reference, quantitatively established, it [the Rorschach] is or can be a quantitatively founded method. As these factors organize into the whole personality, we are dealing with another phenomenon, in another plane, one having its own laws and forming a new level of operations. The individual Rorschach test factors do make possible an analysis on the basis of quantitative identification without destroying the personality. (p. 91).

It would appear that there is a need for both kinds of validation research. Since the nature of the Rorschach appraisal is holistic and the meaning of a score, in actual clinical practice, does depend to some extent on the entire response pattern, it may sometimes

be preferable to validate a larger unit, such as an interpretation based on a configuration of scores. On the other hand, in some cases it may be possible to isolate a variable for independent research without distorting its meaning. When this can be accomplished, it helps to correct, refine, and extend the interpretation of individual factors. Refinement of component parts, in turn, leads to better over-all judgments.

Present Status of Rorschach Validation

There is considerable difference of opinion regarding the over-all status of the Rorschach validation research. The following excerpts from 1956 and 1958 volumes of the Annual Review of Psychology represent one extreme.

Cronbach (1956) writes:

. . .it is not demonstrated that the test is precise enough or invariant enough for clinical decisions. The test has repeatedly failed as a predictor of practical criteria. . .there is nothing in the literature to encourage reliance on Rorschach interpretations. . .(p. 184).

Jenson (1958) states:

. . .in the writer's judgment, the standard projective techniques have been a failure methodologically and substantively in personality research. . .The Rorschach in particular has been worthless as a research instrument. Though claiming for decades to be the method par excellence for studying personality, the Rorschach Method has nothing to show for

its applications in the personality field. After more than thirty years of research the vast bulk of Rorschach studies are still attempting to demonstrate some kind of validity of this test (p. 296).

Referring to the above-mentioned indictments, Hertz (1959) agrees that as yet, in our attempts to validate the Rorschach method, "results have been for the most part negative" (p. 34). In this article, written almost forty years after Rorschach's publication, she compares the present status of Rorschach validation with that described in her earlier reviews (Hertz 1942; Hertz 1952)--written twenty years and thirty years respectively after Rorschach's original contribution--and she concludes that the same difficulties and conditions prevail in research today as did then. She, however, does not share the pessimism of Cronbach or Jensen, and is unwilling to believe that "the Rorschach Method is invalid because its validity has not yet been established" (Hertz 1959, p. 34). It is her feeling that ". . .shortcomings of our procedure and the inadequacy of the clinicians using the method prevent fulfillment of what we most desire,--establishing the validity of the Rorschach method" (p. 46).

Though most clinicians find the Rorschach an extremely useful technique in their work, not many of its interpretive hypotheses have been subjected to rigorous

experimental tests. While some of the experimental studies have been successful in prediction from test performance to other areas of behavior, the results of other experimental studies have been challenged. For instance, Eriksen and Lazarus (1952), following Williams (1947), attempted to predict performance under stress from a number of personality measures including the Rorschach. Subjects were given the Digit Symbol subtest of the Wechsler and the Group Rorschach Test. The Digit Symbol test was readministered, but this time the subjects were informed that they had failed in the first testing. The decrement in performance in the failure-stress situation was not related to any of the Rorschach variables. Commenting about the earlier study by Williams (1947), they stated: "The discrepancy between our study and Williams' study might be accounted for in terms of sampling variability. . .or difference in the type of stress situation" (p. 283). Carlson and Lazarus (1953) undertook to repeat Williams' study, this time paying careful attention to every essential detail. Again, however, they found no relationship between the Rorschach measures and decrement in performance under stress.

It is hard to decide whether faults are inherent in the Rorschach technique itself or whether it is the ineptness of the researchers and their procedures that is responsible for the difficulty in establishing the

validity of the Rorschach test. But the fact remains that some of the basic assumptions of the Rorschach method have not yet been adequately supported. McFarlane and Tuddenham (1951) listed the following three:

1. . . .a protocol is a sufficiently extensive sampling of the subject's personality to warrant formulating judgments about it.
2. . . .the psychological determinants of each and every response are basic and general. . .
3. . . .projective tests tap the durable essence of personality equally in different individuals. . . (p. 34).

It was in the background of such uncertainty in the field of Rorschach validation that the present study was planned.

Derivation of the Hypothesis

The hypothesis of the present study is consistent with the color-response interpretations provided by Rorschach, Klopfer, and Beck, and could probably be derived from them. However, the investigator has preferred to set this hypothesis in the framework provided by Rapaport (1946). Unlike others, Rapaport is not content merely to point out an empirical relationship between certain kinds of color responses and impulsivity, but attempts to state a rationale for such a relationship. He considers the psychological functions which might be

involved in various kinds of color responses. These psychological functions are in turn embeded in the framework of psychoanalytic ego psychology, more specifically, psychoanalytic theory of thinking.

Rapaport states that the process of responding to the unstructured inkblots begins with vague perceptual experiences, which then set off associative processes. An association process takes as its starting point some salient feature of the vague perceptual impression of an inkblot, and mobilizes such memory material as shows some congruence with the percept. The associative process terminates when it arrives at an idea whose corresponding image is sufficiently congruous with the perceptual impression of the inkblot (Rapaport, 1946, Pp. 92-93).

According to Rapaport, the pure color response (C) comes about when there is a "short-circuiting" of the associative process so that it does not reach any definite content, and instead produces as a response a content which shows only a very slight conceptual distance from the concrete color impression. Thus, the pure color responses represent an absence of the delay which would have allowed for a further development of associations and their integration with other qualities of the blot. The color-form response (CF) comes about when there has been more delay possible than that found for the pure color responses. Yet the form aspects of the area chosen are

barely integrated with the color-impressions in the course of the associative process. The weakness of the form element in the color-form (CF) response indicates the insufficiency of whatever delay is achieved, and gives this response an impulsive character--though a complete abandonment of control or delay, as in the pure C response, is not indicated. The form-color response (FC) requires the greatest delay of all the color responses, as it represents a successful integration of the form and color impressions (Rapaport, 1946, Pp. 235-242).

Thus, for Rapaport, the FC response indicates that the subject's actions are smoothly controlled, the CF response stands for poorly controlled impulses and for a general minimization of delay or constraint in action, while the C response represents the extreme of impulsivity and an abandonment of all control (Rapaport, 1946, Pp. 241-242).

If delay of response is the crucial variable differentiating between the various modes of handling color mentioned above, we should expect that people who are characterized by delay of response in problem-solving would tend to give FC responses rather than CF & C, while those who fail to exercise response delay would tend to give CF & C rather than FC.

On first impression one tends to translate the concept of delay of response into a simple measure of

reaction time, forgetting that efficient people are usually both accurate and fast on most problem-solving tasks. The mere fact that an individual reacts faster than others does not mean that he has failed to delay his response. If he is correct in his answer, it means he has exercised all the delay that is necessary for him. The concept of delay of response necessarily involves considering the accuracy of response along with the speed of response. Therefore, the hypothesis of the present study, concerned with the concept of delay of response, would make simultaneous use of two measures: (a) speed of response, and (b) accuracy.

The Research Hypothesis. The study is designed to test the hypothesis that people characterized by inability to delay response on a problem-solving task would, on a perceptual task like the Rorschach, be less capable of integrating the color of a stimulus with its form properties, as compared to those who are characterized by delay of response.

III. PROCEDURE

Testing of the research hypothesis required the identification of people characterized by delay of response and those characterized by inability to delay response. Since delay of response for the purposes of this study was defined in terms of speed of response and accuracy of response, a problem-solving task was needed which could act as a measure of both. An essential requirement of this problem-solving task was that the speed of response to it could make an appreciable difference in the accuracy of response, so as to differentiate people who respond quickly and make errors from those who are able to delay their response and make fewer errors. Since none of the available problem-solving tasks was judged to be suitable for this purpose, the present investigator devised one.

It was necessary to administer the problem-solving task to a relatively homogeneous and large group of people under two different conditions: first, when speed of response was experimentally controlled; second, when ample time was provided and the subjects were encouraged to take as much or as little time as they liked. Differential increase in accuracy on the second administration was then expected to be at least partly a

function of different amounts of time spent. The subjects taking more time and showing greater improvement in accuracy would provide the response delay group, and those taking less time and showing lesser improvement in accuracy, the opposite group, failing to delay response.

The next step after identifying the two groups was to find a suitable perceptual task which could permit different degrees of color-form integration and thus serve as a measure of the dependent variable. The FC, CF and C scores on the Rorschach have generally served as measures of color-form integration. While this test was considered suitable for the purpose, certain modifications in its administration were deemed necessary in order to increase the number of color responses per individual and thus provide a better comparison of people on their ability to achieve color-form integration. Therefore, a modified form of the Rorschach was used as the perceptual task.

Given below is a description of the problem-solving task and the perceptual task, followed by a detailed description of procedures adopted in this investigation.

Problem-Solving Task

The problem-solving task devised by the investigator is called the Mirror Task. This task consists of

25 figures, mostly of geometric or alphabet-like shape, which have to be recognized in the form they would appear in a mirror placed at the top edge of the figure. Each of the problem figures is presented along with four similar figures, one of which correctly represents the mirror image of the problem figure.

The principle involved in the solution of these problems is a fairly simple one: while the image of a figure in a mirror is reversed in vertical (up-down) dimension, there is no change in horizontal (left-right) dimension. However, this principle is somewhat difficult to apply in the case of complex figures and a correct solution often requires some delay of response. As the task provides fairly novel problem-solving situations and most people lack previous training or experience in similar problem situations, a subject is generally left in a state of uncertainty with regard to the correctness of his answers. This provides a greater chance for individual differences in delay of response to emerge. Moreover, on this task, speed of response can often make an appreciable difference in accuracy of response, so that people who tend to react quickly tend to make many errors. These features of the Mirror Task rendered it particularly suitable for the purpose of this study.

The Mirror Task can be administered in two different forms. In the booklet form, the problem figures as well as alternative answers for each problem are given in a booklet. In the screen form, the problem figure is

projected on a screen with only the answers contained in a booklet. The screen form of administration makes it possible to exercise experimental control over speed of response, as the exposure time of each problem on the screen can be regulated by the experimenter.

A copy of the Mirror Task is included in Appendix D.

Perceptual Task

A modified form of the Rorschach test was used. The FC, CF and C scores on the Rorschach have generally served as measures of color-form integration, but as traditionally administered, the test yields, in the average normal adult, only two to four color responses. Comparing individuals with regard to the relative weight of FC vs. CF and C with these few responses is difficult, and a single chance error in inquiry or in scoring can be crucial. This is particularly so in a study employing only a limited number of subjects. For this study, therefore, the Rorschach administration was modified in such a way as to increase the number of color responses per individual.

Fifteen chromatic D locations on the Rorschach were found, on the basis of a preliminary study, to be fruitful in eliciting FC as well as CF and C responses. These 15 locations constituted the perceptual task of this study. In the administration of the task, each card

was covered by a white cardboard so as to expose only the selected location.

The task was administered twice in order to increase the number of responses per subject; after the first administration of all 15 locations, the subject was asked to go over the cards again and see something other than the original percept. Of the total 30 responses per subject, it was found, on the basis of preliminary study, that about one-third were color-determined.

The scoring method used by Rapaport (1946) for the Rorschach was adopted for scoring color responses on the task. Rapaport describes the basic kinds of color response to the Rorschach as follows:

those in which the color impression is the sole determinant ("blood, because it is red"); those in which the color plays the predominant role, but where some form elements are also involved ("flames: the color of flame and these tongue-like projections"); and those in which the color contributes to the response but is contained within a definitive form response, and is only of equal or subordinate significance to the form determinant ("tomato worm: shaped like a worm and it is green") (Pp. 224-225).

An attempt was made to follow Rapaport's scoring method as closely as possible. When a case was not adequately covered by Rapaport's statement of the scoring method, reference was made to Beck's method of scoring rather than to that of Klopfer (1954), who in

scoring the color response brings in considerations of definiteness and indefiniteness of form. Beck (1949a) gives the following rules for scoring of the color response:

(1) Where S's spontaneous expression, more especially if it is in the free association, gives us a lead, that lead is followed: e.g., S may himself tell us that D13 in figure X is 'an autumn leaf', because it is 'brown', and also because of its 'shape' (CF). Or he may eliminate color or shape in so many words. In other instances the indication is not so clear, but dependable-- e.g., because of priority he gives to the one or the other factor, or the amount of his language about one or the other. (2) The material listed in the inquiry fills in what S's free association language has left blank. (3) Experience is consistent and clear in regard to some responses. The blood of figure II and III is always color, more commonly C than CF. The hair bow of D3 in figure III is rarely a color reaction; when it is, it is FC. The occasional butterfly of D2 in figure VIII has color in it, but is as frequently CF as FC.

These lines of evidence sometimes controvert one another. When this happens, I have usually (not always) weighted them in the order stated: free association is more dependable than the inquiry, and the inquiry is more reliable than the accumulated knowledge concerning these same responses (p. 114).

Administration of the Problem-Solving Task

The problem-solving task was administered to a number of Introductory Psychology classes, from six different colleges in the Baltimore-Washington, D.C. area, providing a total of 305 students. The education level

ranged from freshman to junior; the age, from 19 to 23 years. A large majority of these students, 74%, were female.

The task was administered twice to each class in a group session under two different conditions: first, when the speed of response was controlled and the variability in response time was kept minimal; second, when ample time was allowed and specific instructions were given to take as much or as little time as desired.

In the first administration, each subject was provided with a booklet, which did not contain the problem figure itself but only the alternative answers for each problem. The problem figures were projected on a screen for 12 seconds each with no lapse of time between, and the subjects were asked to check the appropriate answer within this brief time. The exposure time of 12 seconds for each item was determined by some preliminary work done with a group of similar subjects. Determination of exposure time and the process of item selection yielded the desired percentage of correct answers -- between 40% and 50%. At the same time, the screen exposure of each item was judged sufficiently brief to keep the variability in response time minimal among the subjects.

With a 12-second exposure per item, the first part of this session with a 25-item problem-solving task took only 5 minutes. In the second part, new booklets

were distributed which contained the problem figure as well as the alternative answers for each problem. The subjects were instructed: "This time you have the same 25 problems which you did before, with the difference that the problem figure is given in the booklet itself and will not be projected on the screen. You have as much as 30 minutes to do these 25 problems. Within this time limit, you can take as much or as little time as you like, but answer each problem as you go along, without skipping any, and once you have turned the page, do not turn back. When you are through with the last problem, raise your hand to let me know that you are finished, and then place all your testing material under your seat. At this point you can leave the room if you like, but do so quietly so as not to disturb the others."

The investigator held a seating plan which marked the exact position of each student in the class. As soon as a student raised his hand, the time taken by him to complete the second part of the testing was recorded on the plan. The size of each group was limited to 25 subjects or less to make possible accurate recording of time.

Thus, while the first administration yielded an accuracy score per subject under conditions of controlled speed of response, the second administration

provided an accuracy score increment or decrement as well as a differential response time under free conditions of time.

Selection of the Experimental Subjects

When the results of all the student classes in group session were available, subjects for further experimental work were selected according to the following procedure:

1. The accuracy scores on the first administration of the problem-solving task were plotted in a frequency distribution. The individuals achieving a score in the middle 50 per cent were selected as a relatively homogeneous group for further consideration, the rest (upper and lower quartiles) being discarded at this point. Ten and 13 proved to be the cutting scores, as 10 to 13 inclusive covered the middle 50 per cent of the accuracy scores on the first administration.

2. The position of each individual in this relatively homogeneous group was plotted on a graph for the time taken and the score increase he achieved (See Fig. 1). Fifteen individuals clustering around that end of the graph which represented minimum time and least score increase were selected to constitute the experimental group manifesting lack of response delay, while 15 more individuals clustering around the other end representing maximum time and most score increase constituted

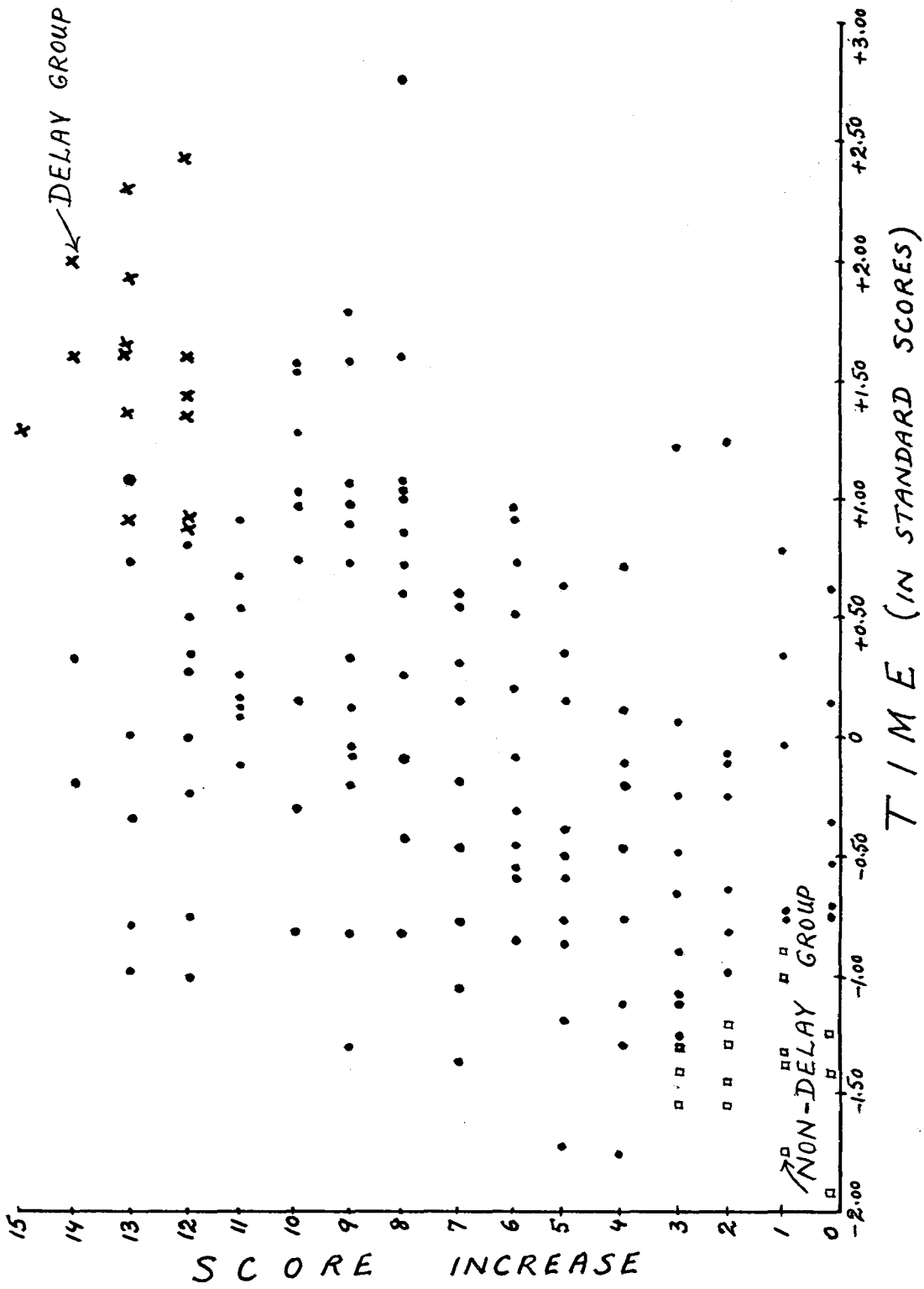


FIG. 1. TIME TAKEN AND SCORE INCREASE ACHIEVED ON SECOND ADMINISTRATION OF MIRROR TASK

the second experimental group which was able to exercise delay of response.

It will be noted that on the vertical axis of the graph (see Fig. 1) score increase is plotted in raw scores, while on the horizontal axis time is plotted in standard scores. The need to use standard scores for time arose because of the following conditions.

The initial subjects of this research were tested in 15 separate group sessions. It was seen later that the time scores of these 15 groups did not represent conditions of random sampling from a common normal population. Under the null hypothesis of equal means of all the populations represented, the value of F for time scores of these groups was found to be 3.55, which for 14 and 137 degrees of freedom was significant at .01 level. Apparently, the conditions differed to some extent from one group-testing session to another. For instance, it was felt that the time taken by a particular subject to complete his test was partly a function of the group atmosphere in which he was tested. If other members of his group were to leave early, he was under a greater stress to complete his test quickly than if most of them stayed on for a longer time. It is not possible to say at this stage what specific factors were operating to make the testing conditions unequal from one group to another, since no attempt was made to control such

factors. The matter, at this stage, is mostly one of speculation; the group atmosphere as a possible factor was mentioned only for illustrative purposes.

The use of standard instead of raw scores for time exerted a distinct effect on the selection of experimental subjects for the delay and the non-delay groups. A larger number of the 15 initial groups were able to contribute subjects to both experimental groups. The over-all correlation between score increase and time spent rose from .46 to .58, thus making the problem-solving task even more effective in the purpose for which it was originally designed, namely, that speed of response to it should make an appreciable difference in accuracy of response.

Administration of the Perceptual Task

The perceptual task was administered to the 30 experimental subjects constituting the delay and non-delay groups. The selected chromatic D locations of the Rorschach were exposed, one at a time, to the subject, and he was asked what they looked like. As soon as he gave his first response, he was presented with the next location. After the first administration of all 15 locations, the subject was asked to go over the cards once again and see something other than what he saw before.

Most subjects were able to give two different

responses for each location. In a few cases, the response on the second administration was just a precision-alternative of the response given before to that location. On the first administration, every subject was able to give a response to all 15 locations. On the second administration, however, there were a few reports of failure. In order to keep the number of responses per subject equal, and to facilitate statistical treatment of data, when this happened the color-score achieved on the first administration was assigned also to the second administration. Such experiences of failure which necessitated arbitrary assignments of score were, however, extremely rare --- constituting less than 2% of the responses.

A number of precautions were observed to check possible bias on the part of the investigator. In the first place, code numbers were assigned to the subjects, so that at the time of the perceptual task administration and scoring, the investigator did not know whether a particular subject belonged to one group or the other. Secondly, five records were picked at random for independent scoring by another psychologist. The scoring was found to be reliable: of the 150 responses scored by the other psychologist, there was disagreement in the scoring of only six responses, all involving a differentiation between FC and CF scores.

IV. RESULTS

The research hypothesis stated that people characterized by inability to delay response on a problem-solving task would, on a perceptual task like the Rorschach, be less capable of integrating the color of a stimulus with its form properties, as compared to those who are characterized by delay of response.

In the experimental procedure, outlined in the preceding chapter, speed of response and accuracy of response on a problem-solving task were presented as the measure of response delay, while FC, CF and C scores on the perceptual task represented different degrees of color-form integration. In terms of this procedure, the research hypothesis can be translated into the following statements:

1. People manifesting ability to delay response on a problem-solving task score more FCs on the perceptual task as compared to those who are characterized by inability to delay response.

2. People manifesting ability to delay response on a problem-solving task score less CFs on the perceptual task as compared to those who are characterized by inability to delay response.

3. People manifesting ability to delay response on a problem-solving task score less Cs on the perceptual task as compared to those who are characterized by inability to delay response.

All three predictions were confirmed, thus supporting the hypothesis. The following three sections describe in turn a test of each of the hypotheses given above.

FC Score

Null Hypothesis. People who are able to delay response on a problem-solving task score as many FCs in response to color areas of the Rorschach as those who are unable to delay response.

Alternative Hypothesis. People who are able to delay response on a problem-solving task score more FCs in response to color areas of the Rorschach than people who are unable to delay response.

Data. The FC scores of 15 subjects in each group are given in Appendix A.

Statistical Test. Since the scores do not seem to be drawn from normally distributed populations, a non-parametric test is indicated. The Mann-Whitney U test is chosen because this study employs two independent samples, uses small samples, and uses measurement which is at least in an ordinal scale.

Analysis and Decision. The value of U is found to be 51.5. In the table of critical values of U (Siegel 1956, p. 275) a U value of 56 or less is significant at the 1 per cent level for a one-tailed test when n_1 equals 15 and n_2 equals 15. The decision is therefore to reject the null hypothesis in favor of the alternative hypothesis. It is concluded that people who are able to delay response on a problem-solving task score more FCs on a perceptual task like the Rorschach than people who are unable to delay response.

CF Score

Null Hypothesis. People who are able to delay response on the problem-solving task score as many CFs in response to color areas of the Rorschach as those who are unable to delay response.

Alternative Hypothesis. People who are able to delay response on a problem-solving task score less CFs in response to color areas of the Rorschach than people who are unable to delay response.

Data. The CF scores of 15 subjects in each group are given in Appendix A.

Statistical Test. Since the scores do not seem to belong to normally distributed populations, a non-parametric test is indicated. The Mann-Whitney U test seems to be the most appropriate.

Analysis and Decision. The value of U is found to be 38.5. In the table of critical values of U (Siegel 1956, p. 274) a U value of 40 or less is significant at the .001 level for a one-tailed test when n_1 equals 15 and n_2 equals 15. Thus, the null hypothesis is rejected in favor of the alternative hypothesis, and it is concluded that people who are able to delay response on a problem-solving task score less CFs on a perceptual task like the Rorschach than people who are unable to delay response.

C Score

Data. The C scores of 15 subjects in each group are given in Appendix A.

Statistical Test. Since the C score does not occur in all subjects of one group and six subjects of the second group, this measure can be seen as a dichotomous one, characterized by presence or absence of C. The Fisher Exact Probability test would, therefore, seem to be the most appropriate.

Null Hypothesis. There is no difference between the delay and non-delay groups in the proportion of members who obtain a C score in response to color areas of the Rorschach.

Alternative Hypothesis. A greater proportion of people who are unable to delay response obtain a C score in response to color areas of the Rorschach than

is the case with those who are able to delay response.

Analysis and Decision. The observed frequencies appear in Table 1. It is found that the one-tailed probability of such a distribution of frequencies under the null hypothesis is .0003. The decision is therefore to reject the null hypothesis in favor of the alternative hypothesis. It is concluded that a greater proportion of people who are unable to delay response obtain a C score in response to color areas of the Rorschach than is the case with those who are able to delay response.

The Research Hypothesis

All three predictions derived from the research hypothesis have been confirmed. Thus, the results of this study support the research hypothesis, which states that people characterized by inability to delay response on a problem-solving task would, on a perceptual task like the Rorschach, be less capable of integrating the color of a stimulus with its form properties, as compared to those who are characterized by delay of response.

Supplementary Analysis of the Data

Impact of Second Administration of the Perceptual Task

As described in an earlier section of this report, the 15 Rorschach locations were administered twice to each subject in order to increase the number of responses per subject to 30. It was believed that an

TABLE 1.

Frequency of C Response in the Two Experimental Groups

	C Absent	C Present	Total
Delay Group	15	0	15
Non-delay Group	6	9	15
Total	21	9	30

increased number of responses would provide a greater chance for individual differences in color response to emerge. It would be of some interest to learn if the color scores on the second administration were any different than those on the first administration.

Complete data are given in Appendix A. The Wilcoxon Matched-Pairs Signed Ranks Test was used for FC and CF scores, while the Sign Test was used for C scores. The results are given below.

1. FC and CF Scores. FC and CF scores of the delay group on first and second administrations of the perceptual task were compared by means of the Wilcoxon Matched-Pairs Signed Ranks Test, and the value of T, in each case, was found not to be significant at the .05 level for a two-tailed test. Similarly, both the T values found by comparing the FC and CF scores of the non-delay group on first and second administrations were also non-significant.

2. C Score. As no one in the delay group received a C score, statistical comparison of C scores on first and second administrations of the perceptual task was made only for the non-delay group. By the Sign Test, value of x was found not to be significant at the .05 level for a two-tailed test.

Conclusion. The data supported the inference that the first and the second administrations sampled the same population of responses.

V. DISCUSSION

Perception and the Concept of Response Delay

The hypothesis of this research was concerned with the study of response delay--a concept derived from psychoanalytic ego psychology, more specifically, from psychoanalytic theory of thinking. It was noted that during the early phases of psychoanalytic theory important differences among people were neglected, as the study of "id" emphasized what was common to all people--the unorganized, primitive, pleasure-seeking instinctual drives. However, with the study of ego, psychoanalysis moved into the field of psychology. It was then possible to understand individual differences in behavior as resulting from an interaction between internal needs and external realities.

One product of this interaction is the development of ability to delay response. The delay is initially enforced by external realities, for when the need-satisfying object is not present, the discharge of impulse is delayed. It is only gradually, by internalization in the course of development, that the externally forced delay is turned into an ability to delay.

Rapaport (1946) employs this concept of ability to delay in his interpretation of the responses to the Rorschach. He states that the process of responding to the unstructured inkblots begins with vague perceptual experiences, which then set off associative processes. An association process takes as its starting point some salient feature of the vague perceptual impression of an inkblot, and mobilizes such memory material as shows some congruence with the percept. The associative process terminates when it arrives at an idea whose corresponding image is sufficiently congruous with the perceptual impression of the inkblot. According to Rapaport, the FC response is believed to involve an ability to delay a response until a suitable percept integrating the color of the inkblot with its form is available to the subject, while the C and CF responses fail to achieve adequate integration of the color with the form because of insufficient delay.

Theoretical attempts such as Rapaport's, which relate perceptual processes to personality variables, and thus make meaningful individual differences in perception in terms of more general principles of ego controls, are potentially capable of leading to great advances in our knowledge of human behavior. When perception is viewed in terms of ego controls, it can be a convenient wedge into

the larger problem of personality organization. Experimental attempts can be made to delineate the personality determinants of individual differences in perceiving. As a result of such experimental attempts, seemingly diverse behavior reactions will begin to assume an ordered, unified character.

In the present investigation, a relationship was demonstrated to exist between delay of response in problem-solving and color-form integration on a perceptual task. Looked at from a phenotypical point of view, this relationship shows no unity; however, seen in terms of response delay and associative processes, performance on a problem-solving task and reaction to color on a perceptual task could both be conceived as alternative manifestations of one and the same principle. It is a long step to predict from delay of response in problem-solving to color-form integration on a perceptual task. The specific formulations as well as the larger theory, which made it possible to predict and understand such a relationship, receive support from this study.

Implications for Rorschach Interpretation

The present study has been able to provide a valid experimental basis for the interpretation of FC as a measure of ability to delay response, and of CR and C as indexes of inability to delay response.

Of the three scores, only C turned out to be adequate in predicting the individual case, as this score did not occur at all in the experimental group characterized by delay of response. However, C is an infrequent score; only nine of the 15 subjects in the non-delay group gave a C response. As for FC and CF, while the differences in these scores between the two experimental groups proved to be statistically significant, some subjects in the delay group scored CF above the median, and some in the non-delay group scored FC above the median.

Caution should be observed in applying these findings directly to the Rorschach as administration of the test was greatly modified in the present study.

Implications for Rorschach Validation Research

Since this study dealt with a single variable--the color response--of the Rorschach performance, its results are relevant for the discussion of a methodological question which was raised in an earlier part of this report. The question relates to the clinician's criticism of the single-variable validation studies of the Rorschach. Typical of such criticism is the following comment by Sargent (1945): ". . . factors taken out of context have little meaning, for the reason that it is not the absolute amount of one determinant but its relation to the whole pattern which gives its significance in the individual

protocol" (p. 275).

The results of the present study support the contention that in an approach to Rorschach validation it is feasible to test one interpretive hypothesis at a time. An experimental test of a single variable would help to correct, refine, and extend its interpretation, whenever it is possible to isolate the variable without distorting its meaning. The present study supports the legitimacy of the single-variable approach in the field of Rorschach validation. This approach aims at systematic refinement of hypotheses for separate Rorschach factors, by formulating precise behavioral predictions from each hypothesis and then checking them against adequate criteria. Such refinement in the interpretation of component parts of Rorschach performance would, in turn, lead to better over-all judgments.

Relationship to Findings of Other Studies

Rosenthal (1954) demonstrated that color responses (on the Rorschach) reflect a tendency to emphasize motor activity rather than mental activity. Rosenblum (1955) made a successful prediction from the hypothesis that preference for color (on the Thurstone-Schmidt) reflected a tendency to emphasize a manipulative, conative mode of approach to problem-solving, instead of a conceptual, cognitive one.

The question arises, What is the relationship of the above findings to those of the present study, which demonstrates that color response is associated with inability to delay response.

It seems possible to maintain that each motor move of color responsive people represents a premature decision on their part, so that a motoric approach to problem-solving turns out to be a specific case of the inability to delay response. If this interpretation is correct, the present study could be seen as enlarging upon the findings of Rosenthal and Rosenblum.

There is also a group of studies which related color response to loss of control under stress. Williams (1947) used form-color integration as an index of control, and successfully predicted decrement in performance on the Digit Symbol test under stressful conditions. Baker and Harris (1949) studied the FC : CF ratio as an index of control and found that CF was related to loss of coordination in speech under stress. In both studies stress was experimentally produced by laboratory methods. The present study, however, made no use of stress. In fact, the subjects were given the problem-solving booklets and asked to take as much or as little time as they desired. Thus, the present study establishes that color response is related to inability to delay response even under conditions of relatively little or no stress. It would seem that

ability to delay response represents a relatively durable and pervasive aspect of personality functioning and is demonstrable under quite neutral conditions.

F Response and Its Relation to FC, CF and C

The scope of this investigation was limited to a study of the relationship between response delay and color-form integration. As one of the central personality variables, ability to delay response is probably related to many other perceptual processes, such as those represented by F, F+, M, and W on the Rorschach. Perceptual processes represented by these scores were, of course, beyond the scope of this study.

The question arises, however, why F response could not be considered as one end of the continuum represented by FC, CF and C. It could be so considered only if F response were always an instance of color-denial or of failure to integrate form with color. In many instances, however, there has been no initial impact of color. Hence, there is some question whether F response is relevant to a hypothesis concerned with color-form integration.

Perception of Form and Bias of the Problem-Solving Task

It might be objected that the problem-solving task selected for this study involved form and spatial considerations similar to those involved in the FC response on the Rorschach. The question of the possible

bias of the criterion measure in favor of one of the two experimental groups can be resolved to some extent by the following considerations.

As described in an earlier section of the report, the problem-solving task was administered twice to the initial groups used in this research. The accuracy scores on the first administration were plotted in a frequency distribution. The individuals achieving a score in the middle 50 per cent were selected as a relatively homogeneous group for further experimental work, the rest (upper and lower quartiles) being discarded at this point. All 30 subjects of the two experimental groups came from this relatively homogeneous group, so that a large difference between the two groups in initial performance on the problem-solving task was unlikely. Nonetheless, a statistical check on the data would seem to be in order.

Data. The accuracy scores of the 15 subjects in each experimental group on the first administration of the problem-solving task are given in Appendix C.

Statistical test. Since the scores were drawn from apparently normally distributed populations, and since the measurement was in at least an interval scale, the t test would seem permissible.

Null Hypothesis. The two experimental groups do not differ in initial performance on the problem-solving task.

Alternative Hypothesis. The two groups differ in initial performance on the problem-solving task.

Analysis and Decision. The value of t is found to be 1.32 and is not significant at .05 level. The decision is, therefore, not to reject the null hypothesis of no difference between the groups.

Conclusion. The data do not give evidence to support the hypothesis that the criterion measure was biased in favor of one of the two experimental groups.

Reaction to Color on the Rorschach and Other Perceptual Tasks

It is the finding of this study that the people characterized by inability to delay response on a problem-solving task are less capable of integrating the color of an inkblot with its form properties, as compared to those who are characterized by delay of response. The question arises whether or not it is legitimate to generalize the findings beyond perceptual tasks like the Rorschach to other measures of color-form integration. In discussing this question in an earlier part of the report, the results of a number of relevant studies were quoted. While Oeser (1932) reported a correlation between color types as determined by a color-form test and Rorschach color responses, Vernon (1933), Thurstone (1944), Eysenck (1947), Clarke (1950), and Keehn (1953a; 1953b; 1955) have cautioned us against accepting the various color-form

tests as equivalent in estimating the use of color by a subject. The findings of Keehn are particularly important for consideration. By a factor analysis of the intercorrelation matrix obtained from a number of color-form tests given to a large group of subjects, he was able to extract a color-form factor. However, the average r between the tests was only .28, showing that results based on different color-form tests were hardly comparable. Moreover, it was found that the color scores on the Rorschach had no saturation on the color-form factor extracted from the various color-form tests. Thus, it would seem that in order to generalize the findings of a study beyond the particular instruments used in it to color responding in general, the investigator must use either more than one test, or at least a test most saturated on the color-form factor. Since the present study has used a single test, and one least saturated on the color-form factor, its findings are not directly applicable to measures of color response other than perceptual tasks like the Rorschach. It may be that the process of color responding is a complex phenomenon having more than one facet, so that different instruments fail to show a correlation with each other because they measure, in fact, different facets of this phenomenon.

It should be noted that much of the earlier experimental work in this field used an 'either-or' approach

to the study of color-form perception. The instruments were designed to elicit from a subject either a color response or a form response: different degrees of integration between color and form were rarely tapped by these instruments. The subjects giving a color response were described as "color types" or having a "color attitude." It may be that color types or color attitude represent an altogether different facet of color responding than that tapped by FC, CF, and C responses on the Rorschach.

VI. SUMMARY

Introduction

This study examined the relationship between delay of response in problem-solving and ability to integrate color and form on a perceptual task. It was an attempt to relate a perceptual process to a personality variable, and thus make meaningful certain individual differences in perceiving in terms of more general principles of ego controls.

Derivation of the Hypothesis

The hypothesis was derived from Rapaport (1946) who employs the concept of ability to delay in his interpretation of the responses to the Rorschach. He states that the process of responding to the inkblots begins with vague perceptual experiences, which then set off associative processes. The association process takes as its starting point some salient feature of the inkblot and terminates when it arrives at an idea sufficiently congruous with the perceptual impression. According to Rapaport, the FC response is believed to involve an ability to delay response until a suitable percept integrating the color of the inkblot with its form is available to the

subject, while the C and the CF responses fail to achieve adequate integration of the color with the form because of insufficient delay.

If delay of response is the crucial variable differentiating between the various modes of handling color on the Rorschach, we should expect that people who are characterized by delay of response in problem-solving would tend to give FC responses rather than CF & C, and those who fail to exercise delay would tend to give CF & C rather than FC.

The concept of delay of response necessarily involves considering the accuracy of response along with the speed of response. The mere fact that an individual reacts faster than others does not mean that he has failed to delay his response. If he is correct in his answer, it means he has exercised all the delay that is necessary for him. Therefore, the hypothesis of the present study made simultaneous use of two measures: speed of response and accuracy.

The research hypothesis stated that people characterized by inability to delay response on a problem-solving task would, on a perceptual task like the Rorschach, be less capable of integrating the color of a stimulus with its form properties, as compared to those who are characterized by delay of response.

Procedure

Testing of the research hypothesis required the identification of people characterized by delay of response and those characterized by inability to delay response. Since delay of response for this study was defined in terms of speed of response and accuracy of response, a problem-solving task was needed which could measure both. An essential requirement of this problem-solving task was that speed of response to it could make an appreciable difference in the accuracy of response, so as to differentiate people responding quickly and making errors from those delaying and making fewer errors. Since none of the available problem-solving tasks was judged suitable for this purpose, the present investigator devised one.

The problem-solving task was to be administered to a relatively homogeneous and large group of people under two different conditions: first, when speed of response was experimentally controlled; secondly, when ample time was provided and the subjects were encouraged to take as much or as little time as they liked. Differential increase in accuracy on the second administration was then expected to be at least partly a function of the different times spent. The subjects taking more time and showing greater improvement in accuracy would provide the response delay group, and those taking less time and showing lesser

improvement in accuracy, the opposite group, failing to delay response.

A suitable perceptual task was required which could permit different degrees of color-form integration and thus serve as a measure of the dependent variable. The FC, CF and C scores on the Rorschach have generally served as measures of color-form integration. While this test was considered suitable, certain modifications in its administration were deemed necessary in order to increase the number of color responses per individual and thus provide a better comparison of people on their ability to achieve color-form integration. Therefore, a modified form of the Rorschach was used.

Given below is a description of the problem-solving task and the perceptual task, followed by a description of the procedures adopted in this investigation.

Problem-Solving Task

The problem-solving task devised by the investigator is called the Mirror Task. This task consists of 25 figures, mostly of geometric or alphabet-like shape, which have to be recognized in the form they would appear in a mirror placed at the top edge of the figure. Each of the problem figures is presented along with four similar figures, one of which correctly represents the mirror image of the problem figure.

The principle involved in the solution of these

problems is a fairly simple one, but this principle is somewhat difficult to apply in the case of complex figures and a correct solution often requires some delay of response. As the task provides fairly novel problem-solving situations and most people lack previous training or experience in similar problem situations, a subject is generally left in a state of uncertainty with regard to the correctness of his answers. This provides a greater chance for individual differences in delay of response to emerge. Moreover, on this task, speed of response can often make an appreciable difference in accuracy of response, so that people who tend to react quickly tend to make many errors. These features of the Mirror Task render it particularly suitable for this study.

The Mirror Task can be administered in two different forms. In the booklet form, the problem figures as well as alternative answers for each problem are given in booklets. In the screen form, the problem figure is projected on a screen with only the answers contained in booklets. The screen form of administration makes it possible to exercise experimental control over speed of response, as the exposure time of each problem on the screen can be regulated by the experimenter.

Perceptual Task

The perceptual task consisted of 15 chromatic D locations on the Rorschach found, on the basis of a

preliminary study, to be fruitful in eliciting FC as well as CF and C responses. In the administration of the task, each card was covered by a white cardboard so as to expose only the selected location. This modification in the Rorschach administration was deemed necessary in order to increase the number of color responses. Two successive administrations of the 15 selected locations yielded a total of 30 responses per subject, of which on an average about one-third were color-determined.

Administration of the Problem-Solving Task

The problem-solving task was administered to a number of Introductory Psychology classes from six different colleges, providing a total of 305 students. The task was administered twice to each class in a group session. The first administration was done with problems projected on a screen so as to control speed of response. The problem figures were projected for 12 seconds each and the subjects checked the appropriate answers in booklets. The second administration used a booklet form of the task and students were allowed to finish the task in as much or as little time as they needed. The time taken by each subject in the second administration was recorded.

The first administration yielded an accuracy score per subject under conditions of controlled speed of response, while the second administration provided an

accuracy score increment or decrement as well as a differential response time under free conditions of time.

Selection of the Experimental Subjects and Administration of the Perceptual Task

When the results of all the student classes in group session were available, subjects for further experimental work were selected according to the following procedure:

1. The accuracy scores on the first administration of the problem-solving task were plotted in a frequency distribution. The individuals achieving a score in the middle 50 per cent were selected as a relatively homogeneous group for further consideration, the rest (upper and lower quartiles) being discarded at this point.

2. The position of each individual in this relatively homogeneous group was plotted on a graph for the time taken and the score increase he achieved. Fifteen individuals clustering around that end of the graph which represented minimum time and least score increase were selected to constitute the experimental group manifesting lack of response delay, while 15 more individuals clustering around the other end representing maximum time and most score increase constituted the second experimental group which was able to exercise delay of response. These 30 subjects constituting the two experimental groups were

administered the perceptual task.

Results

Color score distributions for the experimental groups were examined. A non-parametric test was indicated since the scores did not seem to be drawn from normally distributed populations. The Mann-Whitney U test was selected for the comparison of FC and CF scores because this study employed two independent samples, used small samples, and used measurement which was at least in an ordinal scale. The Fisher Exact Probability test was chosen for the analysis of C scores, since C score did not appear in all subjects of one group and six subjects of the second group, and this measure was best seen as a dichotomous one, characterized by presence or absence of C.

The experimental group able to exercise response delay scored more FCs, less CFs, and less Cs as compared to the experimental group manifesting lack of response delay. The FC difference was significant at the 1 per cent level, the CF difference at the .001 level, and the C difference at the .0003 level.

The research hypothesis was supported by the results of this study, and it was concluded that the people characterized by inability to delay response on a problem-solving task are, on a perceptual task like the Rorschach, less capable of integrating the color of a stimulus with its form properties as compared to those who are characterized by delay of response.

Discussion

1. Experimental attempts can be made to relate perceptual processes to more general principles of ego controls.

2. In the present investigation a relationship was demonstrated to exist between delay of response in problem-solving and color-form integration on a perceptual task. Looked at from a phenotypical point of view, this relationship shows no unity; however, seen in terms of response delay and associative processes, the relationship becomes meaningful, and the seemingly diverse behavior reactions assume an ordered, unified character. The specific formulations as well as the larger theory, which made it possible to predict and understand such a relationship, receive support from this study.

3. The interpretation of FC as a measure of ability to delay response and of CF and C as indexes of inability to delay response is supported, even though administration of the Rorschach was greatly modified.

4. It has been argued that since the Rorschach test deals with a number of interrelated variables and its interpretation involves description of a dynamic pattern of interdependent functions, one could not legitimately subject to experimental test a single Rorschach hypothesis independent of the configuration in which it appears. The

results of the present study support the contention that in an approach to Rorschach validation it is feasible to test one interpretive hypothesis at a time.

5. Previous experimental studies have demonstrated that color responses reflect a tendency to emphasize a motoric approach to problem-solving, instead of a conceptual, cognitive one. In the light of the present findings, the motoric approach to problem-solving could be seen as a specific case of the inability to delay response, where each motor move of color responsive people represents a premature decision on their part.

6. Some other studies have related color response to loss of control under stressful experimental conditions. The present study did not make use of stress and, thus, established that color response is related to lack of response delay even under conditions where stress is absent. It would seem that ability to delay response represents a relatively durable and pervasive aspect of personality functioning and is demonstrable under neutral conditions.

APPENDICES

- A. Color scores of the two experimental groups on the perceptual task
- B. Locations used in administration of the perceptual task
- C. Accuracy scores of experimental subjects on the Mirror Task
- D. A copy of the Mirror Task

APPENDIX A.

COLOR SCORES OF THE TWO EXPERIMENTAL GROUPS ON THE PERCEPTUAL TASK

Delay Group

Non-Delay Group

Sub. Code No.	1st Adm.			2nd Adm.			Total			Sub. Code No.	1st Adm.			2nd Adm.			Total		
	FC	CF	C	FC	CF	C	FC	CF	C		FC	CF	C	FC	CF	C	FC	CF	C
44	2	0	0	3	1	0	5	1	0	68	2	3	0	2	4	1	4	7	1
250	5	2	0	5	2	0	10	4	0	269	3	3	0	1	3	0	4	6	0
111	4	2	0	1	3	0	5	5	0	142	3	5	0	2	7	0	5	12	0
277	6	0	0	3	2	0	9	2	0	150	1	2	2	2	7	1	3	9	3
2	3	3	0	1	5	0	4	8	0	26	2	4	0	4	3	1	6	7	1
204	5	2	0	3	7	0	8	9	0	261	2	2	0	2	6	0	4	8	0
180	4	2	0	5	1	0	9	3	0	194	5	4	0	2	6	0	7	10	0
127	5	1	0	5	1	0	10	2	0	244	3	6	0	5	3	1	8	9	1
173	2	3	0	5	1	0	7	4	0	136	3	5	3	3	4	0	6	9	3
23	7	3	0	2	2	0	9	5	0	76	4	2	0	0	2	0	4	4	0
112	3	1	0	0	0	0	3	1	0	9	3	2	1	2	1	0	5	3	1
235	6	4	0	5	2	0	11	6	0	294	3	3	0	0	4	2	3	7	2
290	2	1	0	3	2	0	5	3	0	107	3	1	1	0	3	0	3	4	1
96	2	2	0	3	1	0	5	3	0	54	3	1	1	3	3	1	6	4	2
165	5	1	0	1	1	0	6	2	0	115	2	4	0	1	5	0	3	9	0

APPENDIX B.

Locations Used in Administration of Perceptual Task

<u>No.</u>	<u>Card</u>	<u>Location</u>
#1	II	upper red
#2	II	lower red: 'butterfly'
#3	III	upper lateral red: 'monkey'
#4	VIII	lower orange-pink: 'butterfly'
#5	VIII	middle blue: 'flags'
#6	IX	upper orange: 'witch'
#7	IX	middle section of lower pink
#8	IX	lateral green
#9	IX	upper Ds: 'vase'
#10	X	large pink detail
#11	X	lateral blue: 'spider'
#12	X	outer corner brown at bottom: 'fall leaf'
#13	X	upper green: 'fish' or 'cow'
#14	X	inner yellow: 'dog'
#15	X	bottom green: 'caterpillar'

APPENDIX C.

ACCURACY SCORES OF EXPERIMENTAL SUBJECTS
ON THE MIRROR TASK

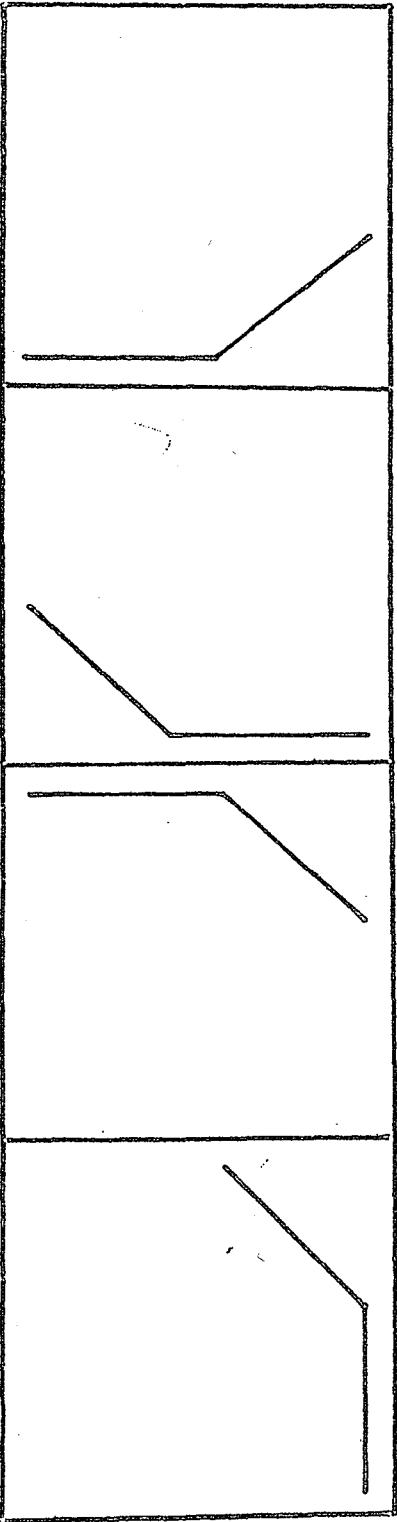
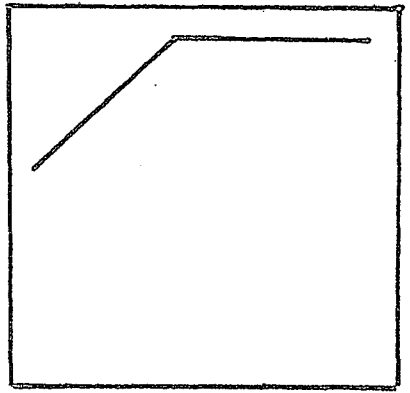
Delay Group				Non-Delay Group			
Sub. Code No.	1st. Adm.	2nd. Adm.	Score In- crease	Sub. Code No.	1st. Adm.	2nd. Adm.	Score In- crease
44	11	24	13	68	10	12	2
250	10	24	14	269	12	12	0
111	11	24	13	142	10	13	3
277	12	24	12	150	11	13	2
2	11	23	12	26.	11	11	0
204	10	23	13	261	10	12	2
180	12	24	12	194	12	14	1
127	12	24	12	244	11	14	3
173	11	23	12	136	12	13	1
23	11	24	13	76	10	12	2
112	10	22	12	9	10	13	3
235	10	25	15+	294	12	13	1
290	10	24	14	107	13	14	1
96	12	25	13+	54	13	12	0-
165	11	24	13	115	13	14	1

APPENDIX D.

A COPY OF

THE MIRROR TASK

MIRROR TASK BOOKLET: PART I

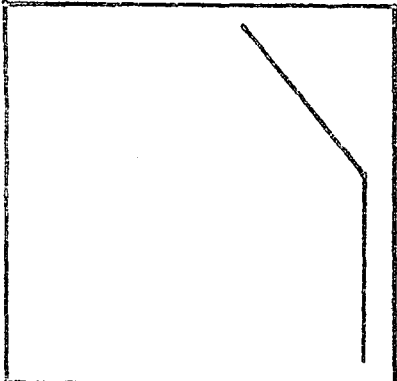


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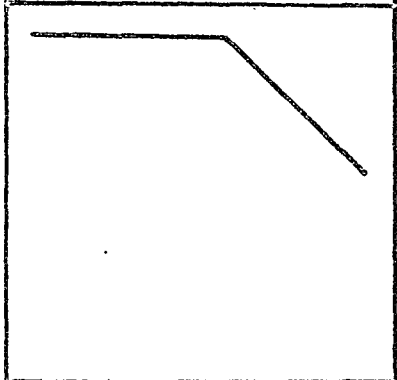
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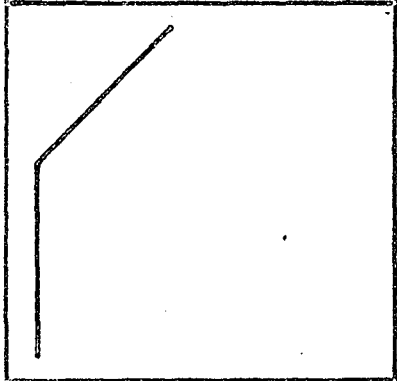
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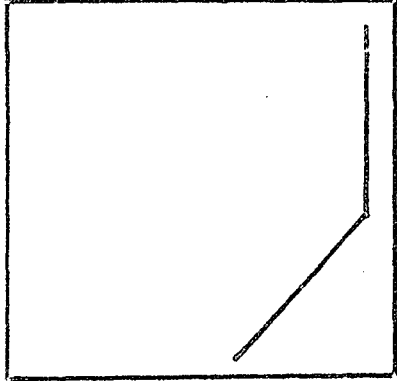
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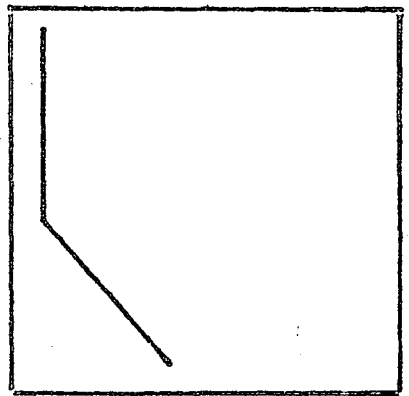
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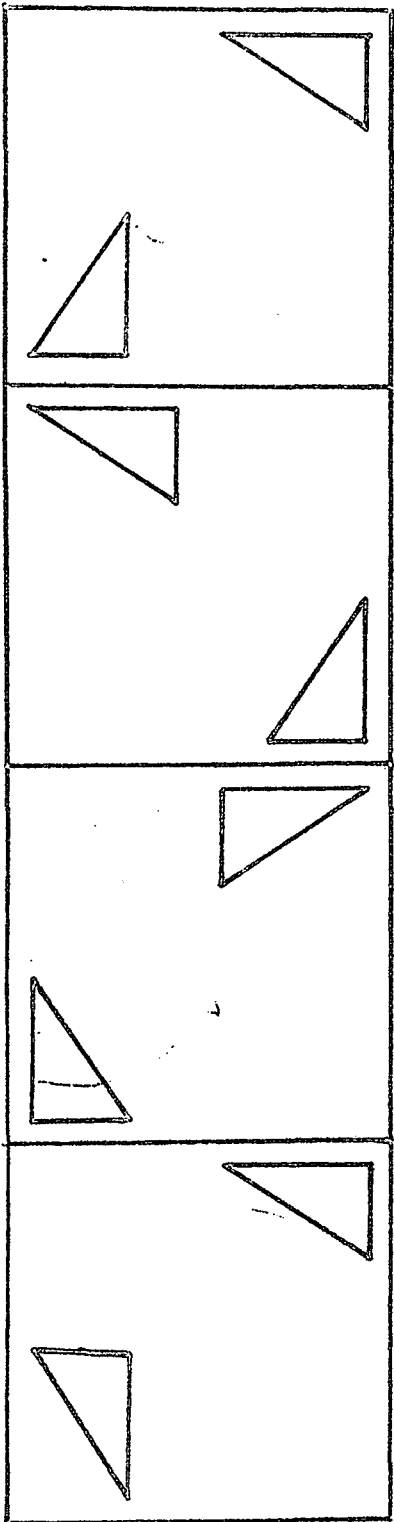


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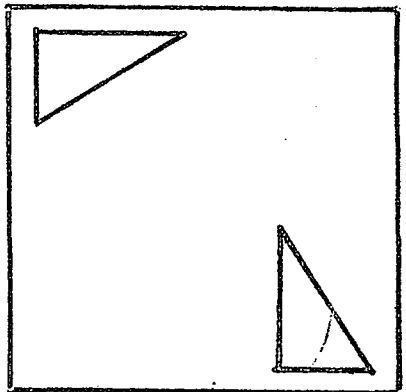
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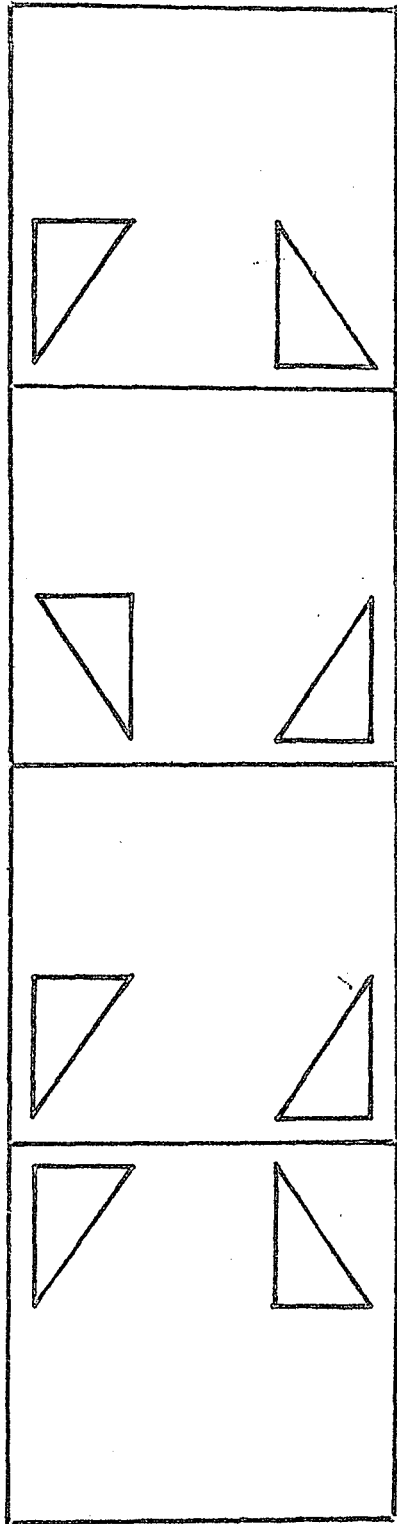
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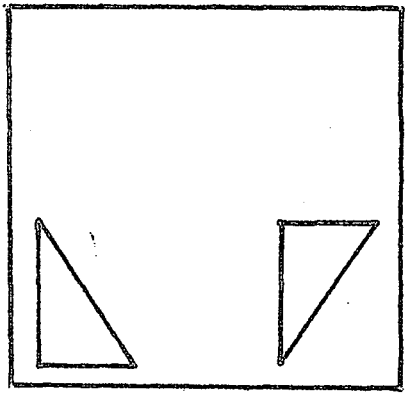
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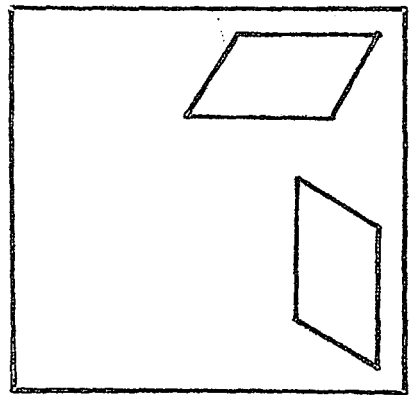
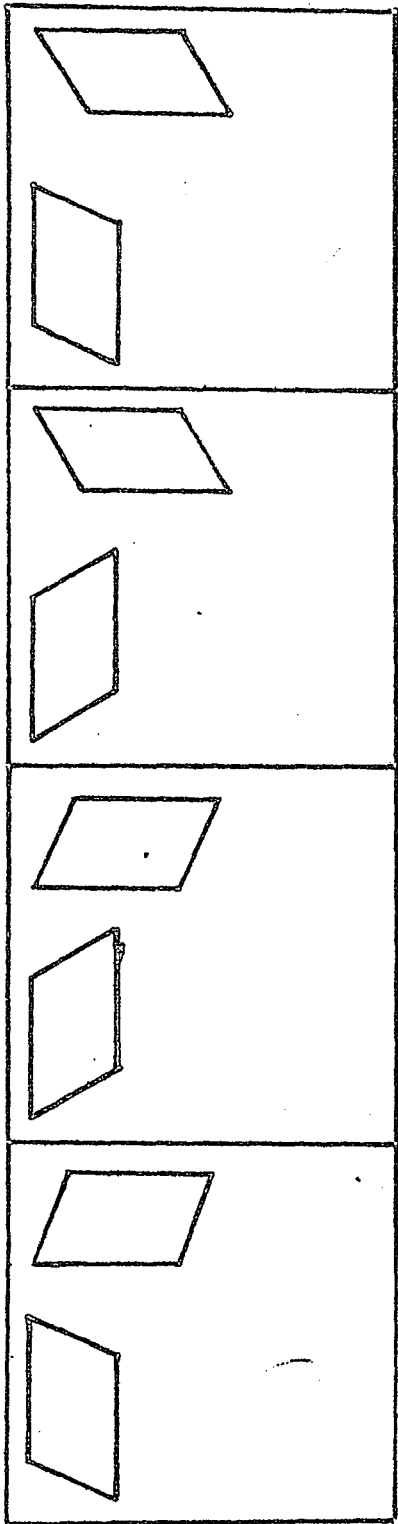
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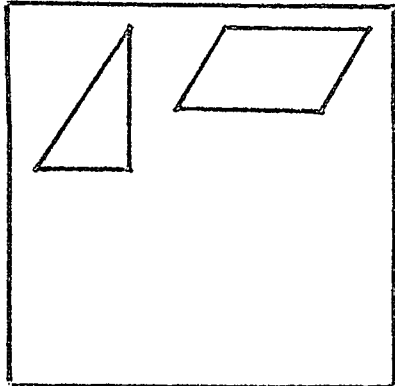
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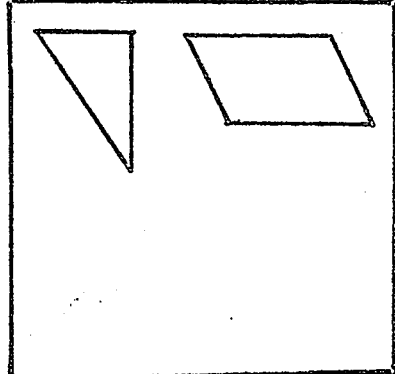
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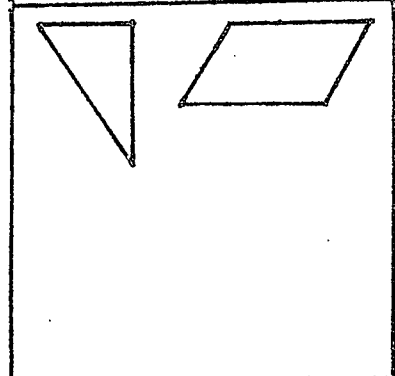




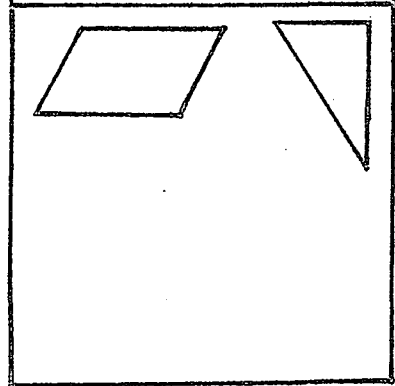
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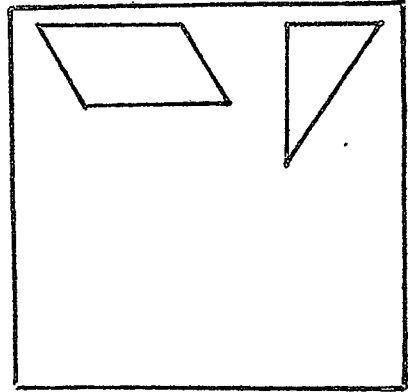


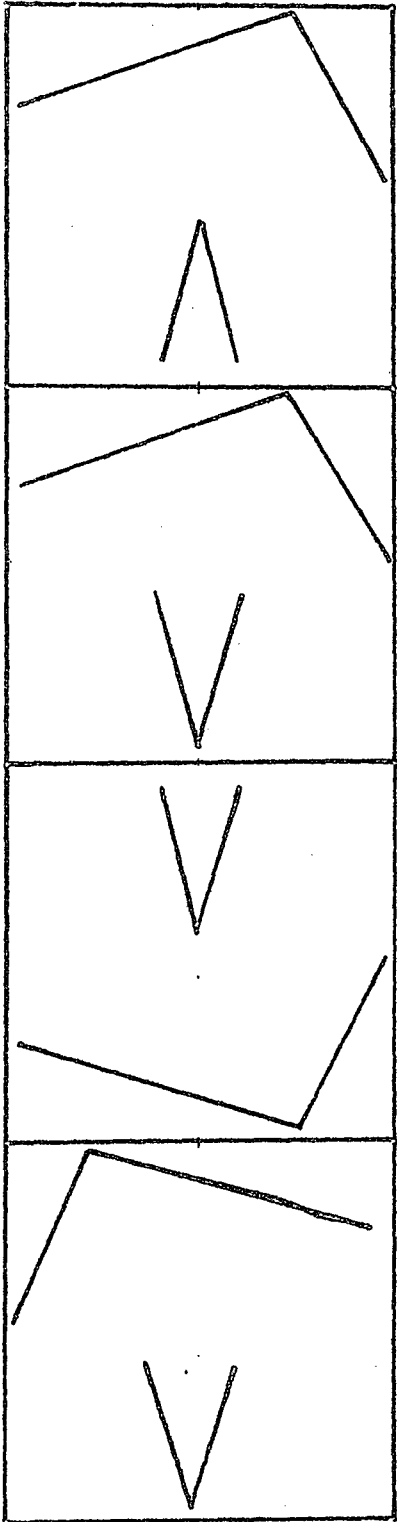
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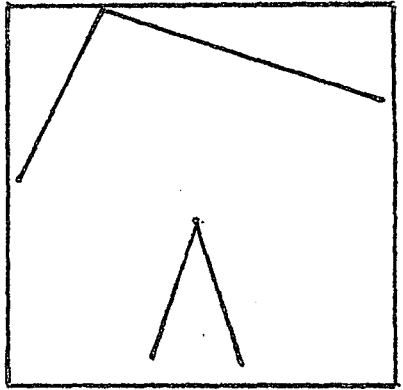
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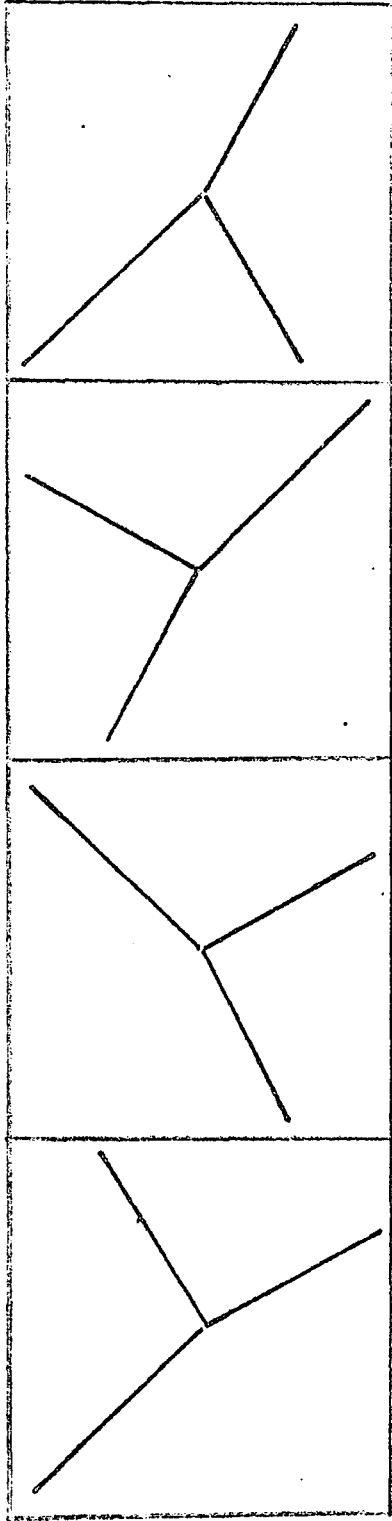
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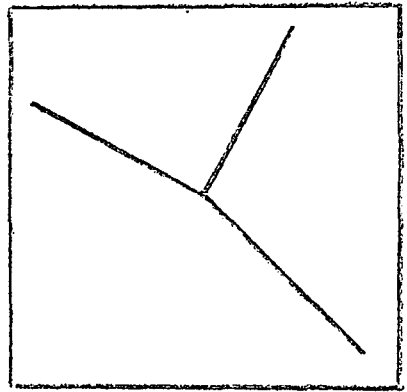
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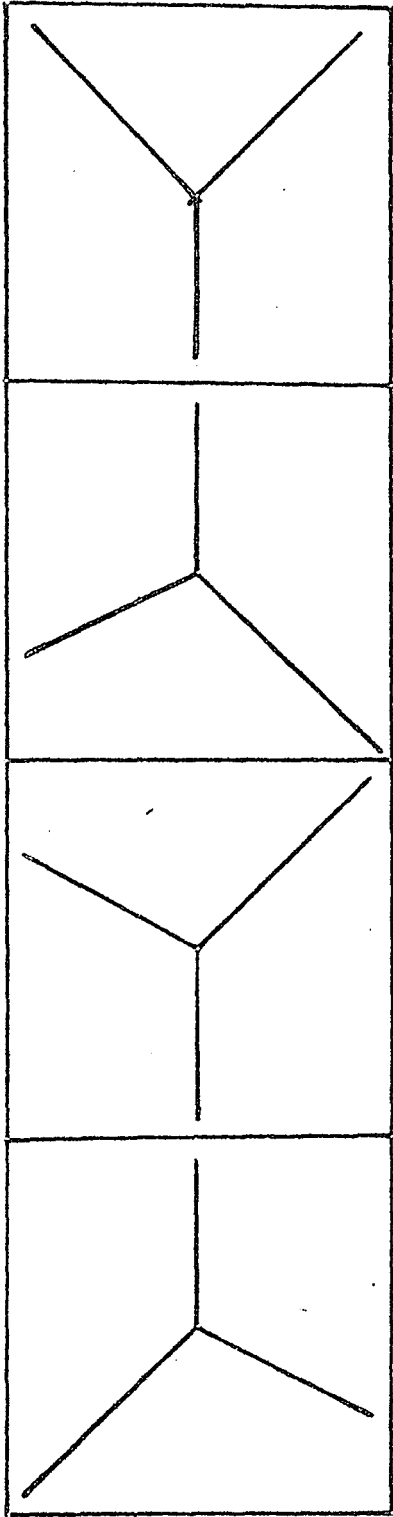
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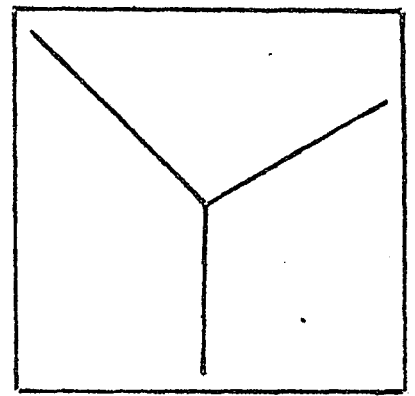
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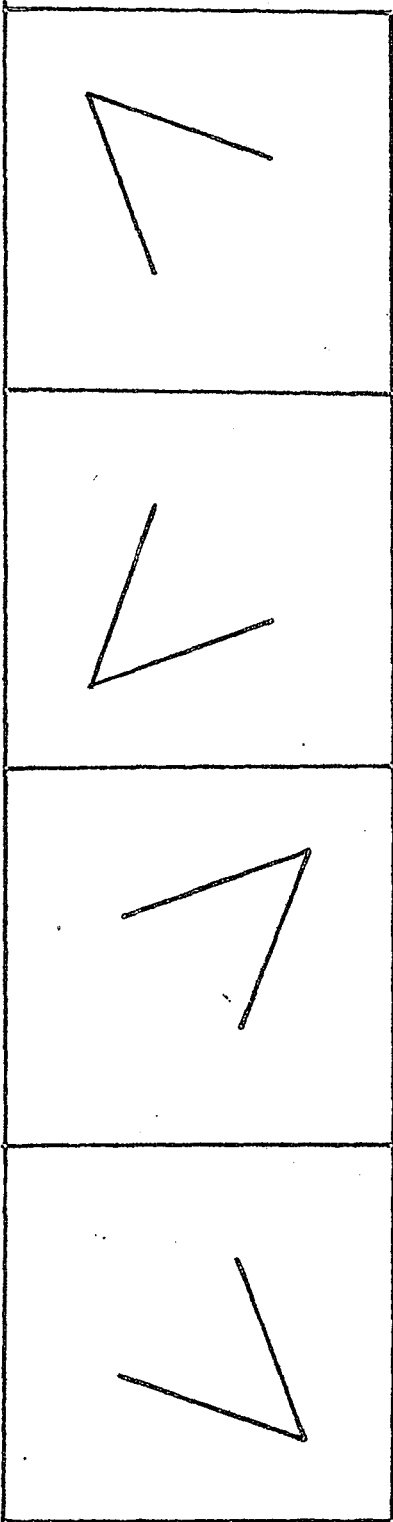
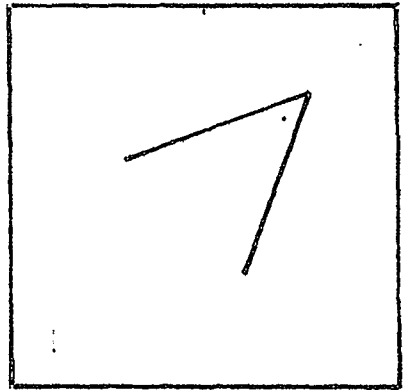
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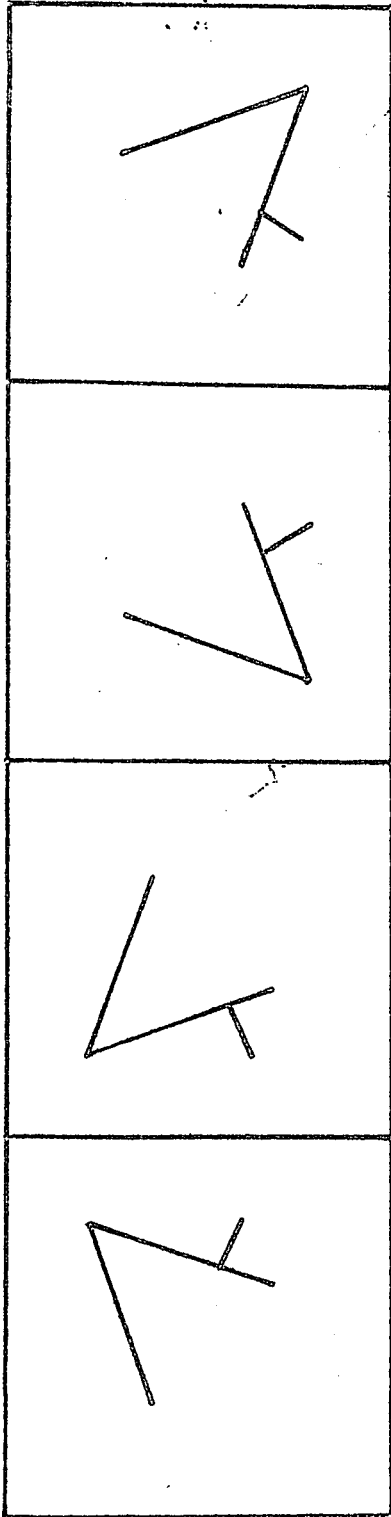


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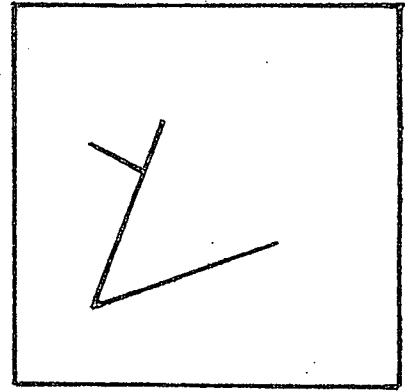
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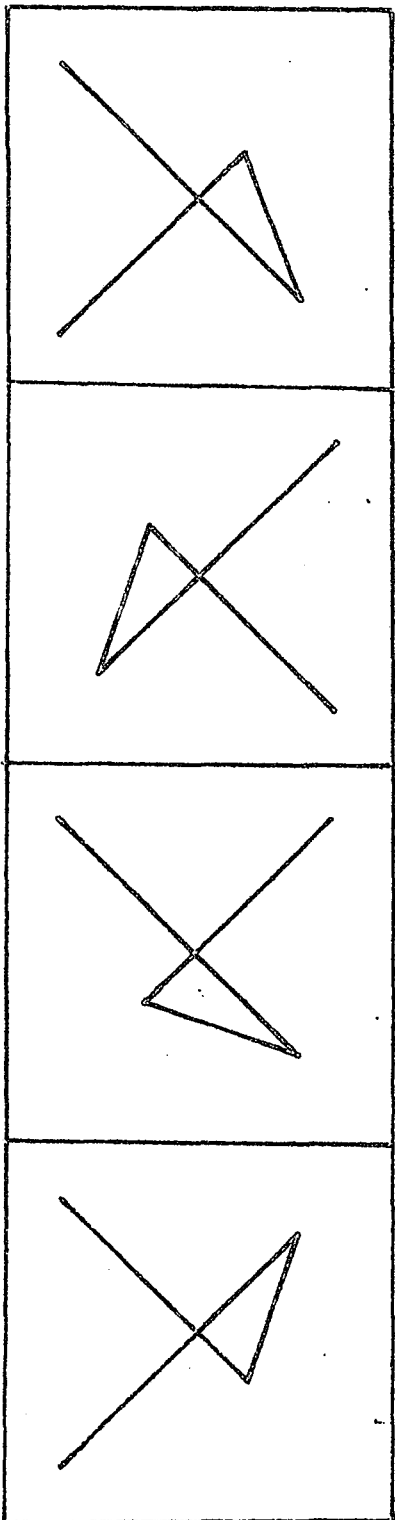
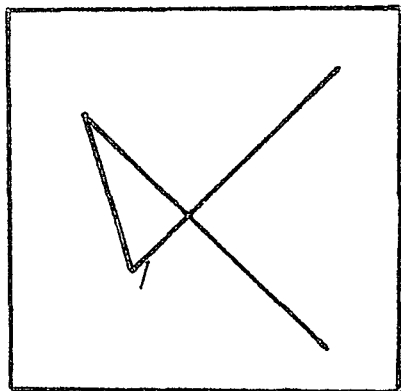
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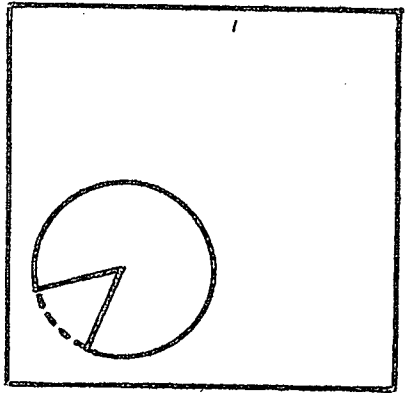
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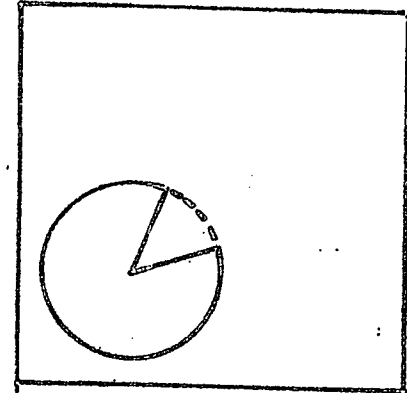
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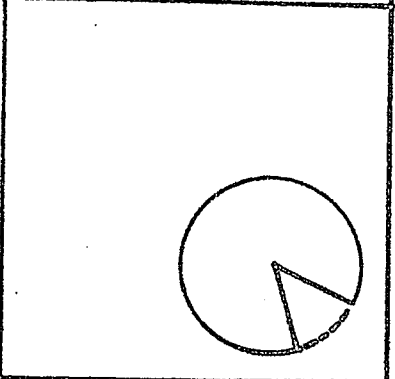
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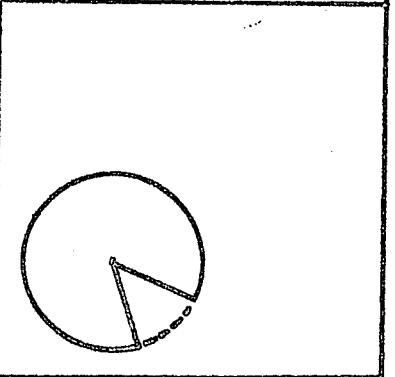
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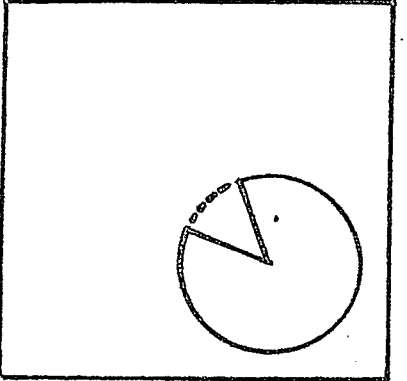
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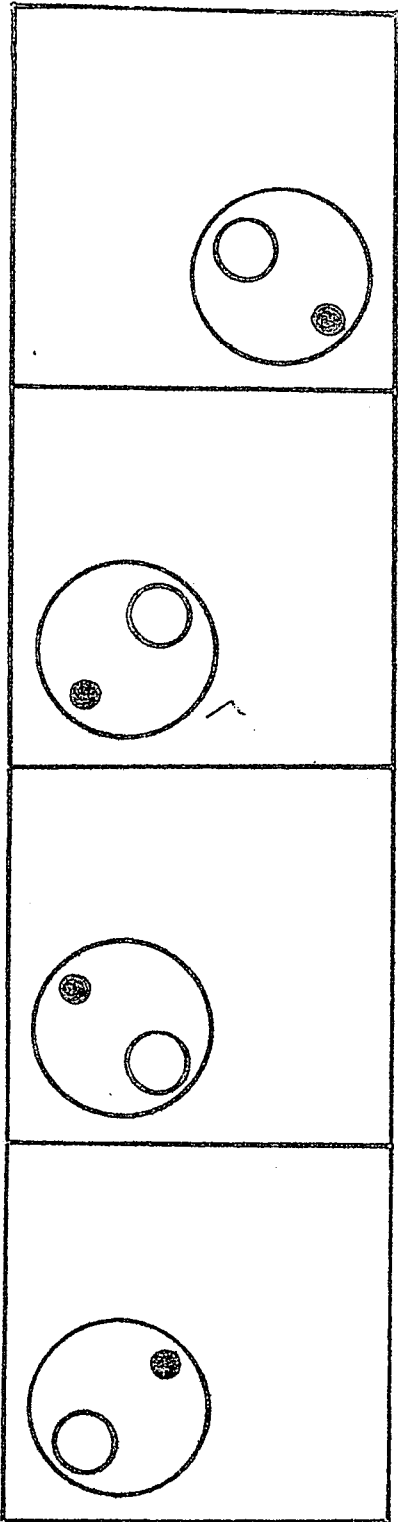


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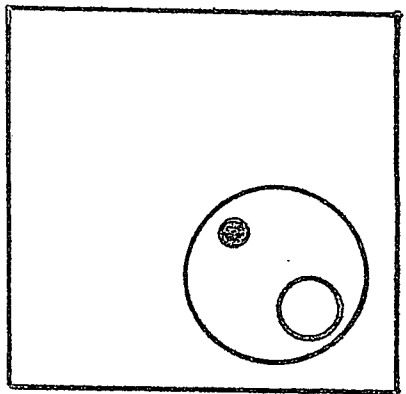
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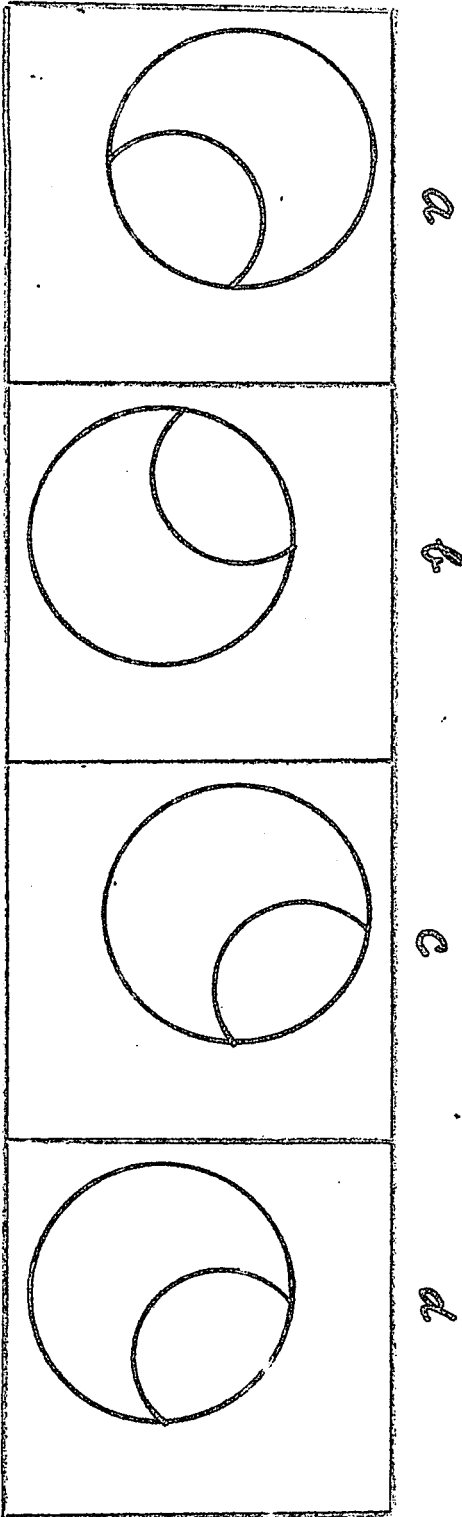
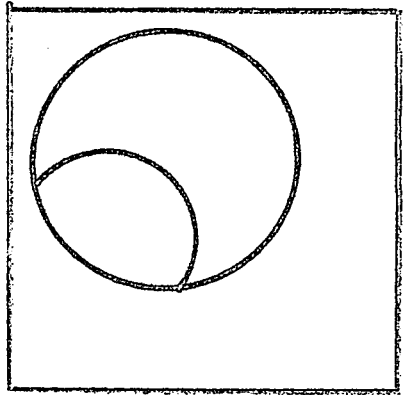
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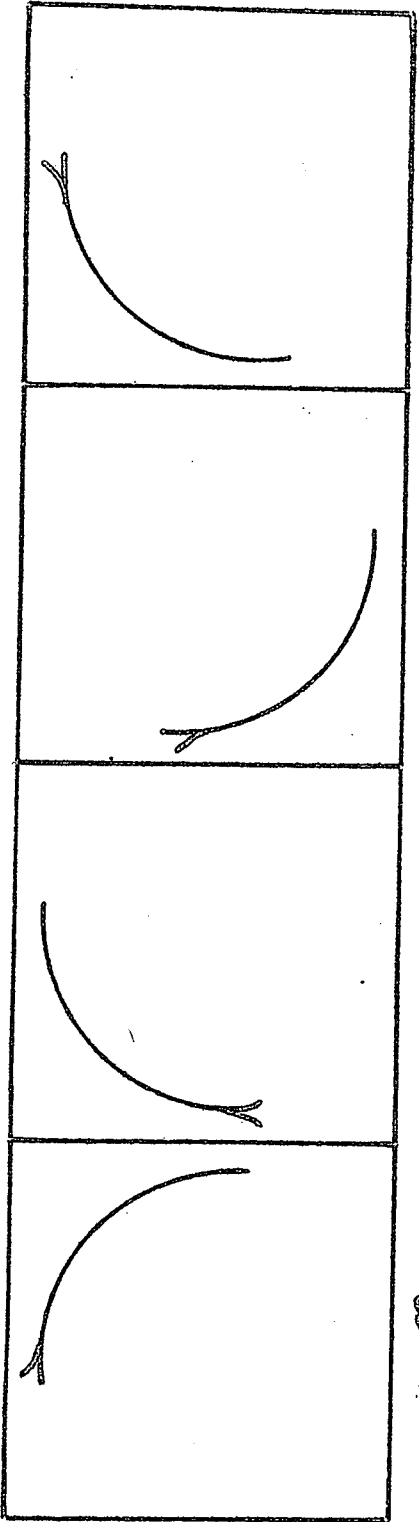
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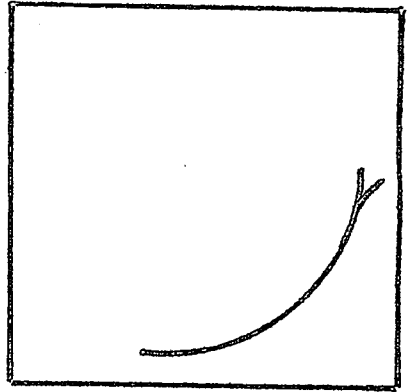
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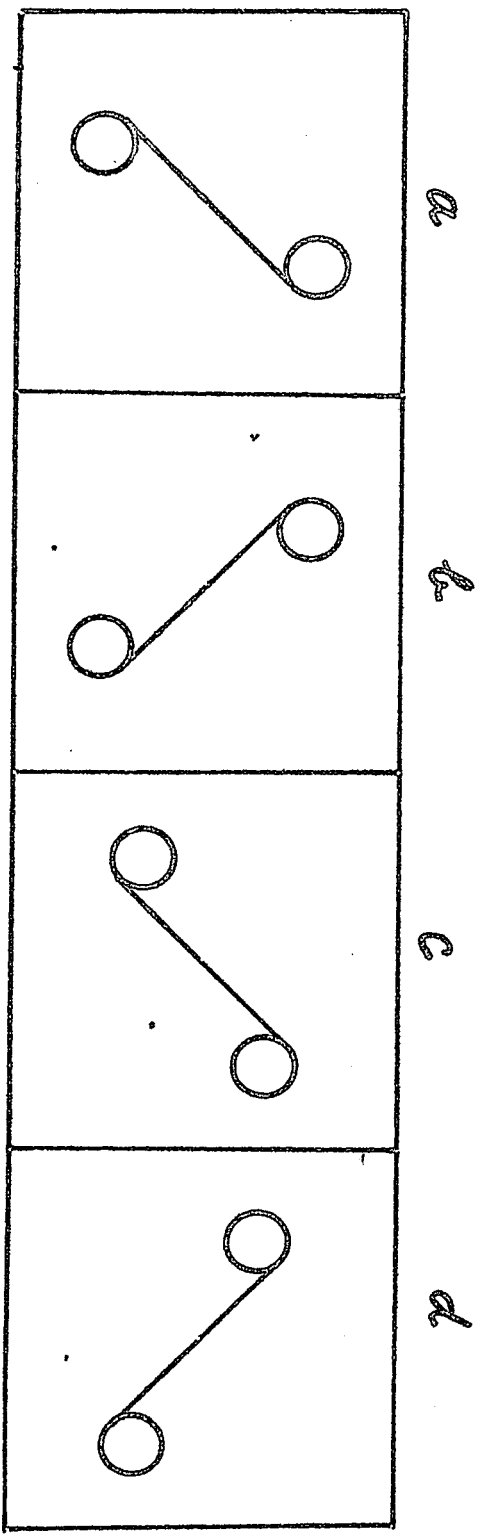
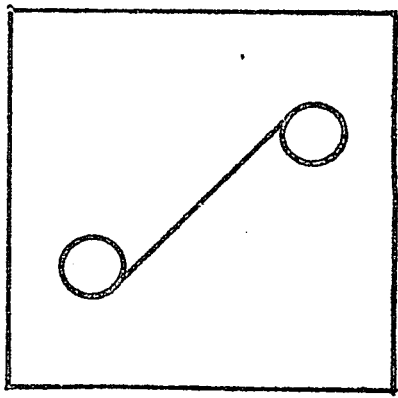
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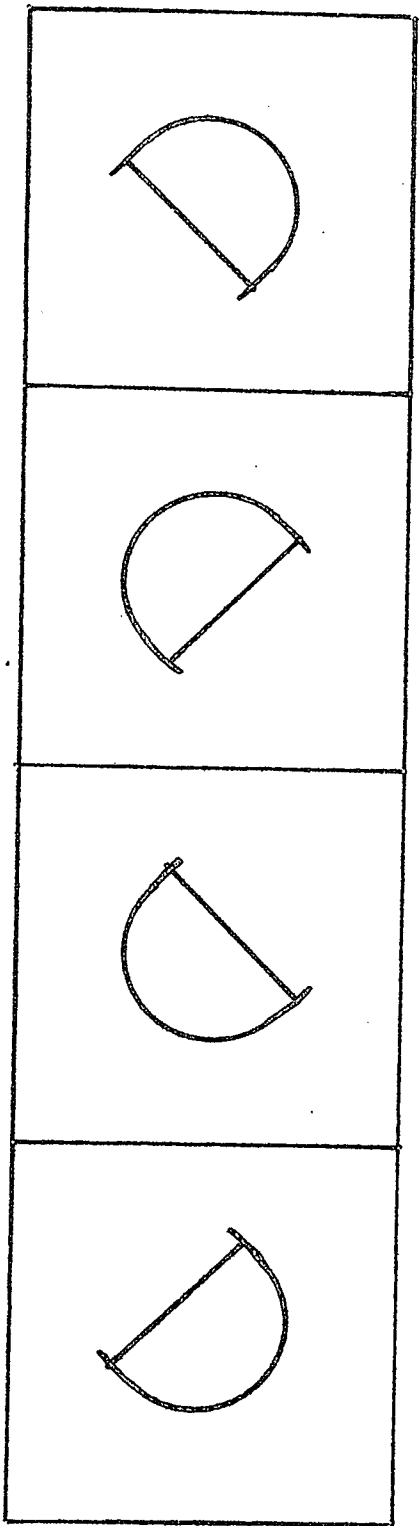
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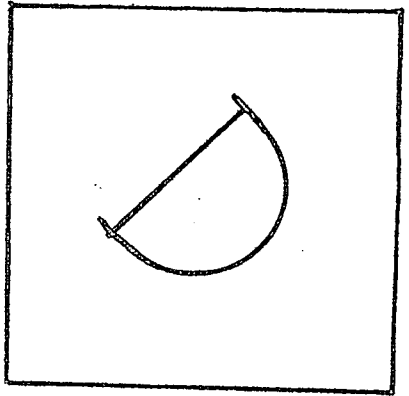
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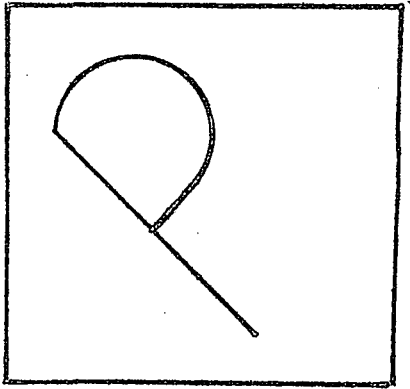
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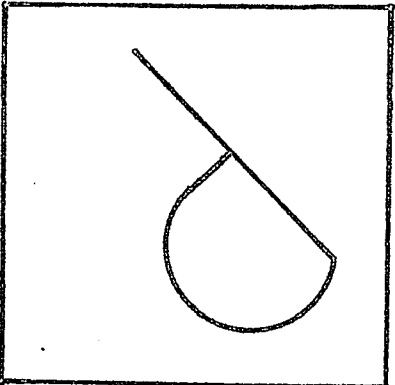
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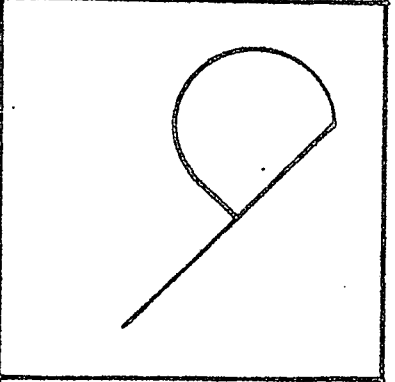
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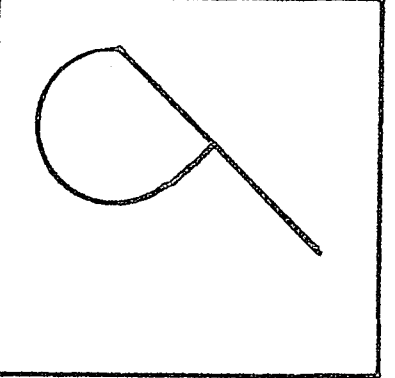
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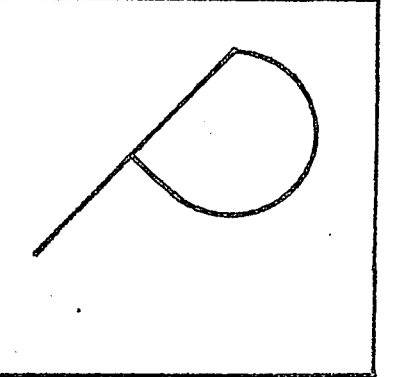
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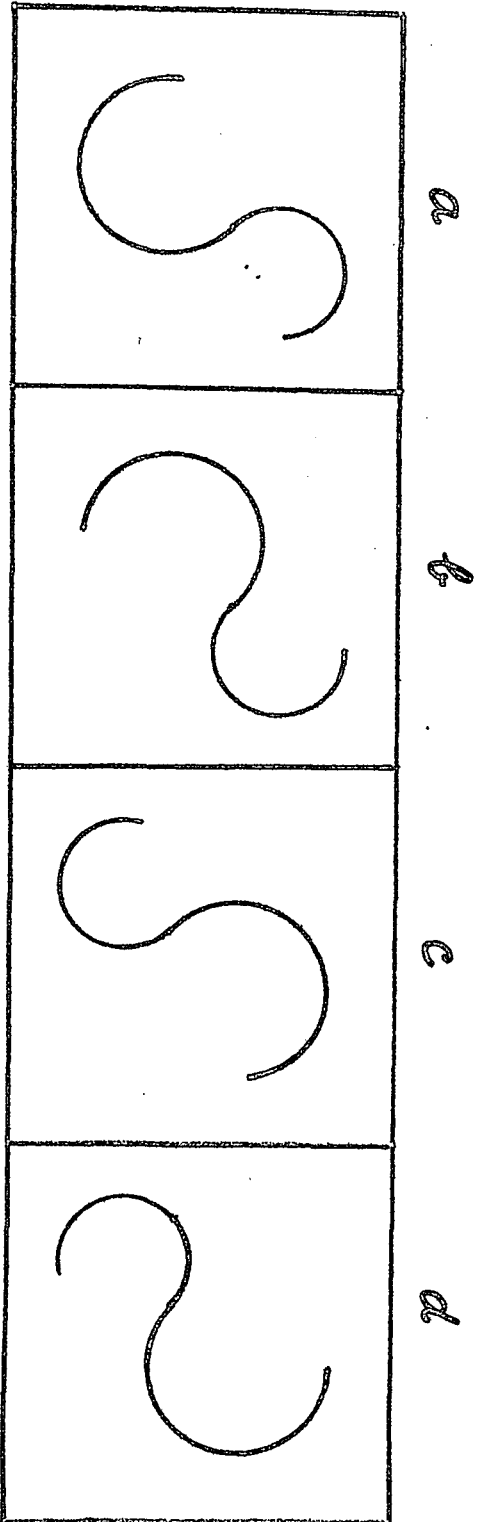
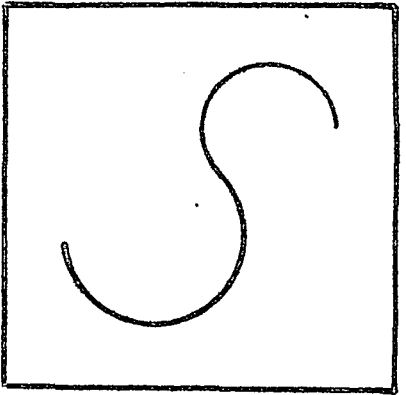
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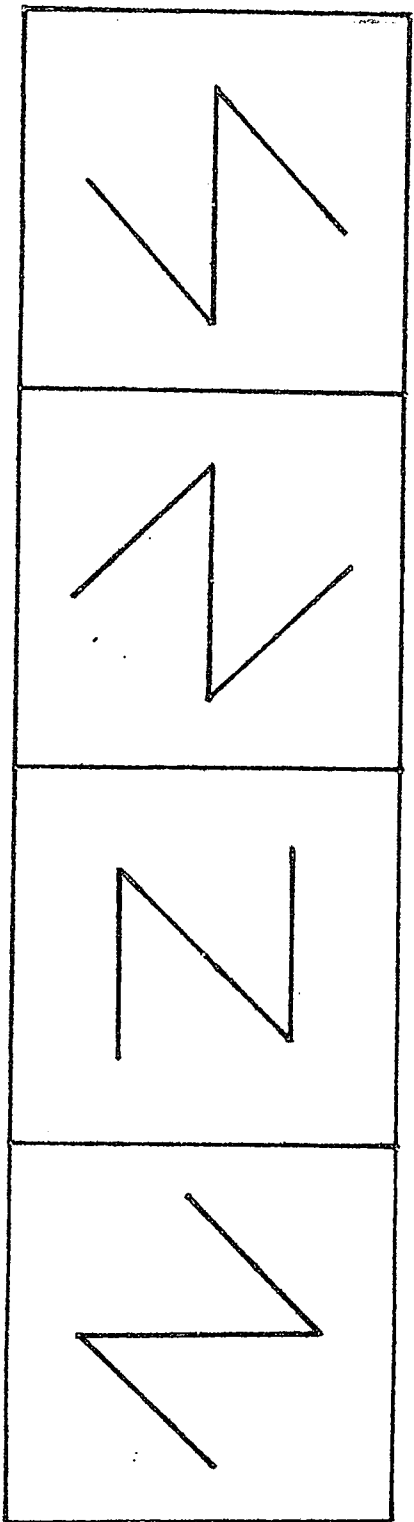
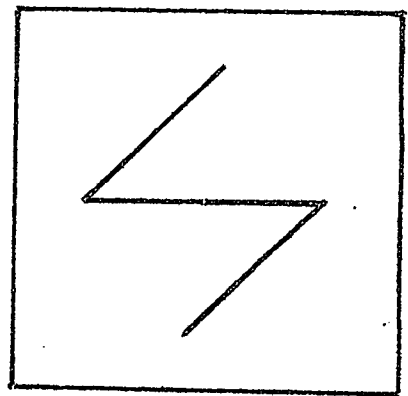
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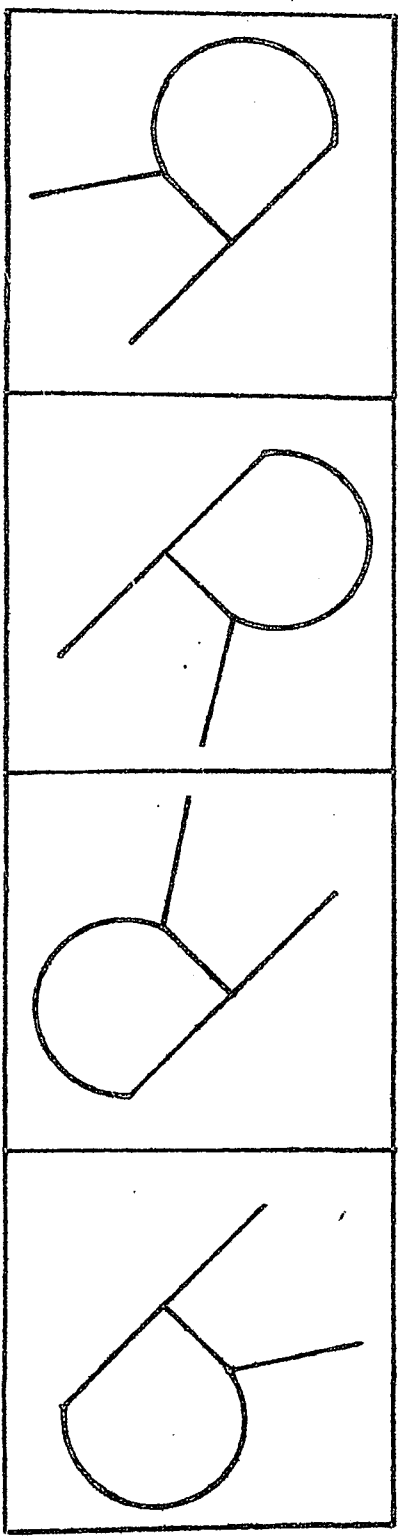
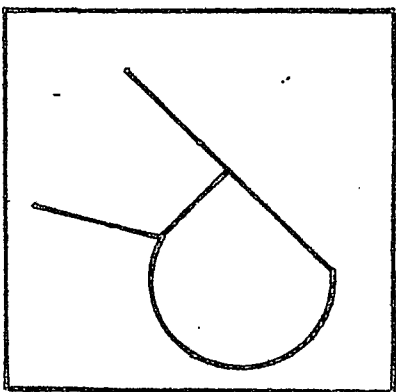
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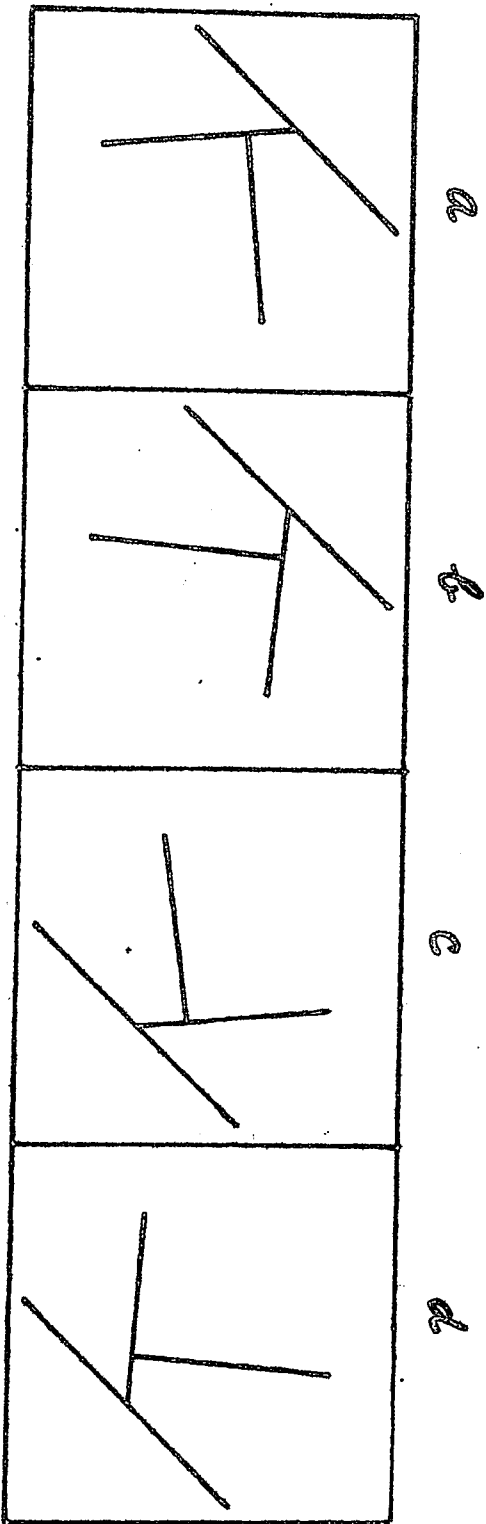
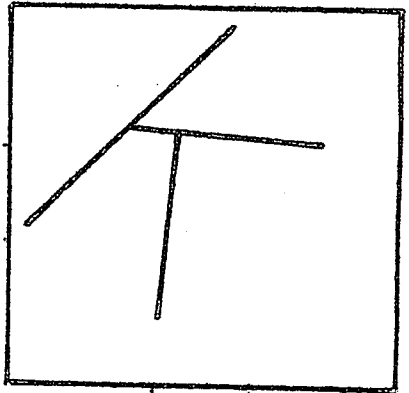
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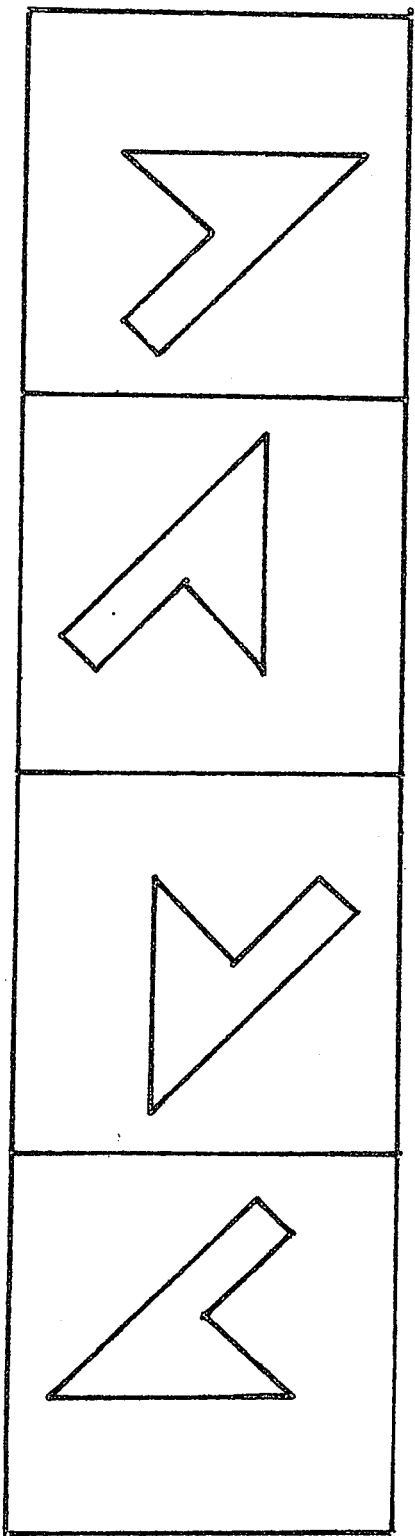
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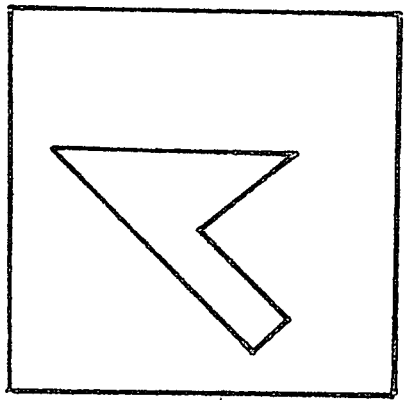


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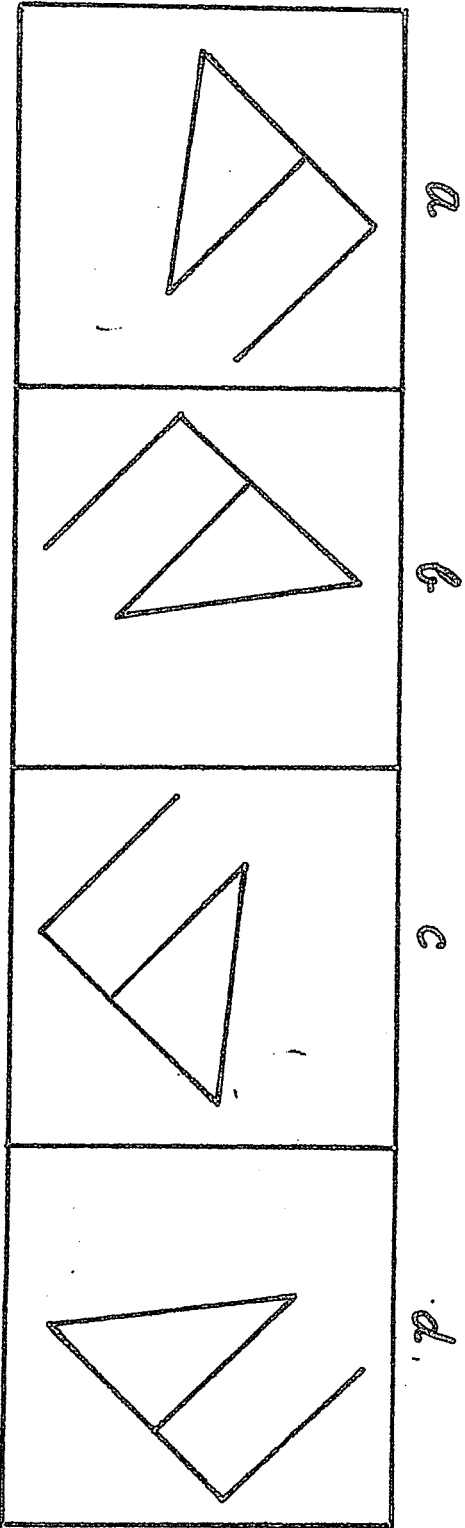
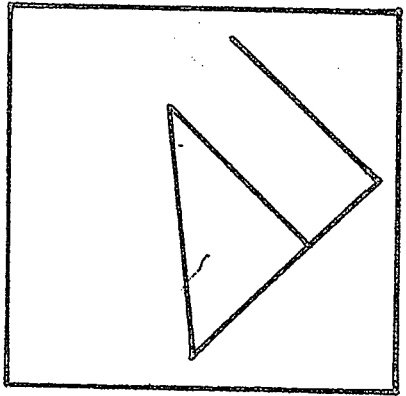
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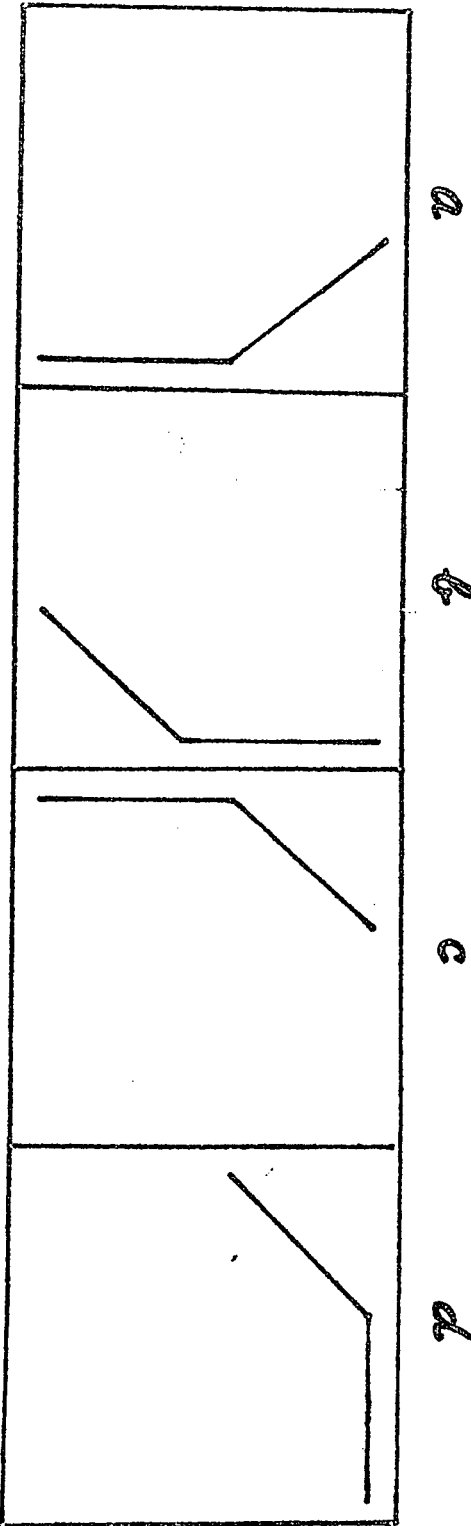
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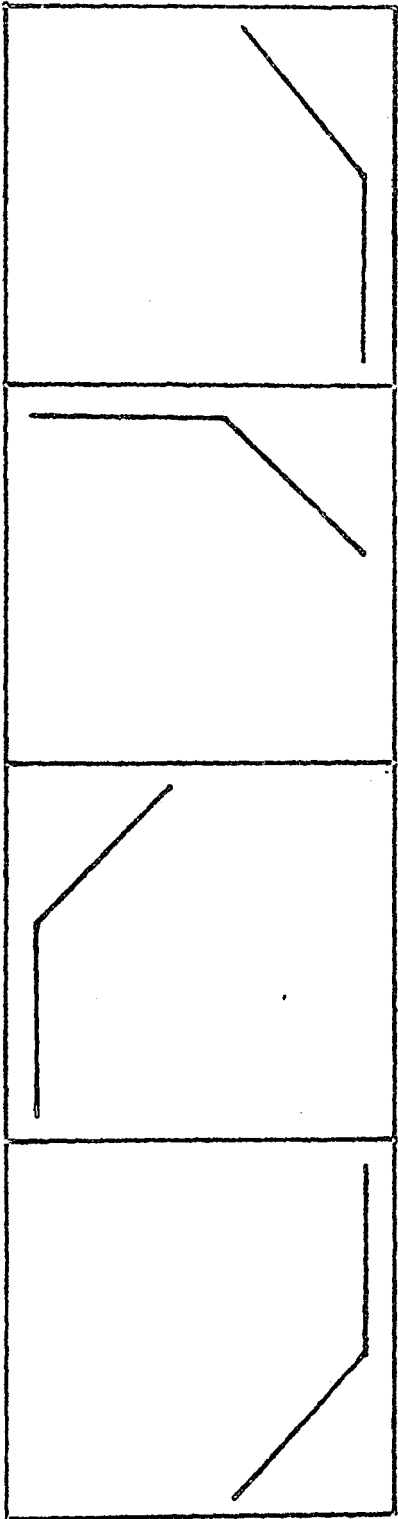
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MIRROR TASK BOOKLET: PART II

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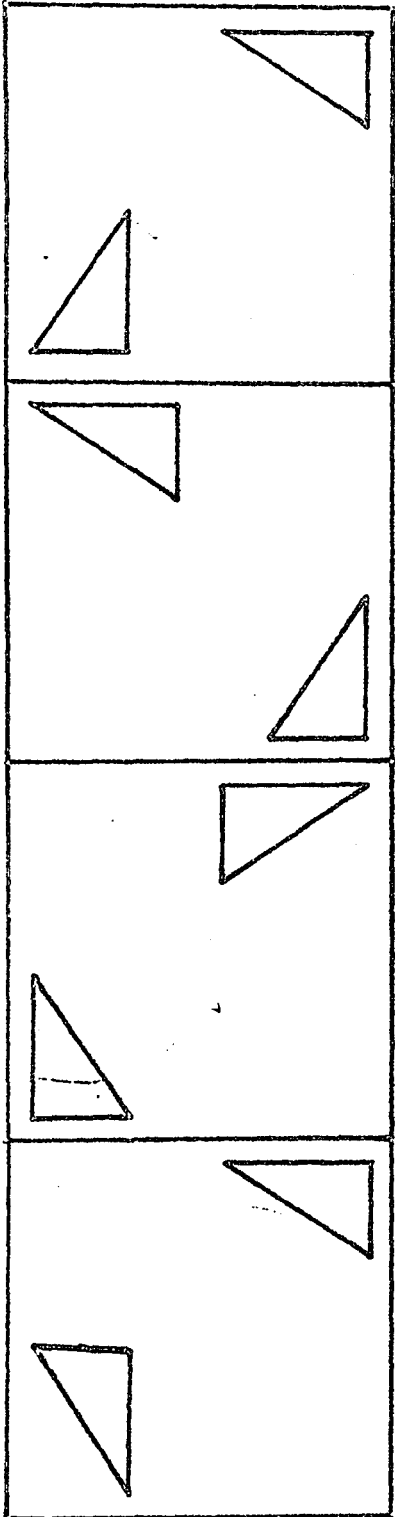
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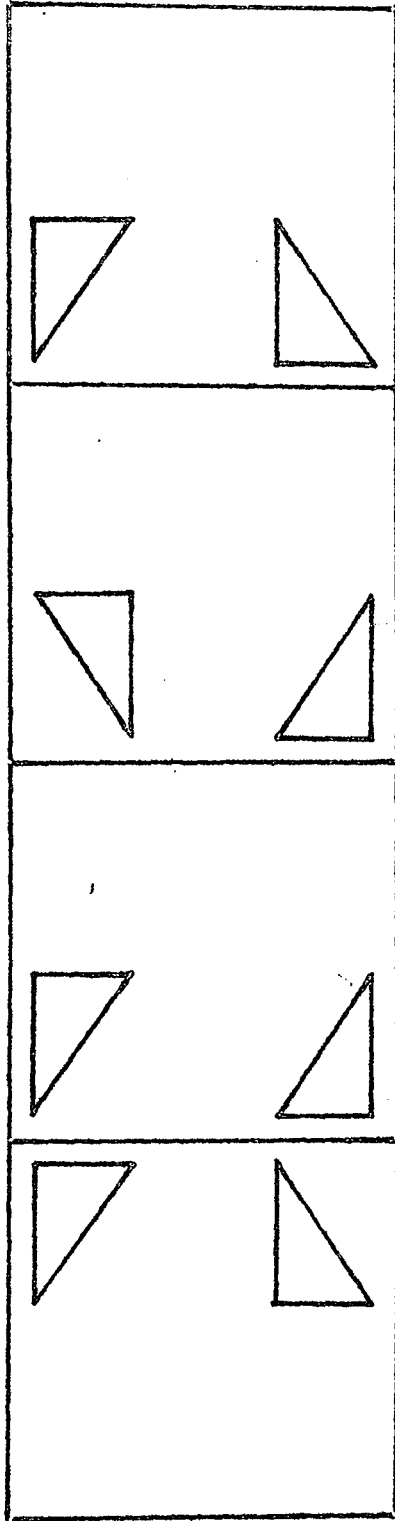
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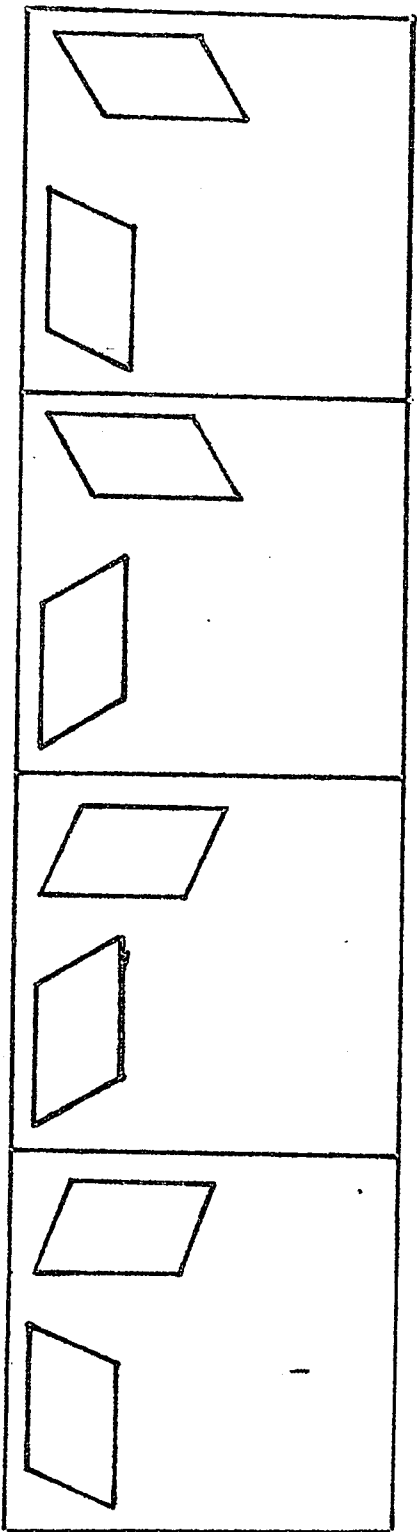
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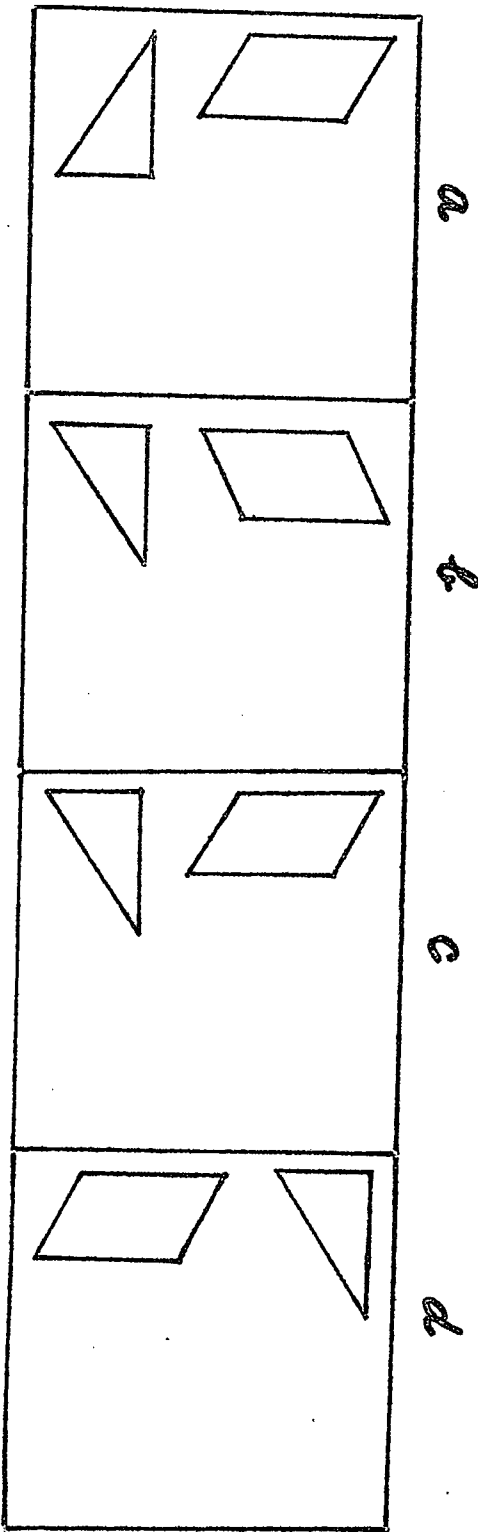
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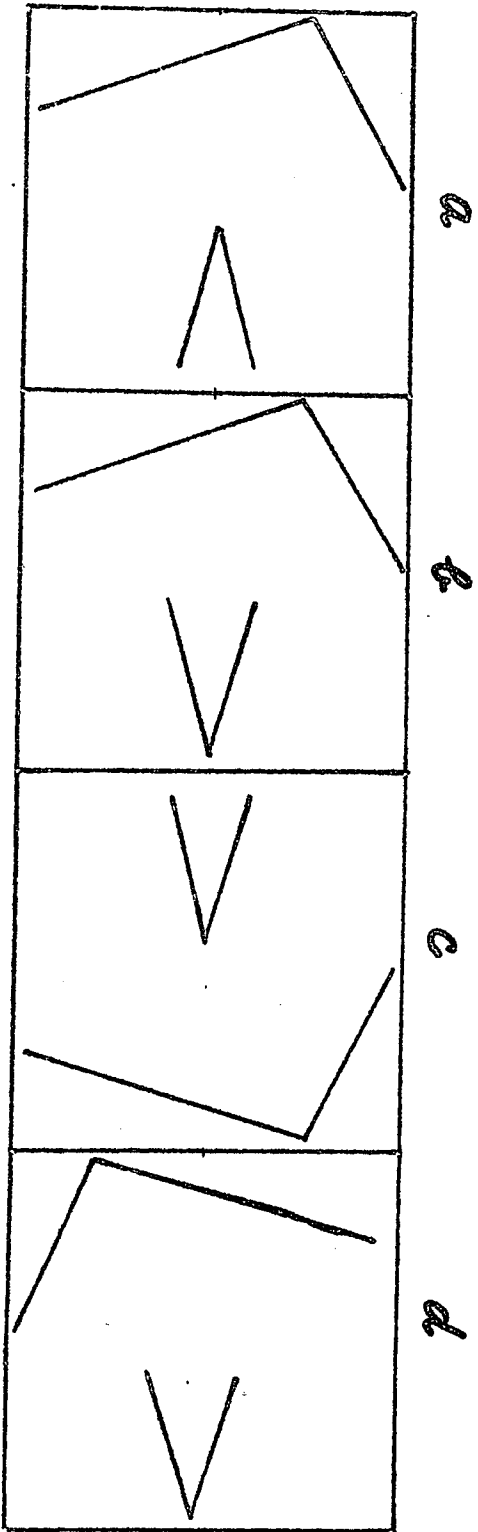
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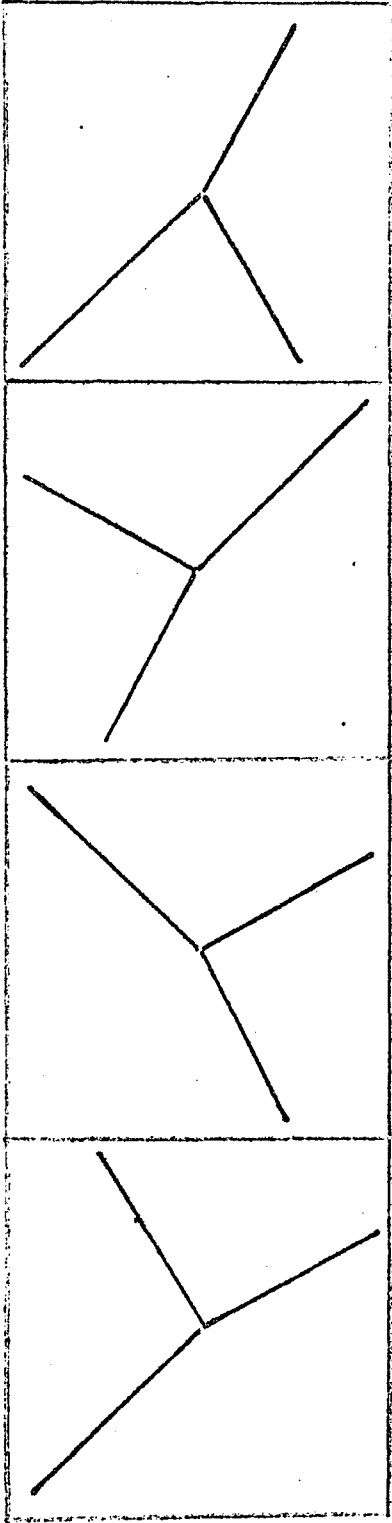
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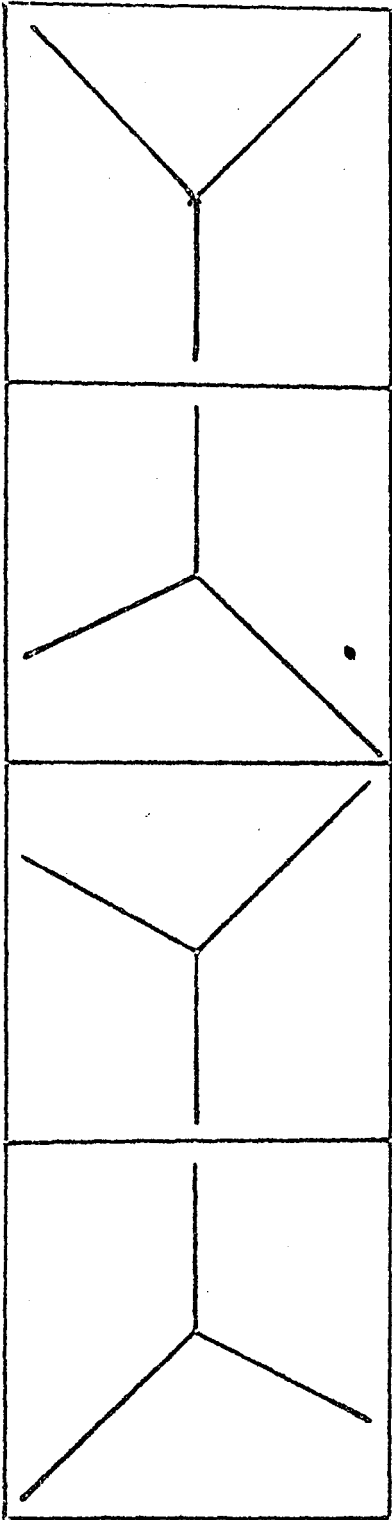
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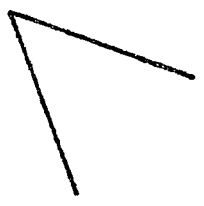
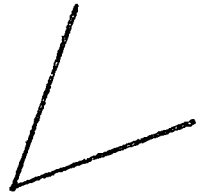
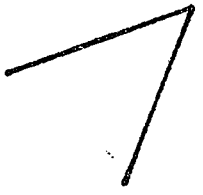
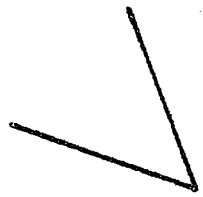
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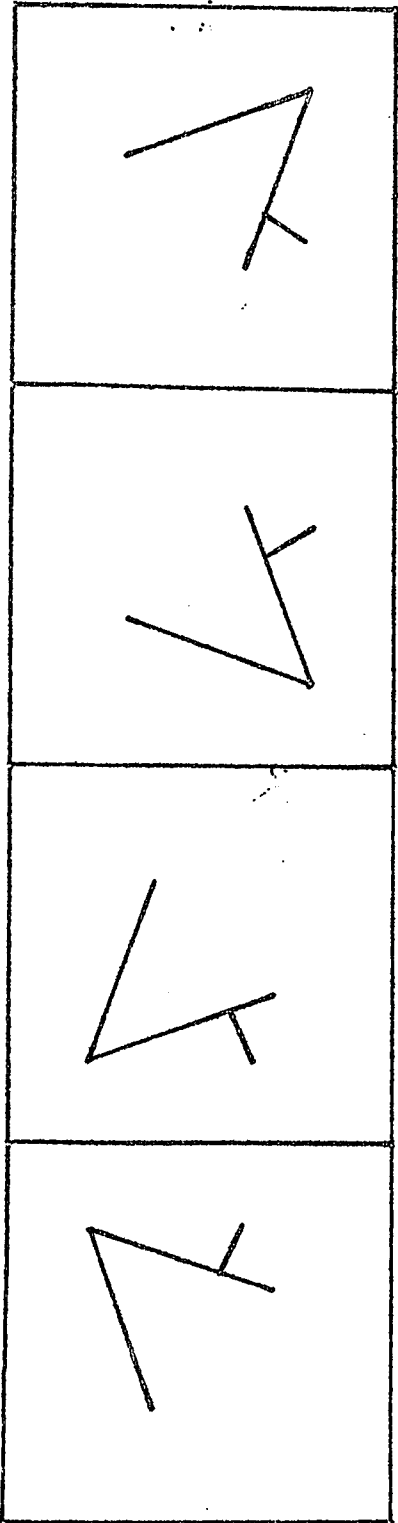
			
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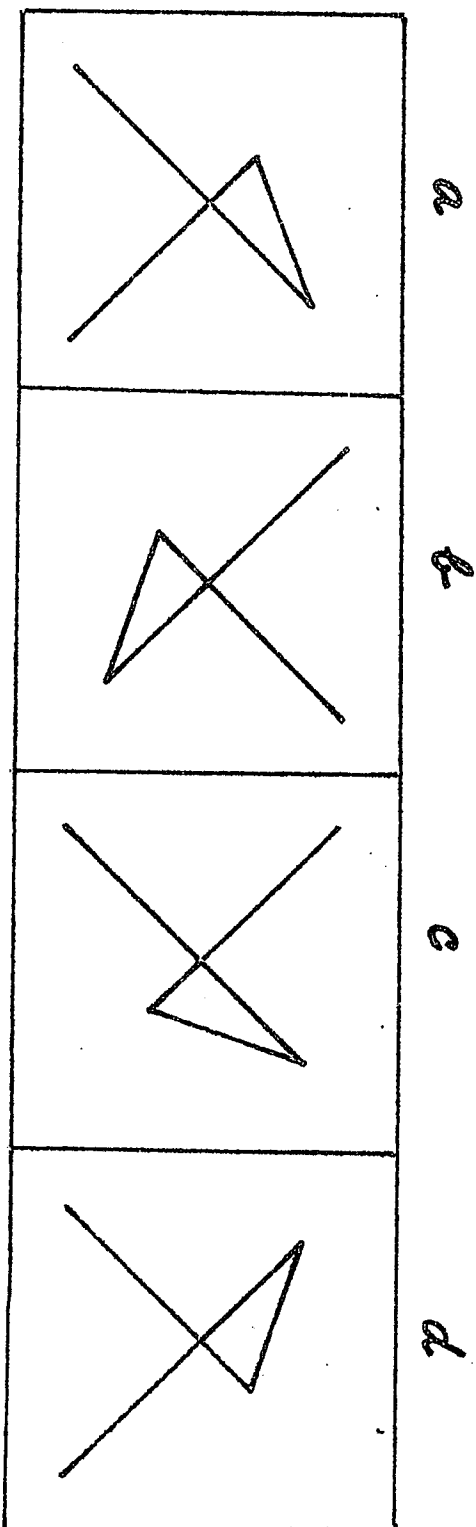
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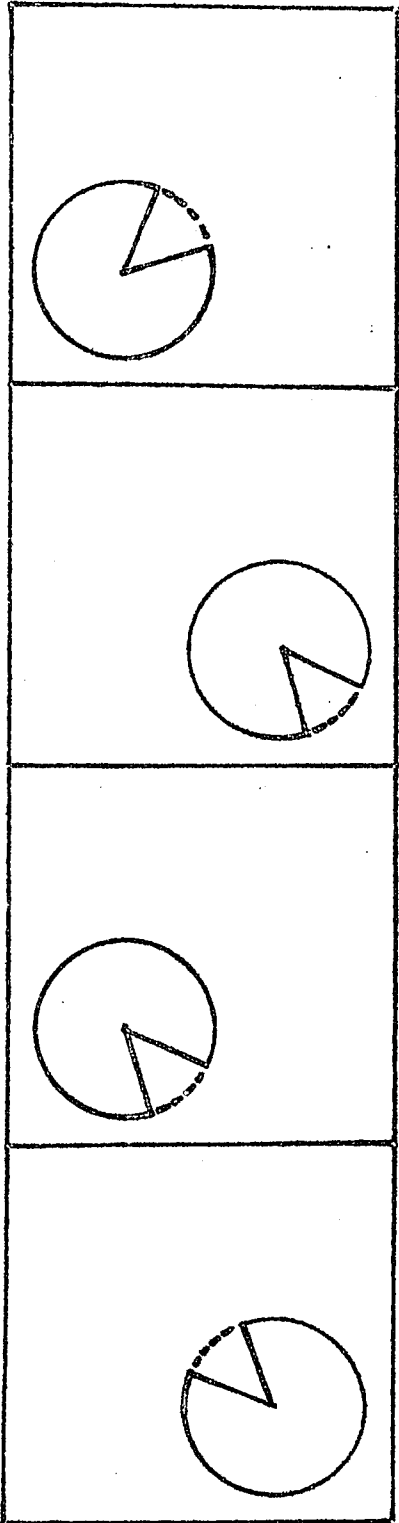
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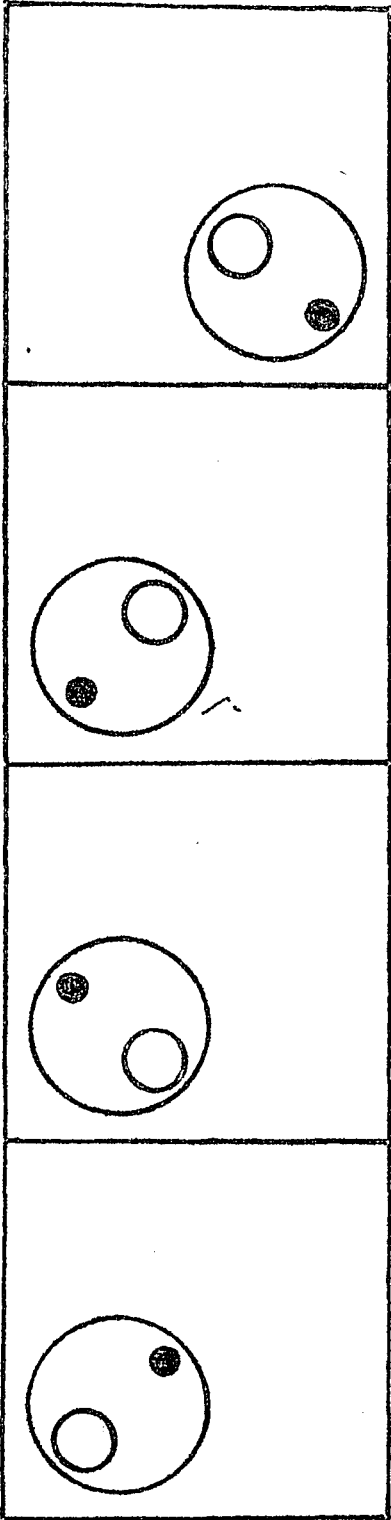
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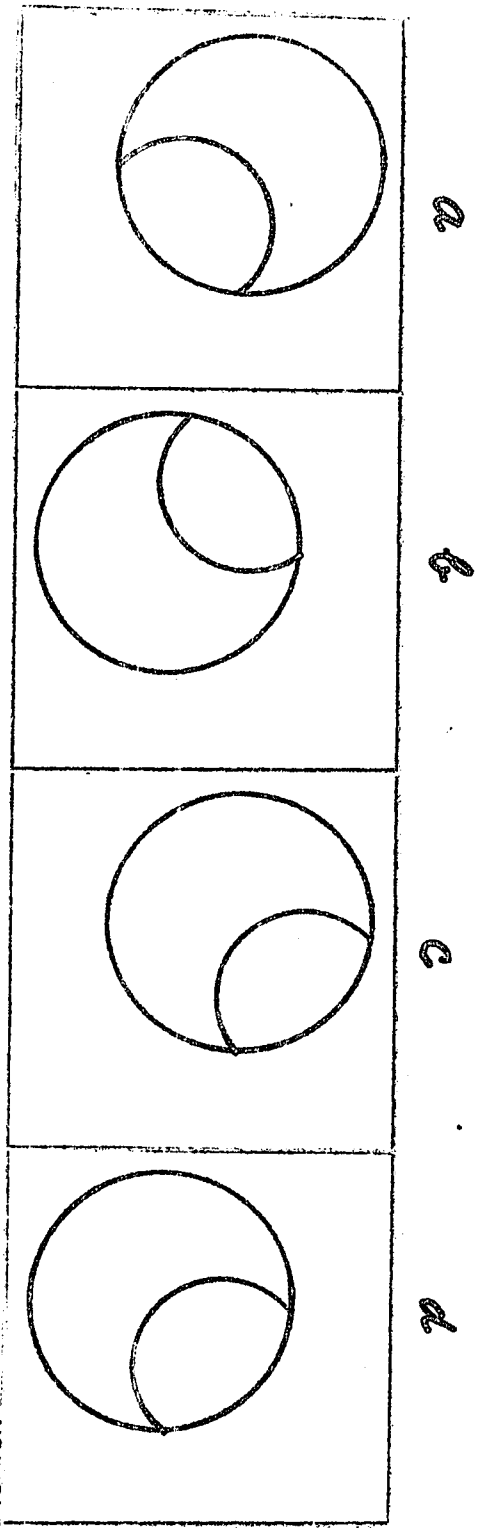


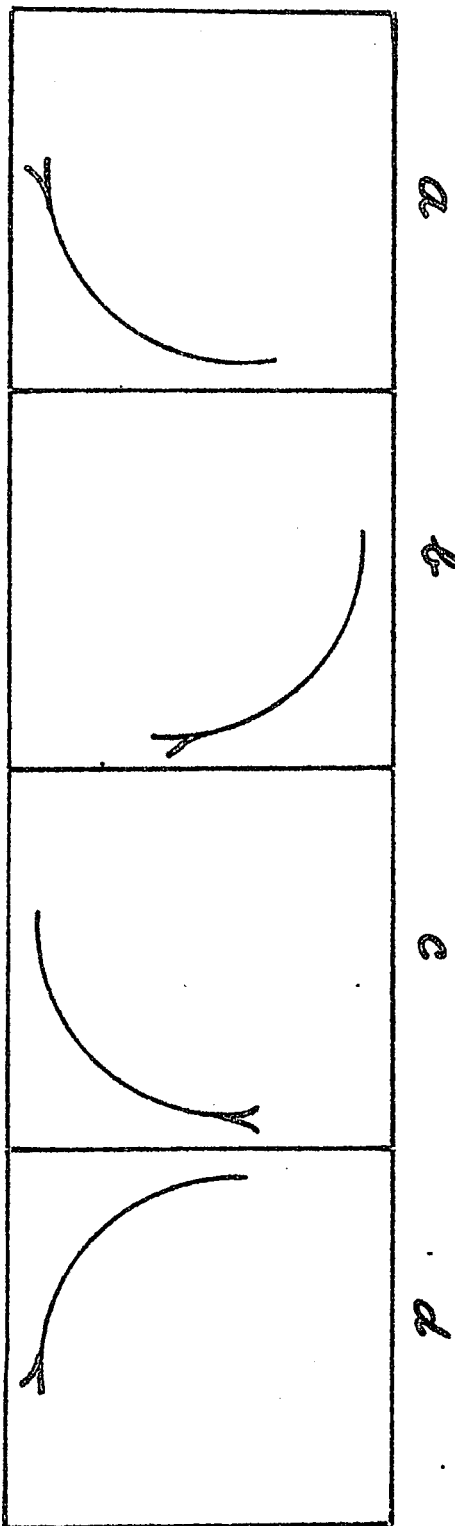
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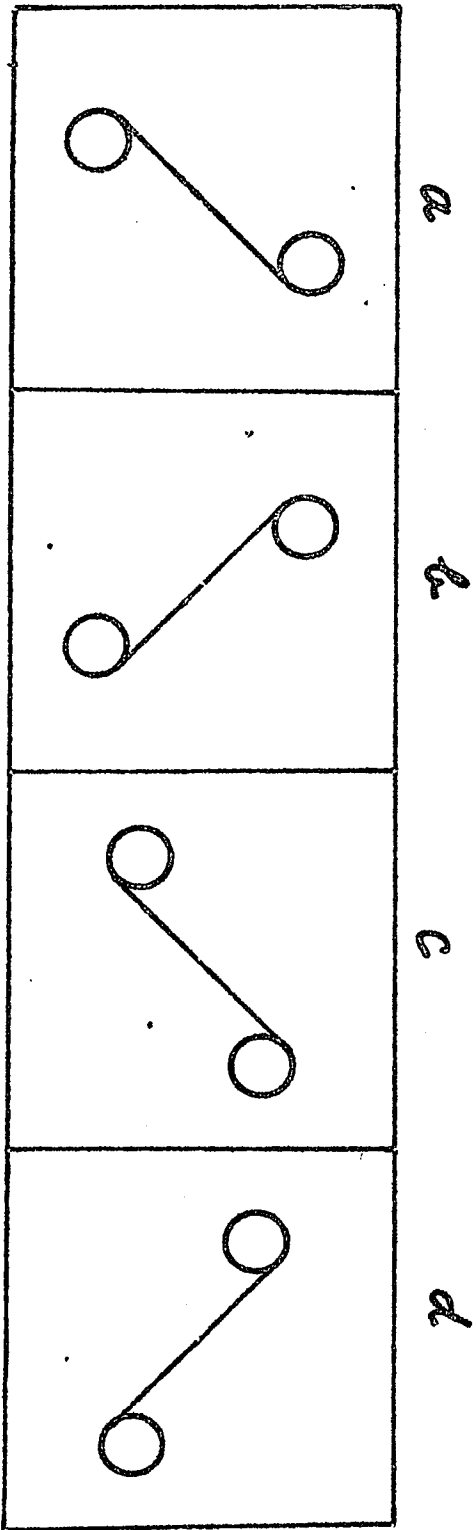
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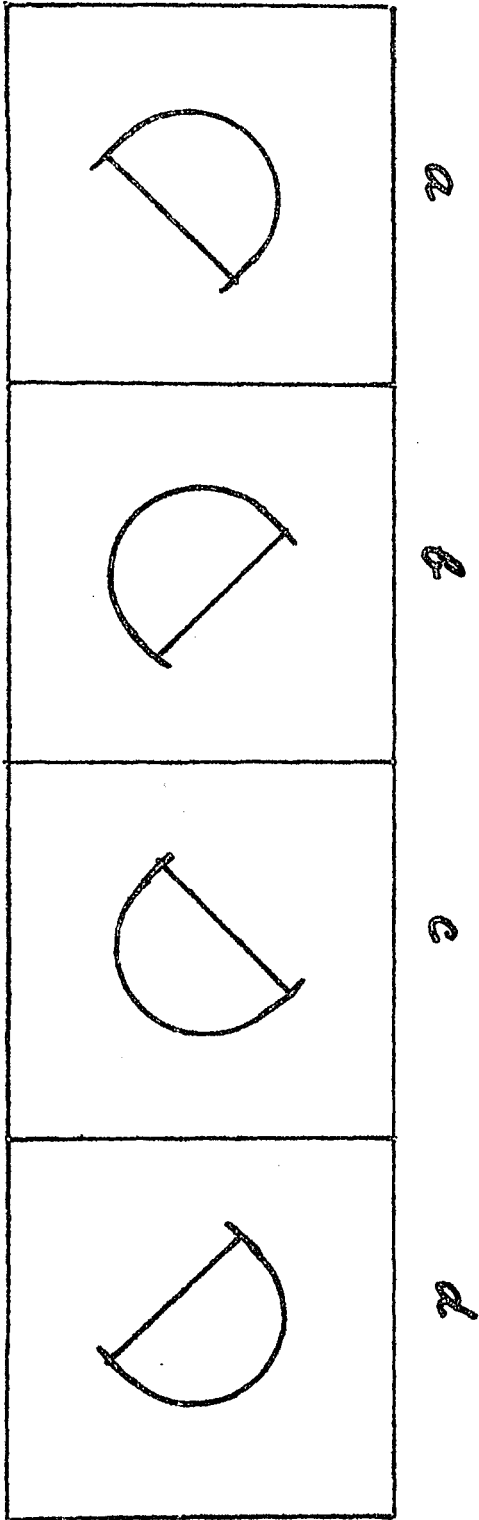
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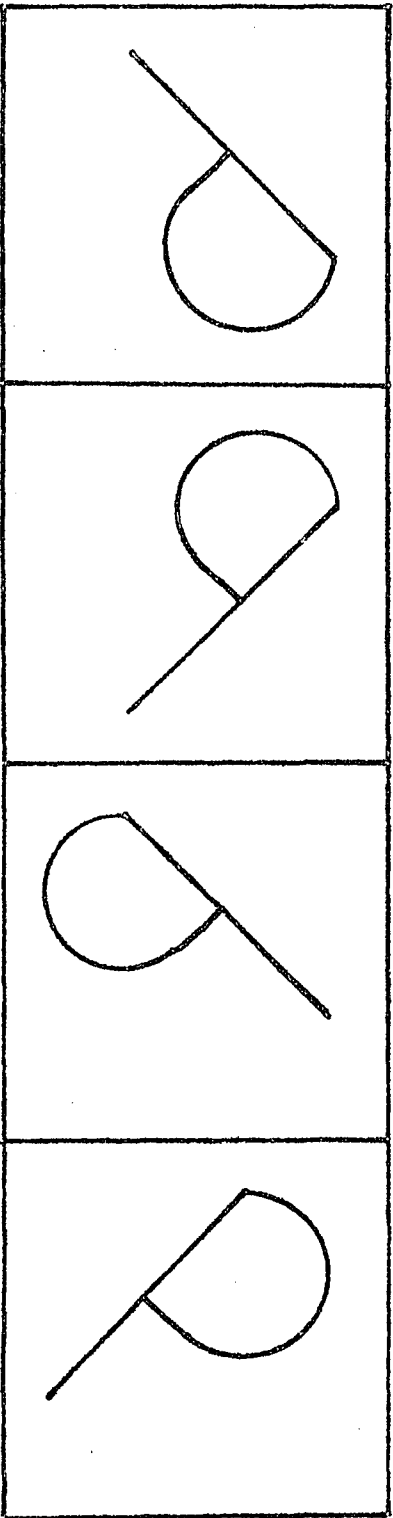
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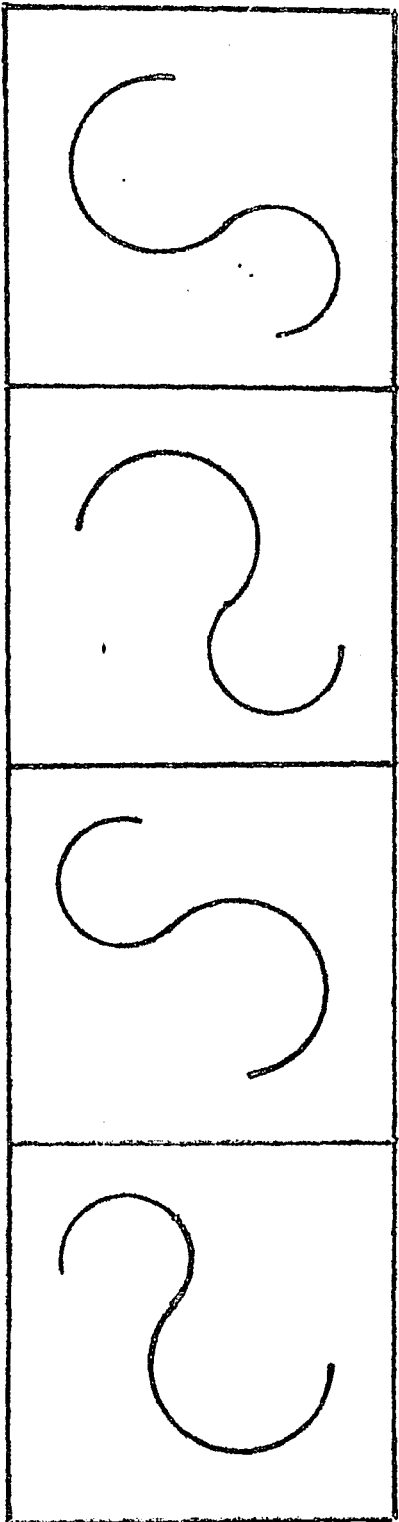


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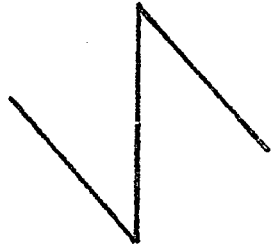
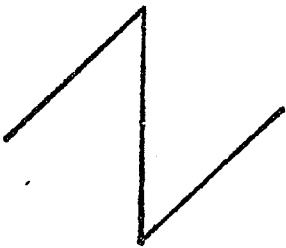
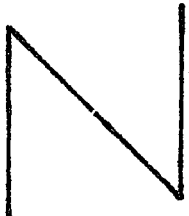
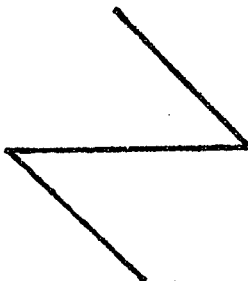


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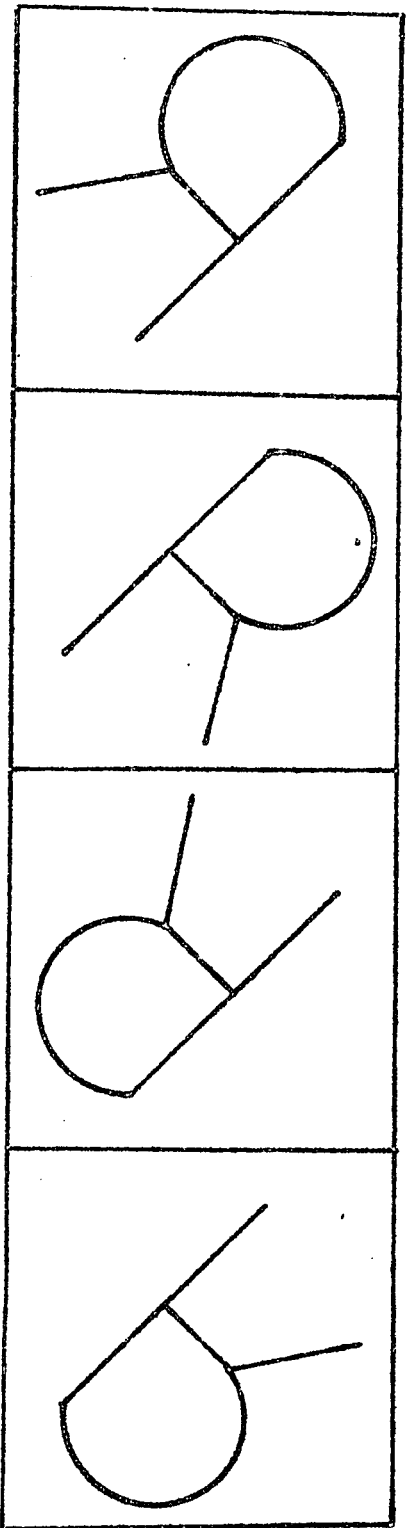
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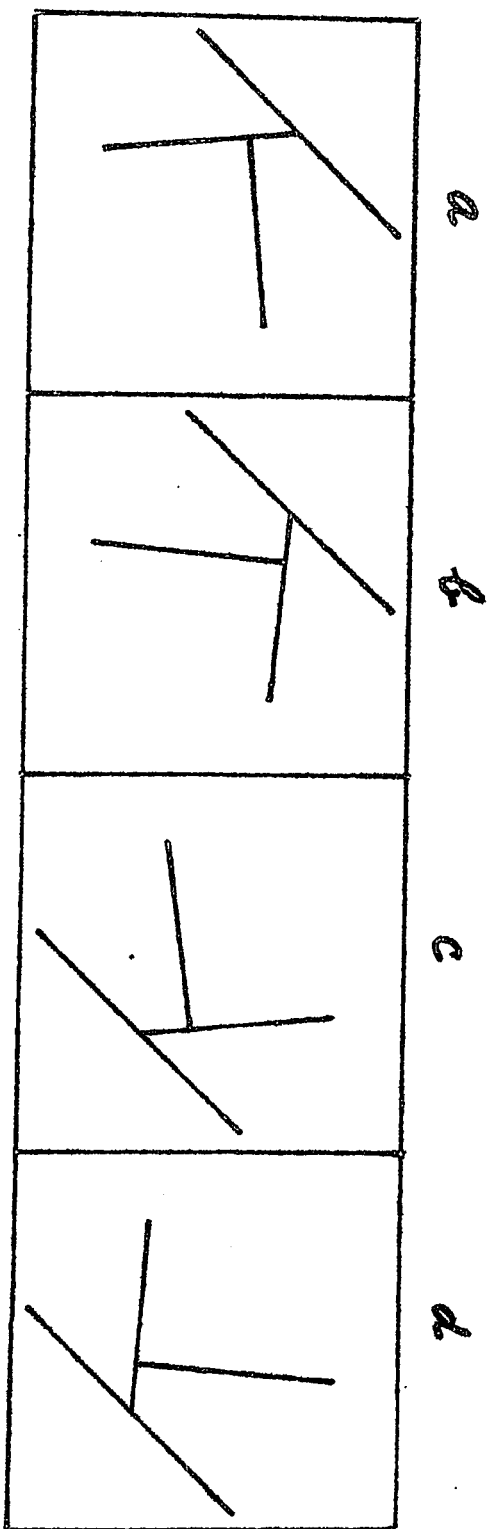
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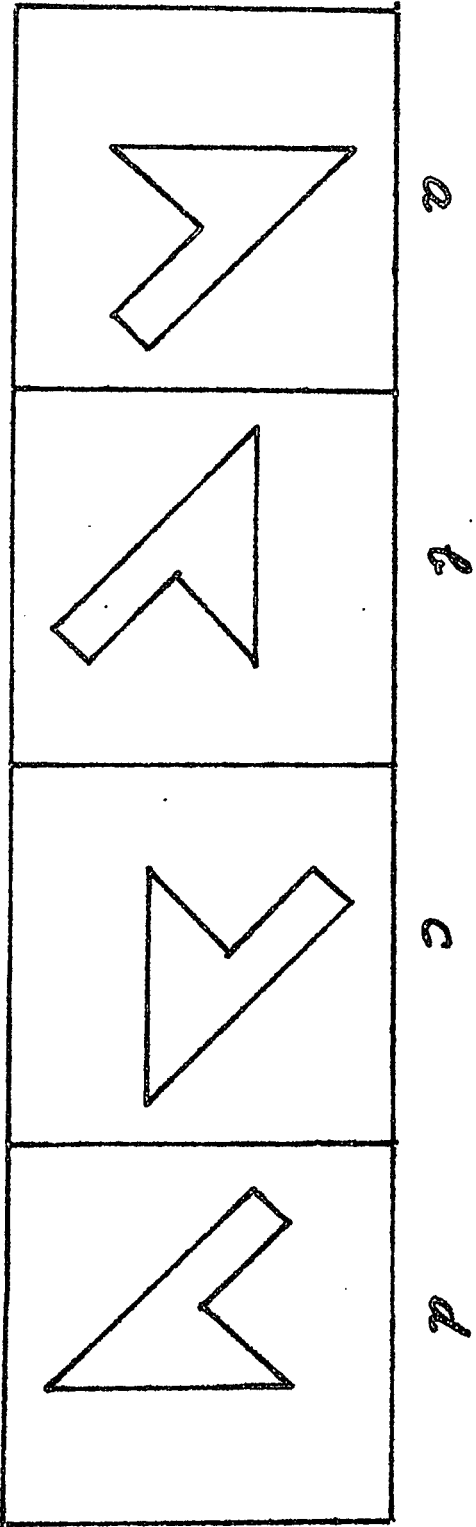
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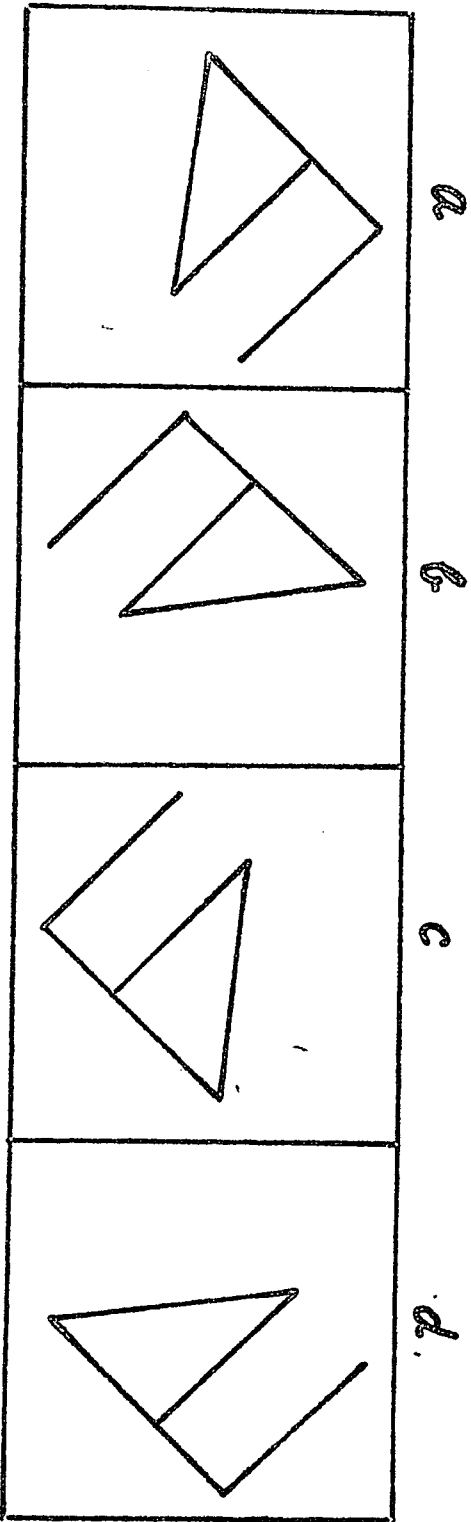
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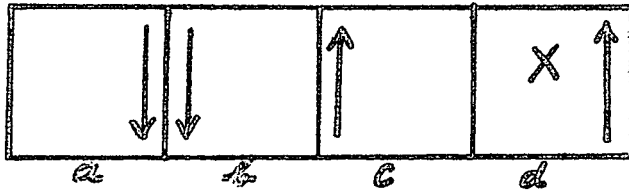
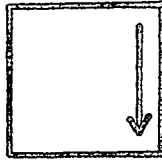


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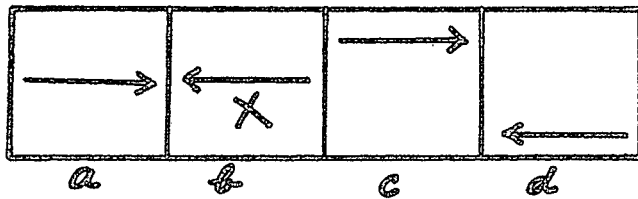
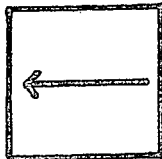


EXAMPLES

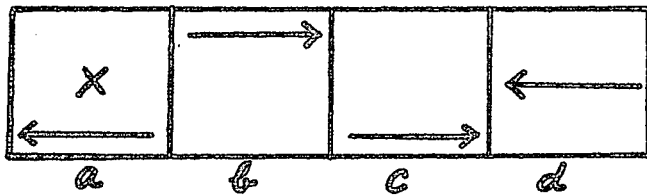
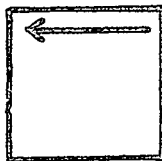
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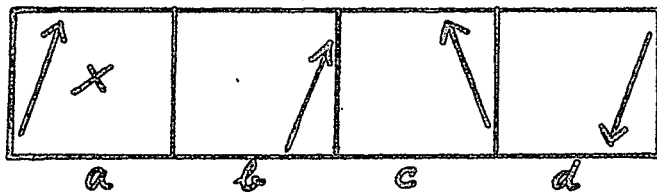
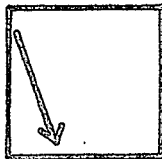
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DELAY OF RESPONSE IN PROBLEM SOLVING AND
COLOR RESPONSE TO RORSCHACH STIMULI
(Library of Congress No. Mic. 61)

Harwant Singh Gill, Ph.D.
Boston University Graduate School, 1961

Major Professor: A. William Hire, Professor of Clinical
Psychology

Introduction

This study examined the relationship between delay of response in problem-solving and ability to integrate color and form on a perceptual task. It was an attempt to relate a perceptual process to a personality variable, and thus make meaningful certain individual differences in perceiving in terms of more general principles of ego controls.

Theoretical Background

The hypothesis was derived from Rapaport who, in the interpretation of the Rorschach, considers psychological functions involved in the process of responding to the inkblots. These psychological functions are in turn embedded in the framework of psychoanalytic ego psychology, more specifically, psychoanalytic theory of thinking.

According to Rapaport, the form-color response (FC) involves an ability to delay response until a suitable percept integrating the color of the inkblot with

its form is available to the subject, while the pure color (C) and the color-form (CF) responses fail to achieve adequate integration of the color with the form because of insufficient delay.

If delay of response is the crucial variable differentiating between the various modes of handling color on the Rorschach, we should expect that the people characterized by ability to delay response in problem-solving would tend to give FC responses, while those unable to exercise delay would tend to give CF & C. In this study, delay of response was defined in terms of both speed and accuracy of response.

Procedure

A 25-item problem-solving task, the Mirror Task, was devised by the investigator. This task consists of geometric or alphabet-like figures, which have to be recognized in the form they would appear in a mirror. A correct solution of these problems often requires some delay of response, so that speed of response on this task can often make an appreciable difference in accuracy of response.

The problem-solving task was administered twice to 305 students in small group-sessions. The first administration was done with problems projected on a screen so as to control speed of response. The second administration used a booklet form of the task and students were allowed

to finish the task in as much or as little time as they needed. The differential increase in accuracy scores achieved on the second administration was found to be at least partly a function of different amounts of time spent. Fifteen individuals spending minimum time and achieving minimum score increase were selected to constitute the experimental group manifesting lack of response delay. Fifteen other individuals spending maximum time and achieving maximum score increase constituted the second experimental group, those able to exercise delay of response.

The 30 experimental subjects were administered a modified form of the Rorschach. This perceptual task consisted of 15 chromatic large detail areas (D) found fruitful in eliciting FC as well as CF & C responses. This modification in the Rorschach administration was deemed necessary in order to increase the number of color responses. Two successive administrations of the 15 selected locations yielded a total of 30 responses per subject, of which on an average about one-third were color-determined.

Results

A statistical analysis of the color scores revealed that the predicted FC, CF, and C differences between the two experimental groups reached .01, .001, and .0003 levels of significance respectively.

The research hypothesis was supported by the results of this study, and it was concluded that the people

characterized by inability to delay response in problem-solving are, on a perceptual task like the Rorschach, less capable of integrating the color of a stimulus with its form properties as compared to those who are characterized by delay of response.



AUTOBIOGRAPHY

I was born in Panjab, India, on March 3, 1932. The names of my parents are Beant S. and Karam K. Gill. The B. A. degree (English, Philosophy, Political Science) was received in 1953, and the M. A. degree (Psychology) in 1955, from Panjab University. Additional work was done at Panjab University, with an appointment as Research Scholar, before transfer to Boston University in September, 1957 for Ph.D. work in Clinical Psychology. The two years of study in residence at Boston University were followed by a year of internship at the Psychiatric Institute of the University of Maryland. Present employment is at the University Hospital of the University of Michigan as a staff psychologist.