ACCURACY OF TACTUAL PERCEPTION AND LEVEL OF ADJUSTMENT

Thesis for the Degree of Ph. D.

MICHIGAN STATE UNIVERSITY

Stanley Paul Rosenzweig

1956

This is to certify that the

thesis entitled

Accuracy of Tactual Perception

and Level of Adjustment

presented by

Stanley Paul Rosenzweig

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Psychology

Donald W. Fiske
Major professor

Date May 11, 1956

ACCURACY OF TACTUAL PERCEPTION AND LEVEL OF ADJUSTMENT

By

STANLEY PAUL ROSENZWEIG

A THESIS

Submitted to the School of Graduate Studies
of
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Psychology
1956

This study stemmed from recent research on the effect of personality variables on perceptual functioning. Specifically, this study was concerned with some aspects of the relationship between personality adjustment and accuracy of perception. Two tactual tasks were used to test hypotheses derived from the findings of previous investigations in this area. The first or Form task involved the identification of letters of the alphabet outlined by tacks and concealed from view in a stimulus box. Each letter appeared in two cue conditions -- minimally outlined and maximally outlined. The second or Numerosity task involved identifying the number of tacks on a card in the same stimulus box.

Three basic groups of subjects were used, each representing a different level of adjustment. The first or normal group consisted of VA employees; the second group consisted of patients in good contact, approximately half of whom were schizophrenics from an open ward in a VA neuropsychiatric hospital; the third group consisted of schizophrenic patients in poor contact from a back ward of the same hospital. All the groups were matched for age and education.

The results upheld two of the three original hypotheses. In general, the following conclusions appear to be warranted.

1. Perceptual accuracy appears to vary directly with overt adjustment, i.e., as adjustment decreases perceptual accuracy also decreases.

2. The perceptual accuracy of individuals at a given level of adjustment is similar regardless of the diagnoses of those involved. (No organic subjects were used in the study.)

3. A difficult perceptual task differentiates better than an easier one between levels of adjustment up to a point. Beyond this stage of adjustment a difficult task does not appear to be any more sensitive than an easier one.

4. A tactual task appears to have merit as a diagnostic tool.

Possible explanations of the relationship between perceptual accuracy and adjustment were discussed. It is believed that an explanation which postulates a general deficit state has considerable merit.

Further investigation of the relationship between perceptual functioning and personality maladjustment particularly using other modalities was recommended. Additional refinement of the tactual task was suggested so that its value as a diagnostic instrument may be increased.

ACKNOWLEDGMENTS

The writer wishes to express his sincere appreciation to Dr. Donald M. Johnson, his committee chairman, for his interest, encouragement, and helpful suggestions throughout the research. Thanks also should go to Dr. Alfred G. Dietze, Dr. Donald L. Grummon, and Dr. Walter F. Johnson, members of the author's guidance committee, for their interest and cooperation.

The author is indebted to the Veterans Administration in general, for facilitating the research and particularly to the staffs at Battle Creek and Ann Arbor, Michigan where this research was carried out. Dr. Julian J. Lasky, Chief psychologist at Ann Arbor, was very helpful and encouraging while I collected data at his installation. Special thanks should go to Dr. Stewart G. Armitage, under whom the author worked for several years, who was always stimulating and helpful. The author is indebted to Dr. Armitage, in addition, for his considerable assistance in constructing the apparatus.

Finally, the author would like to express his appreciation to the many subjects who participated in the experiment.

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I. INTRODUCTION

Perception has traditionally been one of the major areas of interest in psychology and has stimulated a considerable amount of theorizing and research. The early workers generally studied perception as an end in itself, paying relatively little attention to the broader need system of the perceiver. The emphasis was placed either on the sensory apparatus or upon the intrinsic laws of perceptual organization. Many modern investigators, however, now pay considerable attention to problems of interaction between the perceptual process, the environment, and the individual perceiver. They believe that the outer world is not registered by all in the same manner and it is this interaction which should receive the major focus of attention.

This latter interest in perception has been given a variety of designations. Gibson (15) calls this field of interest "schematic" perception, as contrasted with the more traditional studies of "literal" perception. The area is frequently referred to as "personality and perception" and the entire movement has earned the label "The New Look." Allport (1) groups all the major underlying assumptions here under the heading of "directive-state" theory. Murphy (34) earlier had referred to the same phenomena as "autism."

Essentially schematic perception deals with man's motives and needs as they influence his observations. The more traditional literal perception deals with all its dimensions and qualities. While literal perception is concerned with man's ability to discriminate among sensory stimuli (i.e., psychophysics) and also with the phenomenological study of objects and events (i.e., spatial perception, stimulus gradients, size and shape constancy, etc.) schematic perception concerns itself with the study of meaningful objects, individual differences, and social phenomena.

It is rather apparent that this area of investigation should be of great concern to the study of psychopathology. Likewise through the study of psychopathology valuable insights could conceivably be derived which would further clarify "New Look" hypotheses. It is this thought which leads to the conception of the present study. An attempt will be made here to investigate the interrelationship between a crucial aspect of the perceptual process, i.e., perceptual accuracy and personality adjustment. It was felt that such fundamental relationships should be clarified before more complex phenomena in this area can be fully understood.

Before progressing further an attempt should be made to define what is meant by perception. Perception may be conceived of as part of a process in which stimuli are received and acted upon by the organism. This process

can be thought of as having three major phases -- input, integration, and output. In the first stage stimuli act upon the organism's receptors, in the second stage the organism achieves an "understanding" of the stimuli and in the final stage the organism reacts to the stimuli based upon this "understanding." The second stage is in essence an integrative period wherein the meaning of the stimuli to the organism is ascertained. The first two stages, which occur with relatively little delay, may be thought of as representing perception. This definition is in accord with many of the present investigators in the field though some would consider only stage one as representing perception and assign stage two to some other process such as cognition. Concerning this point Allport states, "the two processes are so closely intertwined that it would scarcely be feasible ... to consider one of them in isolation from the other" (1, p. 14).[1]

A word should be said about the Gestalt view of perception. Basically their ideas are not inconsistent with those expressed by "New Look" theorists and in some ways could even be considered the forerunners of this point of view. The original Gestaltists, however, did not concern themselves to any extent with the motivational aspects

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1. It would be going too far afield for the purposes of this paper to deal extensively with the implications of the term perception. An excellent discussion of the problem may be found in Allport (1, Ch. 2).

of perception but instead concentrated a great deal on the properties of the stimulus field particularly in relation to inherent tendencies toward organization. However, they also stressed the dependence of outer organization upon the character of inner fields. Thus, many neo-Gestaltists interpret this conception as implying that the outward environmental stimulus pattern mirrors to a considerable extent the organized inner need pattern. (On this point see Murphy (34).)

II. RELATED RESEARCH AND THEORY

A. Perception and Personality

The research in the area of personality and perception does not stem from an organized set of postulates or a clearly formulated theory. Instead, theoretical concepts have emerged from a variety of studies which were conducted by investigators representing a number of frames of reference. Some attempt to unify this work may be seen in a number of recently published symposia (5, 8) on the topic. F. Allport in his recent book has made an attempt to integrate the bulk of the research data into a more-or-less organized theory. He divides the work in this area into six major sub-divisions. It would be worthwhile to examine each of these subdivisions briefly and then to derive a seventh from which the present investigation will directly stem.

Allport presents this material in the form of hypotheses. The first one is, "bodily needs tend to determine what is perceived." Various experiments have shown the effects of food deprivation upon perception. Sanford (49, 50), who did the pioneer study here, found that hungry individuals tended to interpret mutilated pictures in terms of food. A study by Levine, Chein, and Murphy (25) offered

further substantiation of this tendency for the hunger-state to influence what is seen.

The second hypothesis is that "reward and punishment associated with the perceiving of objects tend to determine what is perceived" and "also tend to determine its apparent magnitude and its speed of recognition." Making the assumption that reward and punishment create needs in an individual, Murphy (34) reasoned that they should therefore influence what is perceived. He and his students then carried out several experiments which upheld this reasoning. In one study (51) a strong tendency was found for subjects to perceive the ambiguous stimulus patterns (resembling a face) for which they had been rewarded during a training period rather than the alternate stimulus patterns which had been accompanied by punishment during the training period. In another study (40) psychophysical estimates were influenced by rewards given during a training period.

Smith, Parker, and Robinson (53) found that they could create a tendency to overestimate number of dots by monetary rewards. Rigby and Rigby (42) found that reward influenced reaction time when stimuli were presented tachistoscopically.

The third hypothesis is that "values characteristic of the individual tend to determine the speed with which words related to those values are recognized." Postman, Bruner, and McGinnies (39) found that the threshold for recognizing given words was related to their value systems as determined

by the Allport-Vernon (A-V) Study of Values, i.e., the higher the value to the individual of the value category of the word the shorter the latency. Vanderplas and Blake (56) found a similar result using auditory stimuli.

The fourth hypothesis states that "the value of objects to the individual tends to determine their perceived magnitudes." Bruner and Goodman (6) did the major study here and found that "poor" children tended to overestimate the size of coins more than "rich" children. A series of additional studies found results which also tended to support this general hypothesis (Ashley, Harper and Runyon (2), Lambert, Solomon and Watson (23), Bruner and Postman (7)).

The fifth hypothesis is that "personality characteristics of the individual predispose him to perceive things in a manner consistent with those characteristics." This hypothesis covers a broad area and is basic to much of the work in clinical psychology. It is, in fact, the fundamental assumption made in the interpretation of projective techniques. Recently there have been a number of perception studies whose results have tended to lend support to the hypothesis. Witkin and his associates (60) in a large scale research project found that specific personality characteristics seemed to be correlated with the way in which an individual orients himself in space. Studies by Frenkel-Brunswik (12, 13) appeared to indicate that intolerance

for ambiguity is a generalized personality trait and that ethnically prejudiced individuals are more rigid in classifying a series of pictures where one object changes gradually into another. Klein (19, 20) in a series of studies found that individuals have characteristic attitudes which are pervasive and emerge consistantly in performing various perceptual tasks.

The sixth hypothesis states that "verbal stimuli that are emotionally disturbing or threatening ... tend to require a longer reaction time than neutral words ... and to arouse their characteristic emotional reactions even before they are recognized." This hypothesis covers the problems of perceptual defense and subliminal perception (or subception) and stems from the original work of McGinnies (30) and McCleary and Lazarus (28). These concepts have stimulated considerable research but it would require going too far afield to explore them to any extent.[1]

To these six hypotheses on the interrelationship of perception and personality the present writer would add a seventh: Disturbances in personality functioning (e.g., social maladjustment) are correlated with the quality and

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1. Many aspects of the preceding discussion are, of course, still controversial. There have been instances when different investigators were not able to replicate the results of some of these studies (9, 43). Allport (1) who is generally critical of the directive-state point of view feels that while it is reasonable to suppose that motivating conditions effect perceptions the exact way in which they are related is not yet clear.

adequacy of the individual's perceptions. To some degree this hypothesis is merely a subdivision of hypothesis 5 but the particular significance of this topic merits it special consideration. Research with projective techniques particularly with the Rorschach test adds important data here. A long list of studies have tended to indicate that socially maladjusted groups perceive the ink blots differently than a normal population. For example, Miale and Harrower-Erikson (32) found that neurotics give fewer responses, less human movement, more pure form and more animal responses than normals. Many investigators have compared schizophrenic reactions to normals. In general most of the findings are in agreement with those of Beck (3) who found that schizophrenics gave more pure color responses, less form dominated color responses, more rare detail, and less adequate form responses than a normal group. (The list is actually much longer than this and includes many important qualitative indicators.) Other investigators have been able to differentiate such clinical groups as depressive and manic states, psychopathic personalities, alcoholics, and organics on the basis of the Rorschach.[1]

A number of studies have specifically set out to test experimentally hypotheses concerning the perception of

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1. For a comprehensive bibliography of such studies see Bell, J. E. Projective Techniques (4).

maladjusted individuals. Merrell(31), for example, after reviewing a good deal of the theoretical literature on schizophrenia concluded that "the schizophrenic process involves a relative inability of the individual to organize stimulus values into extensive, flexible, perceptual units, or conversely a tendency ... to react to stimuli ... by forming relatively limited, rigid perceptual units" (31, p. 27). In order to test this hypothesis he devised a series of pictures which could be grouped into various story units. He then presented these pictures to a group of schizophrenics and a group of normals by projecting them on a screen out of focus. He found that the perceptual units formed by the schizophrenics included fewer of the potential stimulus elements and were more resistive to change in the light of changing stimulus events than those of normals.

Lovinger (26, 27) found that schizophrenics in poor contact with reality manifested less size constancy under experimental conditions involving minimal distance cues (i.e., reduced illumination) than did either schizophrenics in good contact or normals. He interprets this finding as indicating "that the schizophrenic's break with reality involves not only more complex psychological functions but basic perceptual processes as well" (26, p. 59).

While the previous two studies concentrated only on schizophrenic reactions, Rubinstein (48) investigated the

influence of general personality adjustment or integration on the perceptual process. He used a series of incomplete line drawings of simple objects in three graded stages of ambiguity. The subjects were presented with the drawings in the reverse order of their ambiguity and were asked to identify the objects. The subjects consisted of white, male veterans representing a wide range of degree of personality adjustment. Each subject was rated on a scale for personality adjustment three times -- once on the basis of his case history, once on the basis of the psychiatrist's impression and finally on the basis of the psychologist's impression. Also, basic Rorschach scores were computed for each subject. These measures correlated highly with each other and were finally combined into a single measure of adjustment. There were two major findings. First, as the structuration of the stimuli increased errors decreased. Second, there was a significant positive correlation between adjustment and accuracy of perception, i.e., the poorer the adjustment the less the accuracy. The author thus concludes, "all other things being equal, the role of internal factors in the perceptual process decreases with increased structuration of stimulus" and "all other things being equal the role of internal factors in the perceptual process increases with decreased total personality integration" (48, p. 29).

B. Theoretical Formulations

A question that one might ask here is, "How consistant are some of the findings in the area of schematic perception with some of the broader theories of personality?" Actually the hypotheses derived from these studies may be considered as representing a segment of a theory rather than an integrated theory in themselves. However, if these hypotheses have merit they should coincide with the broader formulations about personality. An attempt will be made to show how several of the hypotheses may be derived from two different theoretical viewpoints.

The first point of view to be considered is the phenomenological one centered about the self concept. This is the theoretical orientation usually associated with Snygg and Combs (54), Lecky (24), and Rogers (44). According to these theorists an organism's behavior is determined by its phenomenal field, including the organism itself, as experienced at the moment of action. The organism attempts to satisfy its needs and to conform to the existing organization of its phenomenal field by a process of perceptual selection.

Rogers, in particular, stresses that an individual's behavior is influenced to a considerable extent by sensations and perceptions which, because they are in some way unacceptable to the self, are denied to awareness. A well adjusted individual according to this view is one whose denied

experiences and perceptions are at a minimum. The maladjusted person has had to deny and distort many of his experiences and perceptions. Denied and distorted perceptions lead to further inaccurate perceptions in order to maintain the personality equilibrium. These distortions are not only in the realm of the self concept and interpersonal dealings but also extend to perceptions of the physical world.

Hence, this point of view is quite consistent with the general trend of the research in schematic perception, particularly in the area of perception and pathology (see hypothesis seven). Rogers and his followers, in fact, have contributed research which offers further substantiation of the view. Most of the Rogerian research naturally is concerned with the process of psychotherapy, from which many of their ideas originally stemmed. Therapy is conceived of as a process which allows an individual to reorganize his perceptions. Thus, a number of research studies concerned themselves with perceptual measures before and after successful treatment.

Although when Rogers refers to changes in perception he usually employs the concept in its broadest sense particularly alluding to self perceptions and interpersonal perceptions he also feels that "even if we define perception in its narrowest terms, as the meaning given to visual stimuli there is clinical evidence to suggest that perceptual

reorganization takes place in some clients, and that this reorganization ... appears to affect the perception of the world at large" (45, p. 309).

Rogers reports several studies conducted at the University of Chicago which found structural changes in the perception of the Rorschach ink blots after successful therapy. A group at the same university (41, 52) are conducting studies whereby various perceptual tasks are administered before and after therapy. They hypothesize that those who improve in therapy will show significant changes in their perceptions in the direction of greater organization.[1]

A study dealing with aspects of the self-theory and perception but not immediately concerned with psychotherpy was carried out by Chodorkoff (10). He was particularly concerned with the relationships between an individual's self-description, personal adjustment, and perceptual defense, which in his study referred to the differential recognition of threatening and non-threatening words. His results indicated that the greater the agreement between an individual's self description of him, the less perceptual defense he will show and the more adequate will be

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1. While no results of these studies have yet been published Seeman, the principal investigator, has indicated through personal communication that the changes so far have been insignificant.

his personal adjustment. Also, the more adequate the personal adjustment, the less perceptual defense will be shown. The author thus feels that there is a direct relationship between faulty perceptions and inadequate personal adjustments. This, of course, is a very similar conclusion to the one reached by Rubinstein.

The second theoretical position to be considered is the developmental approach originally formulated by Heinz Werner (58) and later serving an important role in the personality theory of Murphy (34). According to this position there is a definite developmental direction. First, behavior and perceptions are diffuse and undifferentiated, then there is a stage of unorganized differentiation, and finally a state of integrated organization. Development, however, is not regarded as being complete when the final stage is reached but is characterized instead by shifts and changes. Normal and pathological functioning are considered as lying along a continuum representing relative dominance of higher or lower stages of development. Thus, psychopathology or maladjustment represents a relative dominance of early developmental levels and a decreased emphasis of higher, genetically more developed levels.

According to this point of view the individual's developmental status is reflected in his perceptions even more than in his thought content. Also, this status is the determinant of the individual's level of adjustment.

Hence, an adult who functions primarily on the basis of the early developmental stages would be quite maladjusted (e.g., schizophrenic). While such an individual would appear to be childlike in much of his behavior it would primarily be his perceptions which would be "regressed."

The most crucial testing of these hypotheses was probably carried out by a group at Clark University headed by Phillips (14, 36, 37). They employed the Rorschach technique as a measure of perceptual processes. A scoring technique was devised based on location and form-level so that these scores could reflect the entire range of perceptual development (i.e., from the diffuse to the organized). They administered the Rorschach to normal groups including children at various age levels and to a variety of clinical groups. They predicted that the perceptual responses of groups of ascending psychiatric intactness would parallel the ascent in children of increasing age levels and those least intact would be most similar to the youngest age group. In general, the findings tended to substantiate these predictions.

These results appear to be very much in accord with a good deal of the work already cited. Particularly there is agreement with Rubinstein and Chodorkoff that the greater the degree of maladjustment or personality disorganization the less adequate the perception. Developmental theory incidentally is also able to explain why in Rubinstein's

study structured tasks did not differentiate the maladjusted (all subjects in his study made fewer errors as the structuration of the stimuli increased) and why in Lovinger's research it was the minimal cue condition which was able to differentiate between the poor contact schizophrenics and the other groups. As a stimulus becomes less structured, making the task more difficult, it requires a greater amount of the more highly developed perceptual activities on the part of the subject. But since increased maladjustment brings with it a relative decrease in the more mature perceptual abilities when the task is not too well structured (e.g., minimal cue in Lovinger's study) the more maladjusted people are at a greater disadvantage. If a task is so easy as to require only the most minimal perceptual skills then even a severely maladjusted group is apt to do well.

Hence it appears that both theories have something to offer for understanding the interrelationship of perception and pathology. One might even see in perception the potential for tying together various of the personality theories. At any rate it is of interest that different orientations, encouraging different types of research, are able to reach similar conclusions in regard to problems in this area.

III. PROBLEM and HYPOTHESES

The present study is an attempt to follow up some of the findings regarding the interrelationship of perceptual factors and personality adjustment. In retesting a number of these findings, however, an attempt will be made to overcome some of the methodological limitations which are inherent in many of the perception-pathology studies reviewed. Thus, few of the previously cited studies actually dealt with pure perceptual phenomena. They were usually contaminated by more complex psychological factors. Whenever the stimulus is complex and possesses possible affective implications (e.g., such as the Rorschach cards) it is difficult to ascertain just what aspects of the stimuli are eliciting the response. Also, the problem is further complicated when any but the most straightforward response is required, for then the problems of introspective abilities and accuracy of reporting are involved. The ideal experimental situation is, of course, rare. Nevertheless, research eliminating some of the extraneous variables is needed before many of the implications of previously cited experiments can be fully accepted. It is necessary to determine if the same relationships exist when some of these factors are removed.

Various investigators, representing different orientations, have indicated that a direct relationship exists between the adequacy of one's perceptions and his level of adjustment. This finding was implied in the results of Chodorkoff and the Phillips group but was probably most directly dealt with in Rubinstein's study. The first question, then, that is to be considered here is, "Will further investigation substantiate the direct relationship between perceptual accuracy and adjustment as found by these investigators?"

The next question to which this study will address itself concerns the complexity of the task. A direct implication of Rubinstein's study is that a less structured task should be more sensitive to personality maladjustment than a more structured one. This is consistent with Lovinger's finding that only a minimal cue condition in a size constancy experiment was sensitive enough to discriminate a poor contact group from other groups. It may be seen that degree of structuration and amount of relevant cues available are both dimensions of a task's difficulty. Hence, a second question might be phrased, "Will a difficult task (i.e., one with few relevant cues) be able to differentiate between groups at different levels of adjustment better than an easier task (i.e., one with a greater number of cues)?" If no cues are available or if the task is insoluble, of course, the relationship most likely would not hold since there would probably be no difference between groups.

Finally, if this relationship between perceptual accuracy and adjustment is substantial, it would indicate that level of adjustment and not diagnostic category as such is the crucial variable. Thus, it was the severity of the maladjustment which was related to perceptual adequacy in the studies of Chodorkoff and Rubinstein. Hence, a final question to be investigated might be worded, "Will there be a relatively uniform performance on a perceptual task within a given stage of adjustment regardless of diagnosis?"

These questions may now be stated as three specific, testable hypotheses:

1. If relatively discrete groups on a continuum of adjustment are presented a series of perceptual tasks the best adjusted group will make the fewest distortions (i.e., have the greatest accuracy) and each succeeding group will make progressively more, so that the most poorly adjusted group will have the most distortions.

2. A difficult task, i.e., one having few relevant cues, will be more sensitive in discriminating between these groups than an easier one, i.e., one having more relevant cues.

3. Within a given level of adjustment there will be no difference in perceptual accuracy between the major diagnostic groups (i.e., schizophrenics vs. non-schizophrenics).

IV. METHODOLOGY

A. Subjects

Three basic groups of subjects were used, each representing a different stage of adjustment. The normal or control group (A) consisted of 17 male VA employees, mostly workers in physical medicine and rehabilitation and nursing aides, selected from Battle Creek and Ann Arbor, Michigan. All of these employees had a satisfactory work history and were rated as stable by their supervisors. The second or good contact patient group (B) was chosen from patients on the "best" open ward of a VA neuropsychiatric hospital (Battle Creek, Michigan). All of these people were in good reality contact with no observable signs of severe pathology (e.g., hallucinatory activities, mutism, extreme carelessness in appearance). This group consisted of 12 individuals whose psychiatric diagnosis was schizophrenia (B_1) and 14 whose diagnosis was other than schizophrenia, i.e., character disorders, neurotics, manic depressives (B_2). The third or poor contact patient group (C) consisted of twenty schizophrenic patients from one of the "back" wards of the same hospital.[1] The adjustment of patients

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1. The original design of the experiment called for the poor contact group also to consist of both schizophrenics and non-schizophrenics but this plan had to be abandoned since there were almost no patients bearing a non-schizophrenic diagnosis on the "back" wards other than organics.

on this back ward is such that they are not eligible for regular open ward status. If their conditions were to improve they would first be placed on an intermediate ward. Thus, this group can be considered to be more than one step away from the "best" open ward.

Only schizophrenics diagnosed paranoid, unclassified, or mixed (an old term synonymous with unclassified) were used since other sub-classifications were almost non-existent in the open ward and it would have added another factor if those bearing other schizophrenic diagnoses (i.e., catatonic, hebephrenic) were used in the poor contact group. No subject with known organic pathology was used in any of the groups so as to avoid this additional confounding factor.

All groups were matched for age and education. Table 1 gives the major characteristics of the various groups.

These groups, then, may be viewed as representing three distinct steps along a continuum of environmental adjustment. Thus, the first group consists of individuals apparently able to make a stable adjustment in society. The second group is comprised of those whose reality contact is good but whose problems are severe enough so that adequate adjustment on the outside was not possible and hospitalization was necessary. The third group represents individuals whose outward adjustment is poor, even in a mental hospital setting.

TABLE 1

AGE AND EDUCATION OF THE GROUPS

Group		N	Mean Age	Range	Mean Educ.	Range
A	Control	17	31.1	23-36	12.2	8-17
B_1	Good contact schizophrenic	12	29.3	21-38	11.1	8-15
B_2	Good contact non-schizophrenic	14	31.6	26-40	11.0	8-16
B	Total good contact	26	30.9	21-40	11.0	8-16
C	Poor contact schizophrenic	20	31.8	26-38	11.5	8-16

B. The Tactual Tasks

Considerable thought was given to the choice of tasks which would be suitable to test these hypotheses. In order to avoid tapping the many extraneous factors which have confounded other studies on schematic percpetion a basically simple percpetual task requiring an uncomplicated response was sought. Also, since subjects representing a wide range of personality adjustment were to be used the task could not be too complex for those in poor reality contact and yet still had to be challenging for all. It was felt that a tactual task would meet most of these requisites. And, in addition, such a task would allow testing of the perceptual hypotheses in a medium that has rarely been explored in research. Recently two investigators (35, 46) reported considerable success using tasks of a tactual nature as tests of organicity. Their work also indicated that such tasks were practicable for research purposes.

1. The Form Task

The major task used was a variation of the one employed by Ross (46).[1] The stimuli were the heads of paper fastener

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1. Ross (see 47) used plywood boards 10" by 10" with forms outlined by thumbtack heads as his stimuli. He presented them through a plywood box which obstructed them from the view of the subjects. His major task consisted of eleven designs each in four stages of completion. The subjects' task was to identify each form after running his hand over it, by drawing it and later by identifying it in a multiple-choice situation.

tacks (No. 1, round head, bronze) in the form of letters of the alphabet on cardboard sections 7" by 8". There were 34 cards in all, consisting of 17 letters each in two cue conditions or stages of completeness. The first stage of completeness, minimal cue, consisted of the fewest number of tacks which could be used to outline the letter without destroying its essential characteristics, while the other stage, maximal cue, consisted of the letter completely outlined by tacks. These cards were presented through a plywood box (painted black) 12" by 12" by 24". The side which faced the subject had a hole for the arm and was covered by an opaque cloth curtain. The opposite end of the box was open allowing the examiner to present the stimuli. The cards fit securely into slots where they were held stationary. The arrangement was such that the examiner could readily insert or remove a card. A box which contained the stimulus cards completely shielded them from the view of the subject before and after they were presented. For further description of the apparatus see Appendix A.

The 34 cards were presented in a standard random order to each subject. This order (see Appendix B) was derived from a table of random numbers. A sample card containing the letter "Z" was used for the purposes of illustration. This letter, which was the same size as all the others, contained more than the minimal but less than the maximal number of tacks necessary to outline it.

Each of the control subjects was told that he was serving as part of a normal group for research with a new type of test. It was explained that a patient population was being tested with this task and to evaluate their results properly it was necessary to know how normal people performed. Each of the patients was told that a new task was being constructed and a sample of the patients in the hospital was being asked if they would mind participating in the study. Participation was on a voluntary basis both for control and patient groups.

An attempt was made to establish an informal atmosphere with each subject. After the introductory remarks were made, approximately the following instructions were given:

> I am going to show you a task which I think you will find interesting. It is something a little different. We are going to be working with ~~with~~ letters of the alphabet outlined in tacks, similar to this one. (Subject is shown sample card.) Can you tell me what letter this is? That's right (if subject responds correctly). Now, I am going to put this letter in this box and I want you to place your hand underneath the curtain at this end and run it over the letter until you can identify it. (Once the subject places his hand in the box he is oriented to the letter, i.e., the boundaries of the letter are pointed out to him.) Fine, (if

the subject is able to identify the "Z") now that's all there is to it. I have a group of other letters like this one that I am going to present. They will all be capital letters right-side up. The same letter may appear more than once; that is, the fact that a letter occurs once does not mean that it will not occur again. Also, there may be some instances where after running your hand over the letter for a sufficient period of time you will not be sure what letter it is. In these cases I would like you to make your best guess. Any questions? Okay, then we can begin.

Some modifications of these instructions were naturally made to suit individual cases. If, for any reason, the subject was not able to comprehend these instructions or was not able to identify the sample letter he was not used in the research. Thus, testing was not carried out for 2 normals (apparently of very low intelligence), one good contact non-schizophrenic, and four poor contact schizophrenics because of their inability to meet these requirements.

2. Numerosity Task

An additional tactual problem was used, one that could serve as a further check on hypotheses one and three. The task consisted of presenting ten of the minimal cue cards, one at a time upside down through the same stimulus box and

asking the subject to determine the number of tacks on each card. The task was given to the subject immediately upon completion of the first task with these instructions.

> Fine, now we are going to do something else. I am going to present cards to you but now I just want you to tell me the number of tacks on each card. That is, just run your hand over the card and tell me how many tacks there are.

In no instance during the testing was the subject told whether his response was correct or incorrect and generally questions were deferred until the end of the testing period. Encouraging remarks such as, "that's fine" or "you are doing well" were sprinkled throughout the testing. Actually there were enough easy items interspersed throughout the tasks to guarantee some feeling of success for almost all subjects. Most of the subjects apparently found the tasks interesting and there were few if any comments to indicate that the situation was interpreted as threatening or upsetting. The two tasks combined required an average of only 35 minutes for each subject.

For the first or "Form" task a maximum of thirty seconds was alloted for each letter. This was usually ample time to elicit a response from the subject. If he had made no response by this time he was encouraged to guess. Otherwise each letter was removed as soon as the subject made a response. Each correct response was given

a score of one and each correct response given within ten seconds was given an additional score of one. Thus, a maximum score of 68 was possible. Separate totals for the maximal cue and minimal cue cards were also computed. For the second or "Numerosity" task a maximum amount of ten seconds was allowed on each card. The score was the sum of the deviations from the correct numbers. (Thus, if the subject responded "six" to the first card while there were actually eight tacks he received a score of two.)

V. RESULTS

The reliabilities of the tasks were computed by the split-half method and corrected by the Spearman-Brown Prophecy Formula. The computations were based on forty cases selected at random from the total 63. The reliabilities of the Form task were as follows: For the maximal cue condition .780, for the minimal cue condition .742, and for the total score .886. The reliability of the Numerosity task was .847. The correlation between the Form task and the Numerosity task was .364. This correlation is significant at the .02 level. The correlation between the minimal cue condition and the maximal cue condition on the Form task was .600 which is significant at less than the .01 level.

Let us next examine the data bearing directly on the hypotheses. It is necessary to consider the results pertinent to the third hypothesis before the others are considered, for if the good contact schizophrenics and the good contact non-schizophrenics do not differ significantly they may then be combined into one "good contact" group. Table 2 shows the results for these groups on the two tasks. As may be seen in this table the mean scores of groups B_1 and B_2 are quite similar on both the Form and the Numerosity tasks. It would appear from these statistics, then, that

TABLE 2

COMPARISON OF GOOD CONTACT GROUPS

ON THE TWO TASKS

		Form		Numerosity	
Group	N	Mean	S.D.	Mean	S.D.
B_1 Good contact schizophrenic	12	38.33	8.01	8.50	3.47
B_2 Good contact non-schizophrenic	14	37.92	5.91	8.80	3.72
B Good contact total	26	38.11	7.01	8.69	3.52

no real difference exists in the performance of these groups on either task. Thus, the third hypothesis seems to be confirmed. And now the "good contact" group may be considered as a unit for further comparisons.

Table 3A shows the results of the three major groups on the two tasks, while Table 3B shows the results of "t" tests of significance between groups A and B and groups B and C on each task. It can be seen that the Form task was able to differentiate significantly between groups A and B and also between groups B and C. The Numerosity task did not differentiate significantly between groups A and B but did between groups B and C. Thus, except for the difference between groups A and B on the Numerosity task the results upheld the hypothesis.

Data pertinent to the testing of hypothesis two are reported in Table 4. Table 4A shows how each of the three groups fared on the different cue conditions of the Form task. Table 4B gives data which are even more crucial. The minimal cue task is able to differentiate significantly between groups A and B while the maximal cue task is not. However, both the maximal and minimal cue tasks are able to differentiate significantly between groups B and C (and at the same level of confidence). Hence, the second hypothesis, which predicted that the minimal cue task would be the more sensitive

TABLE 3A

PERFORMANCE OF GROUPS ON THE TWO TASKS

		Form		Numerosity	
Group	N	Mean	S.D.	Mean	S.D.
A Control	17	42.47	5.90	8.00	2.55
B Good contact	26	38.11	7.01	8.69	3.52
C Poor contact	20	26.50	7.10	17.70	8.74

TABLE 3B

TESTS OF SIGNIFICANCE BETWEEN GROUPS

	Form		Numerosity	
Groups	t*	p	t	p
A & B	2.15	.02	.74	--
B & C	5.40	.0001	4.25	.0001

* One tail test

TABLE 4A

PERFORMANCE OF GROUPS ON MAXIMAL

AND MINIMAL CUE CONDITIONS

	Maximal		Minimal	
Group	Mean	S.D.	Mean	S.D.
A	30.88	3.60	11.58	3.74
B	29.19	4.24	8.92	3.46
C	22.25	4.90	3.95	3.80

TABLE 4B

TESTS OF SIGNIFICANCE BETWEEN GROUPS

FOR THE TWO CUE CONDITIONS

	Maximal		Minimal	
Groups	t	p	t	p
A & B	1.30	--	2.32	.02
B & C	4.96	.0001	4.41	.0001

one in differentiating between the groups is only borne out between the normal and the good contact patient group.

Although the tasks used were selected primarily to test various theoretical hypotheses one might suspect that they also possess diagnostic potentialities. To ascertain the diagnostic power of the tasks various cut-off points were chosen for each task. Various breakdowns were computed using cut-off scores (see Appendix D) and Table 5 shows the significance of the predictions using these scores. Hence, if one's job is to differentiate a normal group (A) from a good contact maladjusted group (B) and a cut-off score on the Form task of 40 is used, we would be correct in 65% of the cases. If the problem is to differentiate a poor contact group (C) from a population consisting of normals and good contact maladjusted (A & B), by using a cut-off score of 30 with the Form task, 87% of the cases would be predicted correctly.

A more crucial test of a task's diagnostic predicting power is when it is required to differentiate a mixed population into three elements. Here, two cut-off scores must be used. Using cut-off scores with the Form test, it is predicted that all those scoring 40 or above are normals, all those scoring between 30 and 39 are good contacts, and all those below 30 are poor contacts. These scores lead to correct predictions in 67% of the cases. Table 6 indicates that using each of the two tasks in five instances only once

TABLE 5

ACCURACY OF DIAGNOSTIC PREDICTIONS BASED ON CUT-OFF SCORES

A. Form

Groups	N	Cut-Off	% Correct	p*
A & B	43	40	65	.05
A + (B+C)	63	40	75	.01
(A+B) + C	63	30	87	.01
B + C	46	30	87	.01
A + B + C	63	40;30	67	.01

B. Numerosity

Groups	N	Cut-Off	% Correct	p*
A + B	43	8	58	--
A + (B+C)	63	8	70	.01
(A+B) + C	63	13	89	.01
B + C	46	13	85	.01
A + B + C	63	8;13	60	.01

*Based on Chi Square Analysis

is the predictive accuracy not statistically significant, i.e., in differentiating normals from good contacts with the Numerosity task.

VI. DISCUSSION

A. The Hypotheses

The results of this study appear to substantiate several of the hypotheses concerning the relationship between personality adjustment and adequacy of perception. Basically, the direct relationship between level of adjustment and perceptual accuracy referred to by Rubinstein and others was upheld. The present study may be considered as providing a more crucial test of this relationship since the tasks employed, being of a simple nature and requiring relatively uncomplicated responses were less apt to be contaminated by additional internal and external variables. In addition, the Form task was able to differentiate between two groups whose reality contact was phenotypically equivalent but who represented different levels of social adjustment, i.e., the control group and the good contact patient group. Another factor of significance here is that the hypothesis was borne out when tested in a different sensory modality.

It is obvious that not all perceptual tasks are able to differentiate as well between groups at different levels of adjustment. For example, in the present study the Numerosity task was not as sensitive as the Form task.

It can be observed that these two tasks do not measure exactly the same dimension of perception since there is only a low positive correlation between them (.364). Exactly what attributes the Form test possesses which allow it to be more successful are not clarified by this experiment. It does appear to require a less involved response than the Numerosity one. Careful scrutiny of these tasks through further investigation could clarify this point.

The finding that individuals rated at a given level of adjustment perceive with a similar degree of accuracy, a degree which is significantly different from others at different levels of adjustment, might have important implications for general diagnostic procedures. The great differences found among the schizophrencis in good contact and those in poor contact, for example, point out how dissimilar individuals may be though bearing the same diagnostic label. It is becoming increasingly evident that many of the traditional criteria for diagnosing psychopathology are inadequate. There is, in fact, a movement afoot for instituting reforms (see e.g., King (17)). While the results of the present study do not indicate exactly where present diagnostic groupings are inadequate they do point out the importance of one aspect of psychological status, i.e., level of adjustment, an aspect which has often been ignored in traditional nosologies. Thus, to

understand a patient diagnostically it is important not only to know what disease entity he may possess but also where along a general continuum of adjustment he would fall.

Concerning the relationship between adjustment and cue condition or difficulty of a task, the results of the study indicate that this is somewhat more complex than originally hypothesized. Thus, the maximal cue task was at least as difficult to the poor contact group as the minimal cue task. The evidence seems to indicate that a difficult perceptual task differentiates better than an easier one between levels of adjustment up to a point. But, beyond this level of adjustment an individual's perceptual accuracy is apt to be as poor with many relevant cues as with few.

A good deal of this seems to depend on the number of relevant cues available or the structuration of a task. It appears likely that the more relevant cues available, the further along the continuum of adjustment one would have to go before a task falls below the individual's threshold. While the answers here are not all clear, it does appear that the situation is not quite as simple as Rubinstein indicated, namely, that as structure of a task is increased it is less difficult for all regardless of level of adjustment.

B. Explanations of Perception-Pathology Relationship

The present research seems to add more fuel to the finding that the perceptual accuracy of maladjusted people is impaired and that this impairment increases as the maladjustment increases. But, what would account for this? According to the self theory perceptions are denied or distorted to maintain the individual's self equilibrium and according to Werner's theory there has been inadequate perceptual development or perceptual regression has occurred. These are adequate explanations at only one level, they do not explain, however, what happens within the maladjusted individual to account for his inadequate perceptions. In other words, neither theory describes the specifics of the situation at the organism's own level.

A number of possible explanations will be considered. These explanations are by no means mutually exclusive, but instead it is likely that some of them may be operating concurrently. An attempt will be made to evaluate the plausibility of each of these explanations.

Before going into these explanations, however, it might be worthwhile to consider the results of a large scale study recently reported by King (18) in an area outside of perception, i.e., psychomotor behavior. It is felt that the results of this study have much to offer for a fuller understanding of the possible phenomena

occurring here. In King's study a wide variety of psychomotor tasks were applied to a large sample of psychiatric subjects. The test battery included speed of tapping, finger dexterity, reaction time, etc. One of the findings was that psychomotor retardation increased as psychopathology increased, "indicating a close correspondence between performance on the test battery and clinical status" (18, p. 154). The finding, of course, is quite similar to results with perceptual tasks. King believes that motor adjustment to the environment is a basic process which is disturbed in psychopathology. One might, however, wonder whether this impairment is not the result of a more fundamental difficulty which effects not only psychomotor ability but perceptual functioning as well.

Let us now proceed to an examination and evaluation of possible explanations for the phenomena. Six will be considered in all.

1. Deficiency in receptors. One possible cause of impaired perception is impairment of the organism's receptors. Thus, there would be a distortion in the first or input stage of the organism's interaction with the environment (see definition of perception in Introduction). However, no studies have yet indicated that deficiencies actually exist in the receptor organs of maladjusted people. If the difficulty or at least part of the difficulty lies here it has yet to be shown.

2. Deficiency in output. If an individual had difficulty in expressing a response (final stage of the "interaction" process) this could be mistaken for a basic disability in perceptual functioning. Thus, if we ask a person to reproduce a picture of a triangle and he scribbles a few lines we might conclude that this represented what he perceived. Yet, in reality, he might have perceived the stimulus accurately but have been unable to physically reproduce it. This type of disability is especially prevalent in cases of organic brain damage. This problem, however, was greatly minimized in the present study by having the necessary response very simple, by using initial screening (e.g., sample letter), and by eliminating organic subjects from the population. It is, thus, highly unlikely that the perceptual impairment encountered was due to difficulty in output in the experiment.

3. Physiological deficiency. Two major types of physiological deficiencies are frequently mentioned in the literature as being possible concomitants of mental disorders. They are metabolic disturbances and irregular brain waves. Morgan (33) mentions a number of studies attempting to relate metabolic disorder to psychopathology. There are some preliminary results in a positive direction with schizophrenics but as yet no definitive findings. As for brain waves there have been intermittent claims of a strong correlation between irregular EEG patterns and

behavior disorders. However, continued research has been unable to clearly substantiate this relationship. Morgan, after reviewing the studies in the area, concludes that no relationship exists.

Certainly we are in no position to rule out the influence of physiological factors. Possibly some factors that have not yet been considered will prove to have a significant relationship. There are many investigators currently working on this problem. Of course, even if physiological correlates of maladjustment were established it would have to be shown that they would effect perceptual responses.

4. Motivation. Perhaps what appears to be inaccurate perception is actually lack of interest or motivation in the situation. We are referring here to more-or-less fleeting, situational motivation because if the motivational problem is pervasive, always influencing the performance, then we are in reality dealing with something else -- more of a chronic incapacitation. Situational motivation was encouraged in the study by establishment of rapport, using a relatively simple testing technique, and generally attempting to minimize stress in the situation. Also, there is no a priori reason to believe that situational motivation worked more in favor of the control group than the good contact group. It is likely that if any group was influenced by negative motivational attitudes

it would be the poor contact one. However, if this was an influencing factor one might assume that a negative emotional state would be with these individuals in almost everything they performed. In that case the difficulty detected by the perceptual task would still be a fairly basic one.

5. Stress or anxiety. One might conceive of maladjusted people as individuals who are continually under pressure and who possess a certain degree of anxiety which is continually handicapping them. The degree of constant stress would be directly proportional to the degree of maladjustment. If this assumption is tenable we may turn to the literature dealing with the effect of stress on perceptual accuracy. The literature is relatively clear-cut in this area. A group of different studies (22, 38, 57) all found that stress conditions resulted in less efficient perceptions. Thus, it is reasonable to assume that a constant state of stress in an organism would impair the organism's perceptual functioning.

However, reliance on stress as a rationale for inaccurate perception still leaves questions unanswered. One might ask what there is about a stress condition which causes the reduction in perceptual adequacy. Korchin (22) believes that a chemical imbalance (excess of hippuric acid) may be the intermediary between maladjustment and perceptual inefficiency. Postman and Bruner (38) believe

that stress causes a frustrating situation and leads to a type of regression. This latter explanation would fit well into Werner's theory. Perhaps the next logical step, however, is to be found in the sixth and final "explanation."

6. Attention or availability of productive "energy." Suppose we assume that individuals have given capacities to attend to and respond to situations. If this capacity is in any way interfered with or if their attention is deployed elsewhere, only an organism reduced in efficiency will be available to respond to given stimuli. Now, if maladjusted people are considered to be under various degrees of stress (which may or may not be physiologically based) it would seem likely that the stress would interfere with attention and reduce available "energy." Thus, as maladjustment increases there is an increased encroachment on attentive capacities and a corresponding decrease in available productive "energy." The formulation would, of course, not only be applicable to perceptual responses but to psychomotor ones as well (and, hence, to King's results).

It should be noted that the core of the above idea is similar to the view expressed by Hebb (16). He stresses that it is attention or perceptual set which, in addition to sensory stimuli, determines the response.

It can be seen that various types of psychological impairment would be predicted in the maladjusted individual

from this view. Of course, many aspects of this deficit state being postulated have yet to be clarified. For example, it is not clear exactly at what rate productive energy would decrease as maladjustment increased. Perhaps beyond a certain point of adjustment the deficit would increase sharply. For example, it is possible that beyond a certain point added factors, e.g., increased physiological involvement, enter in to compound the deficit. This may have been the case with the poor contact group in this study.

C. Diagnostic Ability of the Tactual Task

It might be recalled that several investigators (35, 46) found that a tactual task was valuable in diagnosing organicity. On the basis of a more-or-less incidental finding in the present study it would appear that such tasks have even greater diagnostic potential. The tactual task used, even in its rough, unrefined form, was able to make significant differentiations between the various maladjusted groups. Further statistical refinements, which would include an item analysis, could conceivably sharpen its diagnostic powers considerable. Various other tactual problems, might be added, such as recognition of geometric forms. Additional information could be supplied by a careful analysis of errors made. To realize its full potential one would certainly want to use the task in conjunction with other psychological tools.

In addition to the task's apparent diagnostic acuity it would have other features to recommend its use. Its reliability, for example, appears to be quite satisfactory on the basis of present evidence. Also, it has a certain novelty about it which may facilitate interest on the part of the subject. Finally, it makes use of a relatively unexploited sensory modality. In general, the task could prove to be a valuable addition to the psychologist's repertoire.

D. Suggestions for Future Research

A number of leads have emerged from this study which might be fruitfully followed up. Some suggestions for future research are as follows:

1. Further testing of the relationship between maladjustment and perceptual accuracy, particularly in other sensory modalities would seem to be worthwhile. The extent and intracacies of the relationship could then be worked out. It is recommended that in testing basic relationships only simple perceptual tasks be used. Test variables should be varied in order to determine what aspects of a task are the most significant in making differentiations. It is also suggested that the rate at which perception is affected as the difficulty of a task is varied be investigated further. Studies using a variety of tasks with systematically varied cues could be carried out with a population rated along a continuum of adjustment.

2. The concept of "deficit" or loss of attentive acuity in maladjustment could be explored further. Possible correlations, for example, between perceptual functioning and other areas where deficit would emerge, e.g., psychomotor activities might be investigated using subjects at different stages of adjustment.

3. Refinement of the tactual task as a diagnostic instrument along the lines described in the previous section is recommended.

VII. SUMMARY and CONCLUSIONS

This study stemmed from recent research on the effect of personality variables on perceptual functioning. Specifically, this study was concerned with some aspects of the relationship between personality adjustment and accuracy of perception. Two tactual tasks were used to test hypotheses derived from the findings of previous investigations in this area. The first or Form task involved the identification of letters of the alphabet outlined by tacks and concealed from view in a stimulus box. Each letter appeared in two cue conditions -- minimally outlined and maximally outlined. The second or Numerosity task involved identifying the number of tacks on a card in the same stimulus box.

Three basic groups of subjects were used, each representing a different level of adjustment. The first or normal group consisted of VA employees; the second group consisted of patients in good contact, approximately half of whom were schizophrenics from an open ward in a VA neuropsychiatric hospital; the third group consisted of schizophrenic patients in poor contact from a back ward of the same hospital. All the groups were matched for age and education.

The results upheld two of the three original hypotheses. In general, the following conclusions appear to be warranted.

1. Perceptual accuracy appears to vary directly with overt adjustment, i.e., as adjustment decreases perceptual accuracy also decreases.

2. The perceptual accuracy of individuals at a given level of adjustment is similar regardless of the diagnoses of those involved. (No organic subjects were used in the study.)

3. A difficult perceptual task differentiates better than an easier one between levels of adjustment up to a point. Beyond this stage of adjustment a difficult task does not appear to be any more sensitive than an easier one.

4. A tactual task appears to have merit as a diagnostic tool.

Possible explanations of the relationship between perceptual accuracy and adjustment were discussed. It is believed than an explanation which postulates a general deficit state has considerable merit.

Further investigation of the relationship between perceptual functioning and personality maladjustment particularly using other modalities was recommended. Additional refinement of the tactual task was suggested so that its value as a diagnostic instrument may be increased.

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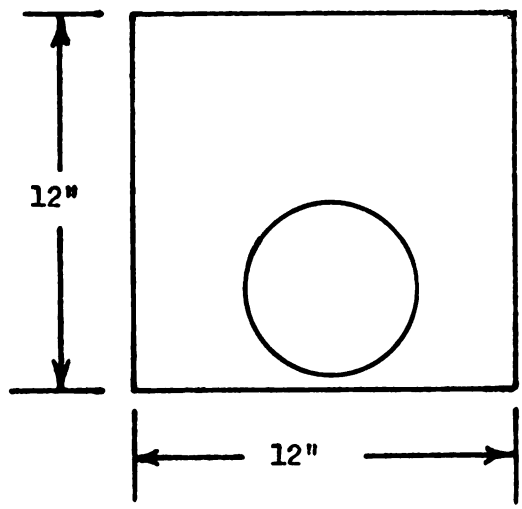
APPENDICES

APPENDIX A

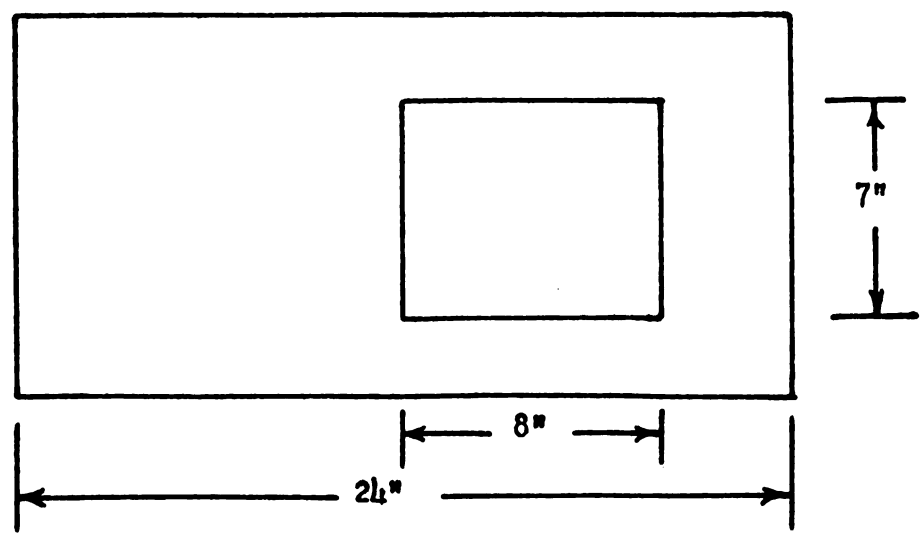
The Stimulus Box

Side Facing Subject (minus curtain)



Floor Plan
Showing Section for Stimulus Cards

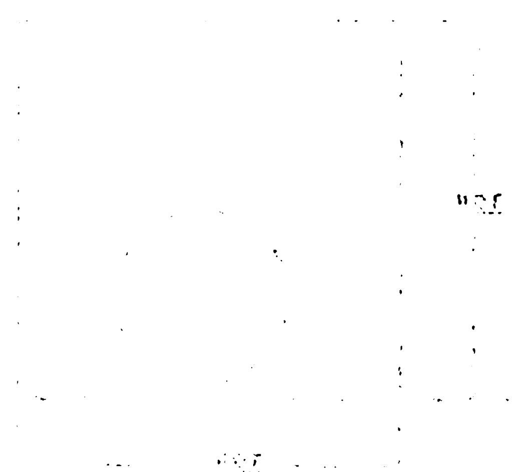
Subject's Side



APPENDIX A

The Stimulus Box

Side Facing Subject (minus curtain)



Floor Plan
Showing Section For Stimulus Cards

APPENDIX B

1. Form Task: Order of Stimuli

	Letter	Cue Cond.		Letter	Cue Cond.
1.	M	Max.	18.	W	Min.
2.	A	Max.	19.	Z	Min.
3.	E	Min.	20.	T	Max.
4.	J	Max.	21.	X	Max.
5.	H	Min.	22.	D	Max.
6.	F	Min.	23.	H	Max.
7.	Y	Min.	24.	Z	Max.
8.	G	Min.	25.	F	Max.
9.	W	Max.	26.	L	Max.
10.	V	Min.	27.	T	Min.
11.	N	Max.	28.	N	Min.
12.	J	Min.	29.	U	Min.
13.	A	Min.	30.	L	Min.
14.	E	Max.	31.	X	Min.
15.	G	Max.	32.	V	Max.
16.	Y	Max.	33.	M	Min.
17.	U	Max.	34.	D	Min.

2. Numerosity Task: Correct Number of Tacks on Each Card

1.	8	6.	9
2.	9	7.	5
3.	9	8.	8
4.	5	9.	9
5.	9	10.	10

APPENDIX C

DIAGNOSTIC PREDICTIONS BASED ON CUT-OFF SCORES FOR THE TWO TASKS

A. Form Task

Cut-Off Score	Group A	Group B	
$\geq$ 40	12*	10	22
< 40	5	16	21
	17	26	43

Cut-Off Score	Group A+B	Group C	
$\geq$ 30	40	5	45
< 30	3	15	18
	43	20	63

Cut-Off Score	Group A	Group B+C	
$\geq$ 40	12	11	23
< 40	5	35	40
	17	46	63

Cut-Off Score	Group B	Group C	
$\geq$ 30	24	5	29
< 30	2	15	17
	26	20	46

Cut-Off Scores	Group A	Group B	Group C	
$\geq$ 41	12	9	1	22
30-40	4	15	4	23
< 30	1	2	15	18
	17	26	20	63

*Underlined scores indicate correct predictions

B. Numerosity Task

Cut-Off Score	Group A	Group B	
≤8	11*	12	23
>8	6	14	20
	17	26	63

Cut-Off Score	Group A+B	Group C	
≤13	42	6	48
>13	1	14	15
	43	20	63

Cut-Off Score	Group A	Group B+C	
≤8	11	13	24
>8	6	33	39
	17	46	63

Cut-Off Score	Group B	Group C	
≤13	25	6	31
>13	1	14	15
	26	20	46

Cut-Off Scores	Group A	Group B	Group C	
≤8	11	12	1	24
9-13	6	13	5	24
>13	0	1	14	15
	17	26	20	63

*Underlined scores indicate correct predictions.

Date Due

Jul 7 '58			
AUG 21			

Demco-293