

A STUDY OF CONCEPT FORMATION AND
PERCEPTUAL SPAN IN PROCESS AND
REACTIVE SCHIZOPHRENIA

Thesis for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY

John Edwin Mason

1962

This is to certify that the
thesis entitled
A Study of Concept Formation and Perceptual Span
in Process and Reactive Schizophrenia

presented by
John Edwin Mason

has been accepted towards fulfillment
of the requirements for
Ph.D. degree in Psychology

M. Ray Denny
Major professor

Date *May 28, 1962*

0-169



ABSTRACT

A STUDY OF CONCEPT FORMATION AND PERCEPTUAL SPAN IN PROCESS AND REACTIVE SCHIZOPHRENIA

by John Edwin Mason

An impaired ability to form concepts has been observed in many schizophrenics and has been referred to as a "pathognomonic sign" of schizophrenia. But while the presence of some form of disturbance has been widely acknowledged, there has been considerably less agreement as to the nature of the disturbance.

Similarly, perceptual research in schizophrenia, although beclouded by contradictory results, suggests that the perceptual processes of schizophrenics tend to be distorted.

Recent studies have demonstrated that the differentiation of schizophrenic subjects along the process-reactive dimension holds promise as an effective procedure for reducing the variability frequently observed in undifferentiated schizophrenic groups.

On the basis of scores obtained on Becker's Abbreviated Elgin Prognostic Scale from rating their case histories, 60 male schizophrenic patients in a Veterans Administration Neuropsychiatric Hospital were cast into three subject groups. The 20 patients having the lowest scores comprised the reactive group, the 20 patients having the highest scores comprised the process group, and the remaining 20 patients comprised the midgroup. A group of 20 male nursing-assistant trainees served as controls. With the exception of a significant age difference, the four groups were comparable. No correlation was found between age and conceptual or perceptual abilities.

The major part of this study was concerned with an investigation of the role of distraction in concept formation in process and reactive

schizophrenia by means of a card sorting task designed to elicit correct sorts, distracter sorts, and irrelevant sorts. The sorting task devised by Chapman was modified by the writer to include "affect-laden" and "affect-free" conceptual categories. The procedure was essentially the same as that described by Chapman.¹

The second part of this study was concerned with an investigation of visual perception by means of the perceptual span accuracy test. This test consisted of the tachistoscopic presentation, at five different exposure times, of a series of 13 cards each containing a random pattern of small circles which varied from three to 15 in number.

The results of a preliminary study suggested the following hypotheses which were formulated for the main study: 1) the reactive group will produce fewer correct card sorts than the control group; 2) the process group will produce more correct sorts than the reactive group; 3) the reactive group will tend to exceed the process group in the number of distracter sorts; 4) the process group will tend to exceed the reactive group in the number of irrelevant sorts; and 5) the reactive group will tend to respond more frequently to affect-laden distracter figures than to affect-free distracters. Hypothesis 1 was confirmed ($P_{.025}$), hypothesis 3 was confirmed ($P_{.05}$), and hypothesis 5 was confirmed ($P_{.01}$). Hypotheses 2 and 4 were not confirmed.

Two supplementary hypotheses were formulated for the perceptual investigation: 6) the reactive group will be inferior to the control group in terms of perceptual span accuracy; and 7) the reactive group will exceed the process group in terms of perceptual span accuracy. Neither hypothesis was confirmed.

¹L. J. Chapman, The role of type of distracter in the "concrete" conceptual performance of schizophrenics. J. Pers., 1956, 25, 130-141.

It was concluded that the observed group differences in conceptual performance reflected a differential susceptibility to distraction between the process, middle, and reactive groups, rather than an inability to form concepts. A positive relationship between distraction and affective level was postulated to account for the differential distractibility between the groups.

The results of the perceptual investigation suggest that process and reactive schizophrenics do not differ with respect to visual perceptual adequacy.

Approved _____
Committee Chairman

Date _____

A STUDY OF CONCEPT FORMATION AND PERCEPTUAL SPAN
IN PROCESS AND REACTIVE SCHIZOPHRENIA

By

John Edwin Mason

A THESIS

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

DOCTOR OF PHILOSOPHY

Department of Psychology

1962

ACKNOWLEDGMENTS

The writer wishes to express his sincere appreciation to Drs. M. Ray Denny, Harold H. Anderson, Charles Hanley, and Paul Bakan for their assistance in connection with this thesis. Particular thanks are due Dr. Denny who so willingly accepted the responsibility for guiding the study after Dr. Albert I. Rabin, the original chairman, took sabbatical leave from the university. The writer is indeed indebted to Dr. Rabin for his assistance and helpful criticisms during the developmental stages of the research.

I am especially indebted to Drs. Stewart G. Armitage and David Pearl for their constant encouragement and invaluable suggestions. Without their help and the kind cooperation of the other members of the staff of the V. A. Hospital, Battle Creek, and the patients, this study could not have become a reality.

Finally, I would like to thank Mr. Jay N. Thomas and Dr. Martin Zlotowski for their assistance in rating the patients and the others who have contributed toward the successful completion of this study.

The writer dedicates this thesis to his wife
Annabel and daughter Melody, immeasurable
sources of inspiration and encouragement.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
THE PROCESS-REACTIVE HYPOTHESIS	4
CONCEPT FORMATION IN SCHIZOPHRENIA	8
PERCEPTION IN SCHIZOPHRENIA	13
DEVELOPMENT OF THE PROBLEM AND PRELIMINARY STUDY	18
Apparatus	19
Distracter Card Sort	20
Subjects	22
Procedure	23
Results	24
Conclusions and Discussion	25
Development of the Hypotheses for the Main Study	26
METHODOLOGY OF MAIN STUDY	28
Apparatus	29
Classification of Subjects	29
Characteristics of the Sample	32
Procedure	39
RESULTS OF MAIN STUDY	42
DISCUSSION	69
SUMMARY	80
REFERENCES	82
APPENDICES	89

LIST OF TABLES

TABLE	Page
1. Characteristics of the sample.	33
2. "t"-Test for mean age differences between paired groups	35
3. Mann-Whitney "U" test for mean differences in visual acuity between paired groups	36
4. Hospitalization characteristics for the schizophrenic subjects.	37
5. Mann-Whitney "U" test for mean differences in neutral card sorts between paired groups	43
6. Mann-Whitney "U" test for mean differences in correct sorts (I + C Sorts) between paired groups	45
7. Mann-Whitney "U" test for mean differences in sorting time (seconds) for I + C Sorts between paired groups . .	48
8. Mann-Whitney "U" test for mean differences in dis- tracter sorts (I + C Sorts) between paired groups	50
9. Mann-Whitney "U" test for mean differences in Identity (II + CI Cards) Distracter sorts between paired groups .	52
10. Mann-Whitney "U" test for mean differences in Concept Distracter (IC + CC Cards) sorts between paired groups	53
11. Mann-Whitney "U" test for mean differences in affect- free distracter sorts (I + C Sorts) between paired groups	55
12. Mann-Whitney "U" test for mean differences in affect- laden distracter sorts (I + C Sorts) between paired groups	57
13. Comparison of affect-free with affect-laden distracter sorts within each subject group	59

LIST OF TABLES - Continued

TABLE	Page
14. Mann-Whitney "U" test for mean differences in irrelevant sorts (I + C Sorts) between paired groups	61
15. Mann-Whitney "U" test for mean differences in irrelevant sorts (I + C Sorts) between groups (only subjects making irrelevant sorts)	62
16. "t"-Test for mean differences in perceptual span accuracy scores between paired groups.	65
Supplementary tables may be found in Appendix D	97

LIST OF FIGURES

FIGURE	Page
1. Sorting test	21
2. Distribution of Abbreviated Becker-Elgin scores for 98 schizophrenic patients	31
3. Average estimates for five trials on perceptual span test for control and schizophrenic groups	66
4. Average estimates for five trials on perceptual span test for control, reactive, middle, and process groups	67
A. Perceptual span card for 13 circle pattern	96

LIST OF APPENDICES

APPENDIX	Page
A. Abbreviated Becker-Elgin Prognostic Scale	90
B. Distribution of Abbreviated Becker-Elgin Scores for 98 Schizophrenic Subjects	93
C. Perceptual Span Test Card	96
D. Supplementary Tables	97

INTRODUCTION

Theoretical attempts to collate the experimental findings relevant to the disorder "schizophrenia" are, in the main, disappointing and frustrating. Some of the difficulty appears to arise from the complex and heterogeneous nature of this disorder. But some of the difficulty arises from a lack of adequate, rigorously planned investigations (Langfeldt 1951, Rabin and King 1958).

The present study is concerned with three problems of "schizophrenia": the problem of nosology, the question of impaired concept formation, and the question of perceptual adequacy. The nosological problem may be characterized as a dissatisfaction with the traditional Kraepelinian classificatory schema. Studies by Ash 1949; Mehlman 1952; and Eysenck, Granger, and Brengelman 1957, are in agreement in concluding that the reliability of psychiatric diagnoses is quite low. In the past, mental patients typically have been selected for research purposes on the basis of their diagnoses. Since there is evidence of poor reliability of diagnostic classifications, it would appear that to continue to select research subjects on this basis would perpetuate a source of error variance in research designs which otherwise might be avoided.

The "process-reactive" hypothesis is one alternative to the classical subtype classification of schizophrenic patients. This hypothesis, derived from the frequently observed relationship between prognosis and premorbid personality structure, provides a conceptualization for differentiating "schizophrenic" patients into two or more subgroups. The feasibility and desirability of dichotomizing schizophrenics for research purposes has been advocated by many writers including

Lewis (1936), Bellak (1958), and Garnezy and Rodnick (1959). This procedure tends to increase group homogeneity thereby decreasing the variance commonly observed in undifferentiated schizophrenic groups. In addition, replications and comparisons between studies tend to be facilitated by enabling one to more closely approximate similar subject groupings from one study to another. Finally, recent studies have demonstrated that process and reactive subgroups may be established reliably by means of the Becker-Elgin Prognostic Scale (Becker 1955, 1956; Smith 1959; McDonough 1958, 1960; Zlotowski (1960).

The questions about the schizophrenic patients' performance on conceptual and perceptual tasks have been dealt with previously by assessing the evidence for distortion, disturbance, or deficit in the performance of schizophrenics as compared with "normals." From their review of the literature, Rabin and King (1958) have concluded: "The results, inconsistencies and all, certainly cannot be meaningfully organized by any available theoretical framework" (p. 254).

Many writers look upon disturbed thought processes and defective concept formation as "pathognomonic signs" of "schizophrenia" and have attributed these disturbances to a multiplicity of factors. Consequently this aspect of the disorder has been probed with a variety of approaches, tools, and techniques. One such approach is directed towards the study of concept formation employing various types of sorting tasks as the tools of investigation. Chapman (1956, 1956, 1958) has interpreted his findings as evidence that some schizophrenics can form concepts and concludes that distraction, rather than a loss of the "abstract attitude," is responsible for the poor performances on conceptual tasks observed in some schizophrenics.

The writer is unaware of any previous studies which have been concerned with concept formation in process and reactive schizophrenia.

Consequently the major part of this study is concerned with an investigation of the role of distraction in concept formation in process and reactive schizophrenia by means of a card sorting task.

The second part of this study is concerned with the question of visual perceptual adequacy in process and reactive schizophrenia. The two directly relevant studies which have been reported present contradictory findings in this area (McDonough 1958, 1960; Fine and Zimet 1959). Therefore an attempt was made to obtain additional evidence by comparing the process and reactive groups in terms of their performance on the perceptual span accuracy test.

THE PROCESS-REACTIVE HYPOTHESIS

The classification of psychiatric disorders established by Kraepelin (Arieti 1955, Cameron 1944) and later modified by Bleuler (1950), is the one currently referred to for classifying mental patients (APA Diagnostic Manual 1952). The early taxonomists took cognizance of the variation between patients by subsuming under the rubric of "dementia praecox" and later "schizophrenia," the subtypes of paranoid, simple, hebephrenic, catatonic, and mixed or undifferentiated. However, as indicated in the Introduction to this paper, there appear to be weaknesses in the effective application of this system.

Basically, the process-reactive hypothesis, which cuts across the traditional subtypes, is premised upon the observation that prognosis frequently appears to be correlated with the prepsychotic personality pattern in schizophrenic patients. Thus, an acute, sudden onset following a significant precipitating event in an outgoing individual whose previous adjustment has been adequate, frequently carries a favorable prognosis (reactive schizophrenia). But the development of frankly psychotic behavior in a withdrawn, inadequate individual, with no apparent precipitating stress, generally is unfavorable from a prognostic viewpoint (process schizophrenia). A detailed development of the process-reactive hypothesis has been traced by DeVault (1955), McDonough (1958), and Smith (1959), and will not be elaborated in this paper.

Once the decision has been made to employ the process-reactive hypothesis in selecting subjects for research purposes, the investigator can choose one of two methods for differentiating subjects. One method, employed in the early process-reactive studies, consists of reading the

case history and judging it to be process or reactive on the basis of criteria descriptive of each group.

The second method involves the use of a rating scale to evaluate each history. From a methodological viewpoint, the contributions of Becker (1955, 1956, 1958, 1961) toward the development of the rating scale are particularly significant. The Elgin Prognostic Scale was developed by Wittman (1941) to predict a patient's prognosis from pertinent case history material. Whereas endpoints were employed for each item on the Elgin Scale, Becker sought to increase the precision of the scale by subdividing each item into a number of descriptive statements in order to describe the relative degree to which each item is applicable to the person being rated. By means of a factor analysis, individual weights were assigned to the descriptive statements for each scale item. Thus, a subject's Becker-Elgin score may be obtained by summing the weights of those descriptive statements adjudged to describe the subject's history. The magnitude of this score, in turn, determines the subject's position on the process-reactive continuum. High scores are associated with the process end of the continuum: low scores are associated with the reactive end of the continuum.

Further modification of the Elgin Scale, by Becker (1961), produced an abbreviated scale of 10 items which compares favorably with the original 20 item scale. A copy of this scale may be found in Appendix A. Correlations of .90 and .96, between the abbreviated and complete Becker-Elgin scales have been reported by Zlotowski (1962) and Pearl (1962), respectively.

The use of a scale reflects Becker's conception of the process-reactive hypothesis as a continuum of "levels of personality organization." Becker cites Bellak's multiple factor theory and the overlap between the groups as evidence against considering process and reactive as two distinct types of disorder.

The hypothesis has gained support from empirical evidence derived from several psychologically oriented studies (Kantor, Wallner, and Winder 1953; Becker 1955, 1956, 1958; Brackbill 1956; Brackbill and Fine 1956; Reisman 1958, 1960; Fine and Zimet 1959; Smith 1959; Zlotowski and Bakan 1959; McDonough 1960; and Zlotowski (1960).

A number of physiologically oriented investigations of autonomic nervous system reactivity to cholinergic drug injections between process and reactive or analogous groups have been reported (Funkenstein, Greenblatt, and Soloman 1948, 1949, 1952; Hirschstein 1955; Geocariss and Kociker 1956; King 1958; Grosz and Miller 1958; Zuckerman and Grosz 1959; and Pearl and VanderKamp 1960). King (1958) reported a heightened autonomic reactivity as reflected by a drop in blood pressure was significantly greater for the reactives than for the process group. Contradictory findings have since been found by Grosz and Miller (1958). Hopefully, the relationship between these two variables may be clarified by additional research.

Relevant to the process-reactive hypothesis are several studies carried out under the guidance of Garmezy and Rodnick (1959). The Scale of Premorbid Adjustment, developed by Phillips (1953), was employed to select "good" and "poor" premorbid subjects which are analogous to reactive and process subjects, respectively. Garmezy and Rodnick (1959) conclude that dichotomizing subjects resulted in a marked reduction in the variability of performance as compared with the performance of all the schizophrenics taken as a single group.

Systematic theoretical formulations in support of the process-reactive hypothesis have been conspicuous by their absence. Perhaps the most extensive effort in this vein was set forth in a paper by Winder (1958) based upon the work of Kantor and Winder. Impressed by the apparent continuity between the premorbid personality and later manifestations of the full-blown psychosis, these writers, borrowing from

Sullivan, elaborated the view that schizophrenia represents a form of social conduct or interpersonal adaptation. The developing personality progresses through five developmental stages beginning with the "empathic" stage and culminating in the "syntactic mode." Severe interpersonal difficulties encountered at any of the five levels tends to fixate the personality at that level which, in turn, impairs development through subsequent levels. Should schizophrenia later become manifest, the symptomatology will tend to reflect the level at which the earlier fixation took place.

In terms of the process-reactive hypothesis, if the problems of living are severe during the empathic stage, the subsequent development of the social self will be retarded and misdirected. Later in life, should schizophrenia develop, it will appear as a malignant disorder arising out of a life-long pattern of inadequacy and poor adjustment. The disorder takes the form of process schizophrenia. Reactive schizophrenia, at the other extreme of the continuum, is likely to characterize the adult, under heavy stress, whose personality development has been relatively uneventful in terms of interpersonal problems, and has attained the syntactic or highest level of development.

Since development rarely proceeds in an all-or-none fashion, and differing degrees of difficulty can be encountered along the way, the adult personality will reflect this unevenness. Thus, one finds relatively few pure process and reactive cases with the majority of the cases distributed along the continuum between these extremes.

Referring back to the two methods of differentiating subjects, in view of the above, the use of a scale appears more defensible since each subject can be located in a distribution of scores as opposed to being judged either black or white, as it were.

CONCEPT FORMATION IN SCHIZOPHRENIA

There appear to be limits upon the number of individual objects or events the central nervous system can keep track of at any given time (Miller 1956). If, however, these discrete events can be pigeon-holed into categories, the task of the central nervous system is reduced to one of accounting for a few categories. In a similar fashion, categories may be ordered into larger categories and so on. Employing such a filing system, the central nervous system can store a vast amount of information which was originally perceived in "bits" and was successively "encoded" into larger and larger "chunks" or concepts. The terms "assimilation (McReynolds 1960), "concept formation," and "encoding," from information theory (Attneave 1959, and Miller 1956), appear to describe essentially the same process.

Basic to this process is the ability to isolate or abstract common elements or common denominators from each of the discrete events or objects. One then "generalizes" or embraces these elements, and hence the respective objects or events within a single category or concept (Payne 1961). Thus, the originally diverse, single objects or events now "belong together" insofar as they share the newly acquired category or concept.

In terms of this analysis, assuming that perception and concept formation are distinguishable processes, either one or both of these processes could conceivably become defective. The resulting conceptual system consequently would become altered and various descriptive adjectives such as "peculiar," "rigid," "over-inclusive," "private," or "open" might be invoked to describe the distorted system. Since thinking may be considered to be a manipulation of concepts (Payne 1961),

thought patterns involving altered concepts would tend to be peculiar, distorted, or bizarre.

The language and/or thinking of schizophrenic patients has been the target of a considerable number of investigations since a disturbance in this area has long been associated with this disorder. Historically, Bleuler (1950) considered the thinking disorder to be a primary or fundamental symptom. The current Diagnostic and Statistical Manual for Mental Disorders published by the American Psychiatric Association characterizes schizophrenia by "...fundamental disturbances in reality relationships and concept formations..." (1952, p. 26).

Rabin and King (1958), after reviewing the literature, summarized the various viewpoints by writing:

...the language and thinking of schizophrenia have either been depicted as representing a deficit (e.g., a deficit in conceptual thinking) or a type of disturbance (e.g., overinclusion, paleo-logic thinking) (p. 231).

The position expressed by Rapaport, Gill, and Schafer (1946) holds that phenomenologically, an idea can be investigated from three points of view; memory, concept formation, and attention-concentration-anticipation. The second, concept formation, is "that aspect of thought processes...which determine the 'belongingness' of our ideas--that is, of the objects of our world--to each other (Vol. I, p. 387). The importance attached to concept formation is further highlighted by Rapaport's assertion that

concept formation is one of the main channels through which maladjustment encroaches upon thinking, and that in it we may be able to discover early traces of impending maladjustment (Vol I, p. 388).

Rapaport, Gill, and Schafer are in essential agreement with Benjamin (1946) who asserts

signs of thinking disorders are relatively independent of the stage of illness and the momentary clinical condition of the patient. They are, to be sure, found in almost all so-called

deteriorated cases, but are also seen, sometimes, in less pronounced forms, at very early stages, occasionally long before a clinical diagnosis has been made, as well as after a clinical recovery from a severe attack. (p. 67).

While many investigators are in agreement as to the presence of disturbed concept formation in schizophrenia, there is considerably less agreement as to the nature of the disturbance. There appear to be two broad groups into which many of these writers may be placed. One group would be comprised of those who tend to support an "impairment or regressive" line of reasoning. Typically, for this group, schizophrenia is believed to be a "regression-to-childhood" type of disorder. The presence of some form of organic involvement is inferred or explicitly stated by some members of this group who are prone to reject a psychogenic etiology for the disorder. One might include such writers as Vigotsky, Goldstein, Gelb, Kasanin, Hanfmann, and Scheerer (Cameron 1944, Feldman and Drasgow 1951, Meadow and Funkenstein 1952, and Arieti 1955). Generally speaking, disturbed concept formation would be described as a loss or impairment of the "abstract attitude" with increased "concreteness" of thought, to use Goldstein's (1944, 1948, 1959) terminology. It should be noted however, that while some writers have interpreted Goldstein's writings as supporting a view of organic involvement in schizophrenia, a recent note by Goldstein (1959) contradicts such a view.

The abnormal concreteness of the schizophrenic appears thus as a secondary phenomenon; it is not the effect of an organic defect; it does not represent a damage of abstraction, a deterioration of the mind, or a defect in thinking. It is an expression of the restriction in the use of the highest mental capacity. (p. 147).

The second group would include those who have attempted to explain disturbed conceptual performances as resulting from the operation of such variables as; a lack of motivation (Cavanaugh 1958, Coons 1956, Webb 1955); the presence of intrusions (Cameron 1944; Chapman

1956, 1956, 1958; Epstein 1953), social withdrawal (Flavell 1956, McGaughran and Moran 1956, Whiteman 1954), affective components (Webb 1955), and "defective ego development" (Schulman 1953). Generally, for these writers, poor performance of schizophrenic subjects on conceptual tasks is viewed as a consequence of the disruptive effects of these psychogenic variables upon the concept formation process. The capacity or potential for concept formation remains intact and presumably would function properly if the disruptive variable were removed. This group would tend to view the deficit as a reversible function in contrast to the former group who would more likely view the deficit as an irreversible function.

The development of the present study was influenced considerably by two studies carried out by Chapman in which the conceptual performances of schizophrenics and normals were compared by means of a card sorting task of his design. In his initial study, Chapman (1956) asked the subjects to sort the cards by designated communalities between figures on each of two cards. They were instructed to use certain figures and to ignore the other figures which were referred to as "distracters." The schizophrenics made fewer correct sorts than the normals. It was further observed that the incorrect sortings were not random placements but were determined largely of sortings by conceptual relationships between the distracter figures. Chapman concluded the schizophrenics could form concepts and that contrary to the position ascribed to Goldstein (e.g., schizophrenics are unable to form concepts), the frequently observed poor conceptual performance is due, at least in part, to the schizophrenics being distracted.

Chapman's (1956) second study was designed to investigate the influence of the type of distracter on the conceptual performance of schizophrenic subjects. As in the initial study, correct sortings were achieved by discovering designated communalities between one figure on

each of two cards, ignoring the distracter figures. The cards were so designed that if the subject ignored the directions, it was possible to sort the cards in terms of the distracter figures. Two types of sortings were possible: one sort derived from identical distracter figures while the second derived from conceptual communalities between the distracter figures. This design enabled Chapman to compare the "pull" of the two types of distracters upon correct sorting performance. It was observed again that the schizophrenics, more so than the normals, sorted the cards in terms of the distracter figures. In addition, the patients, unlike the normals, were more distracted by distracter communalities consisting of identical whole figures than by those consisting of a shared concept. The results were interpreted by Chapman as further confirmation that the observed poor conceptual performance of schizophrenics is not due entirely to their inability to form concepts.

So far as the writer is aware, there have been no studies reported in which the process-reactive differentiation was considered as the independent variable and concept formation as the dependent variable.

PERCEPTION IN SCHIZOPHRENIA

Historically, the area of perceptual research belonged within the province of the general or experimental psychologist concerned with distinguishing between "sensations" and "perceptions" (Graham 1951, Osgood 1953). In recent years however, interest has been centered more upon the role of central nervous system determinants in perceptual processes as exemplified by the concepts of "perceptual defense" and "perceptual vigilance" (Bartley 1958). Consequently this territory, more so than previously, appears to be "open to hunting" for the research-minded clinical psychologist.

The diversity of thought with regard to what constitutes "perception" becomes apparent when one attempts to define the term. Allport (1955) and Bartley 1958) have each enumerated thirteen theories of perception and their listings are not identical.

Johnson (1955) sums up the state of affairs quite well by writing:

The word "perception" itself, in addition to its principal meaning of obtaining knowledge through the senses, has a secondary meaning of cognition or understanding. Such multiple meanings have always caused trouble in psychology, and the extended meaning of perception is particularly likely to produce confusion because principles that hold for one meaning of the word may or may not hold for the other. (p. 102).

Bartley (1958) concludes the need exists to define more sharply what is meant by the term perception and proceeds to present his position:

Perception is the overall activity of the organism that immediately accompanies energistic impingements upon the sense organs.

...Immediate behavior in order to be called perception must be discriminatory. (p. 22).

The many positions on perception, while divergent with respect to various aspects and points of emphasis, appear to share at least two threads of communality. First, the term "perception" refers to the means by which the individual relates to his surrounds. Secondly, the perceptual response is a function of the total organism. Therefore, an alteration of the perceptual response should tend to reflect concomitant, transient alterations as well as the more enduring alterations of the personality such as psychotic states or disorders.

Methodological problems involved in perceptual research are noted by Winder (1960) who cites as a major complication the difficulty in clearly distinguishing between the "perception system" and the "response system." After reviewing several studies, he concludes that

taken as a group, these studies support the general hypothesis that although perceptual processes of schizophrenics are often disturbed, there are significant differences in degree of disturbance, that degree of disturbance is related to premorbid factors and adjustment, and that the deficits are reversible. (p. 217).

The writer is aware of two published studies in which the process-reactive hypothesis was the independent variable and some form of perceptual task was the dependent variable. The Fine and Zimet (1959) study compared process and reactive subjects in terms of perceptual maturity. The subjects' Rorschachs were analyzed by means of Friedman's genetic scoring system. It was concluded that the process group, characterized by a "grosser perceptual immaturity," differed significantly ($P_{.001}$) from the reactive group, characterized by "more adequate and integrated perceptual functioning" (p. 85) in terms of perceptual maturity.

McDonough (1958, 1960) compared groups of organic, process, reactive, and control subjects in terms of their performances on critical flicker frequency and the Archimedes Spiral tasks. The organic group differed significantly from the other three groups with respect to critical

flicker frequency fusion threshold and the ability to perceive the spiral aftereffect. No differences were observed between the process and reactive groups on either task.

The results of McDonough's study appear to contradict the results obtained by Fine and Zimet since the latter observed perceptual differences between their process and reactive subjects while McDonough found no differences between his process and reactive subjects. If, however, one accepts Bartley's view of perception as an immediate, discriminatory response, it would appear that responses to both critical flicker and rotating spiral stimuli would tend to be produced more readily than responses to Rorschach cards. Admittedly, emphasizing the relative times between stimuli and responses is a crude differentiation since some subjects are capable of producing Rorschach responses in rapid succession. If this weakness is granted however, the tasks employed by McDonough would then appear to be more in keeping with the requirements of a perceptual task.

Tests of "perceptual span" ("span of attention" or "span of apprehension") in perceptual research date back to 1859 (Woodworth and Schlosberg 1954). In 1871, Jevons (Woodworth and Schlosberg 1954) repeatedly threw handfuls of marbles onto a tray and estimated the number of marbles after a quick glance. When the estimated numbers were plotted against the actual numbers, a skewed ogive curve was obtained which, when analyzed, suggested that two processes were involved. When the actual number of marbles was small, a direct and exact perception of the number was given. In the case of a number of marbles too large to be directly perceived, an estimate was given.

Kaufman, Lord, Reese, and Volkmann (1949) obtained similar results from flashing random patterns of dots on a screen for 1/5 of a second duration time. The number of dots varied from 1 to 200 in the patterns. The subjects were very accurate in their responses to patterns

containing less than seven dots, and were said to be "subitizing." When the patterns contained more than seven dots, accuracy deteriorated, and the subjects were said to be estimating.

According to Graham (1951), the number of objects correctly perceived may be influenced by the duration and the intensity of the stimulus, the class of objects, and the age of the subject i. e., children are less accurate than adults. On the other hand, practice effects are minimal, and a low correlation obtains between intelligence scores and perceptual span.

Two physiologically oriented studies were conducted by Pearl to investigate the relationship between autonomic reactivity to injections of mecholyl and accuracy on the perceptual span test. An earlier study by VanderKamp, Norgan, Wilkinson, and Pearl (1958), demonstrated that, for schizophrenic patients, the best prognostic indicator, in terms of autonomic reactivity, was the pulse rate deviation from the basal rate, seven minutes (PRD-7) following an injection of mecholyl. PRD-7 measures and independent ratings of improvement following insulin coma therapy correlated .63. A second measure, pulse rate area, was obtained by plotting pulse rates taken at two minute intervals for a 15 minute period following the injection. The area under the curve was then calculated to obtain the pulse rate area measure.

In the initial study, Pearl (1960) obtained a correlation of .42, significant at the $P_{.01}$ level of confidence, between pulse rate area measures and perceptual span accuracy scores for 53 schizophrenics. The perceptual span test described in the Methodology section of the present study is identical to the one used by Pearl.

In the second study, Pearl (1961), dichotomized 80 newly admitted schizophrenic patients on the basis of their PRD-7 measures. The 41 subjects with deviations of 24 or more who made up Group "A" were characterized by a better prognosis (high autonomic reactivity).

Group "B" (N=39) was comprised of those patients with deviations less than 24 who were characterized by a poorer prognosis (low autonomic reactivity). The perceptual span test was given to both groups.

A median score of 16 correct responses, obtained in the initial study, served as the criterion of perceptual acuity. Pearl found a significantly ($P_{.001}$) greater number of "A" subjects than "B" subjects reached the criterion. Whereas 77% of Group "A" attained the criterion, only 8% of Group "B" succeeded. Further analysis revealed a tetrachoric correlation of .88. Pearl concluded that a positive relationship between perceptual span and sympathetic excitability was demonstrated.

One aspect of an investigation of phenothiazines effects in chronic schizophrenia (Pearl 1961) is relevant to the present study. Each of four groups of schizophrenic subjects received a different tranquilizer of the phenothiazine family of drugs for a twelve week period. A "placebo" group and a "nothing" group served as controls. All subjects were given the perceptual span test prior to and following the test period. An analysis of variance disclosed significant differences at the $P_{.01}$ level of confidence for the perceptual span test. All phenothiazine groups showed significant decrements in scores compared to the control group. Insignificant differences were present in intraphenothiazine comparisons and again in a comparison of the two control groups. Pearl concluded that the phenothiazines reduce perceptual efficiency.

DEVELOPMENT OF THE PROBLEM AND PRELIMINARY STUDY

The following conclusions appear tenable: Investigations involving groups of "schizophrenic" subjects frequently yield results which are ambiguous and variable. Secondly, some schizophrenics are less accurate and more variable than other schizophrenics on some perceptual tasks. Thirdly, some schizophrenics are less accurate and more variable than other schizophrenics on concept formation tasks. Finally, the process-reactive hypothesis holds promise as a means of classification which tends to reduce error variance by increasing the homogeneity of subject groupings in research designs.

The typical reactive schizophrenic may be characterized by an abrupt, stormy onset of the psychosis following a severe stressful situation. The premorbid personality is usually described as having been essentially "normal" or perhaps neurotic.

The typical process schizophrenic may be characterized by an early and insidious onset of the psychosis usually in the absence of a precipitating stress. Rather, the psychosis appears to be a culmination of a life-long marginal adjustment in which there has been a tendency to withdraw from human contacts. Affect is frequently dull or flattened.

Process-reactive research, to date, has yielded fairly consistent results with respect to performance characteristics of the two groups. In addition, the results generally have supported hypotheses derived from theoretical distinctions drawn between process and reactive schizophrenia. The reactive group typically responds more favorably than the process group and sometimes compares quite well with the normal group with respect to response characteristics.

Chapman (1956, 1956, 1958) concludes that distractibility accounts for poor concept formation performances in some schizophrenics. It follows from this that some schizophrenics are not distractible, or at least to the same extent. One may therefore speculate about a possible relationship between distractibility and the process-reactive hypothesis. Perhaps distractibility is more characteristic of the reactive schizophrenic who generally tends to be more affectively responsive to his environment than is the case of the process schizophrenic.

If distractibility is a function of affectivity, it would not be surprising to elicit distraction more readily by confronting a subject with an affect-laden stimulus complex as opposed to a stimulus complex relatively free of affective connotations.

The writer constructed a modified form of the card sorting test described by Chapman (1956) to obtain additional information about the phenomenon of distractibility. A preliminary study was then undertaken to explore the potentialities of the writer's test for the projected investigation of concept formation in process and reactive schizophrenics.

APPARATUS

The sorting test consists of an "Identity Sort" and a "Concept Sort," the meanings of which should become clearer in the following paragraphs. There are nine conceptual categories (clothing, sports equipment, furniture, means of transportation, animals, smoking equipment, tools, sexuality, and aggression) with each category containing four figures or members, making a total of 36 different figures. "Sexuality" and "Aggression" were substituted for Chapman's categories of "fruit" and "kitchen utensils" to provide two affect-laden categories. The test cards were constructed by initially drawing the 36 figures. The drawings were then photographed, in reduced size, to obtain the desired figure dimensions of $1 \times 1\frac{1}{4}$ inches. The required number of reproductions were

then photographically printed and mounted on $4\frac{1}{2} \times 4\frac{1}{2}$ inch squares of Bristol board.

PRETEST SERIES: This series consists of 36 cards. Located in the center of each card is one of the 36 figures mentioned above. The remainder of the card is blank. These cards were used as a pretest to screen patients too seriously disturbed to participate in the study.

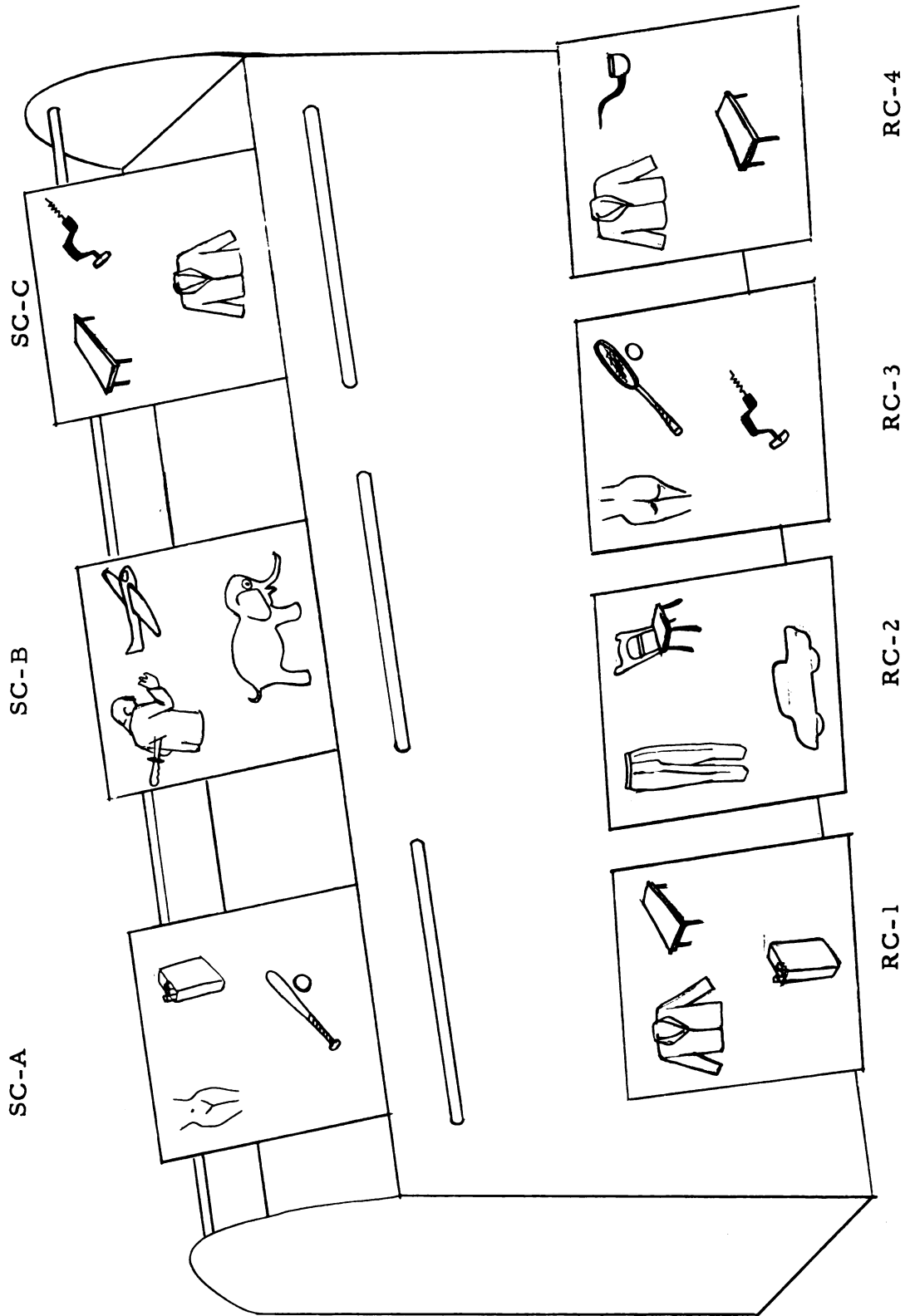
DISTRACTOR CARD SORT

STIMULUS CARDS (SC): Three cards comprise one set of SCs (see Figure 1). Each card contains three figures, located in a triangular fashion, representing three different conceptual categories. By successively rotating the three figures clockwise one position at a time, on each card, two additional sets of SCs were obtained. This was done to minimize the influence of a possible position effect upon any figure.

RESPONSE CARDS (RC): A set of 144 RCs were constructed for each set of SCs, in effect making three complete sorting tests. The total of 432 RCs were constructed by systematically rotating all combinations of three figures, from the 36 conceptual figures. Each of the 36 figures appears equally often, both in a single set of RCs and in the three sets of RCs to rule out any preferences which might arise from excessive exposure of any single figure. Each set of 144 RCs consists of two 72 card series referred to as an "Identity" series and a "Concept" series.

IDENTITY SORT: The subject's (S) task is to find a figure anywhere on the RC which is identical to the figure in the upper right-hand corner of one of the SCs. The correct figure is always located in the upper right-hand corner of a SC, but may occupy any position on the RC. The two other figures on the RC are referred to as "distracter" figures which may be one of two types. Each Identity Sort consists of 36 "II"

Figure 1
SORTING TEST



cards and 36 "IC" cards which are presented to the subject in a pre-arranged random order.

"II" CARDS: In Figure 1, RC-1 contains a package of cigarettes which is identical to the figure (cigarette package) in the upper right-hand corner of SC-A. But RC-1 also contains a man's jacket and a table which are identical to the jacket and table figures on SC-C. There are no intended shared concepts or identities between RC-1 and SC-B. If, therefore, the subject drops RC-1 into the slot beneath: SC-A, it is a correct sort; SC-B, it is an irrelevant sort; and SC-C, a distracter sort. This type of RC is referred to as an "II" card since both the correct sort and the distracter sort derive from identical whole figures.

"IC" CARDS: RC-3 (see Figure 1) represents an IC card. The correct sort for this card involves identical whole figures but the distracter sort involves conceptual communalities. Thus, a correct sort would place RC-3 with SC-C; a distracter sort would place RC-3 with SC-A; and an irrelevant sort would be recorded for placing RC-3 with SC-B. It is intended that the tennis ball and racket and the buttocks figures on RC-3, and the bat-ball and nude female figures on SC-A share the conceptual categories of sports equipment and sexuality, respectively.

CONCEPT SORT: The subject is asked to find a figure anywhere on the RC which is the same kind of figure, but not identical to, the figure in the upper right-hand corner of one of the SCs. Seventy-two cards comprise this series, including 36 "CI" and 36 "CC" cards, which are presented in a pre-arranged random order.

"CI" CARDS: RC -4 (see Figure 1) represents a type CI card. The pipe on this RC and the cigarette package on SC-A share the category of smoking equipment. RC-4 to SC-A is the correct sort. The distracters on RC-4, jacket and table, are identical to the jacket and table figures found on SC-C. Therefore, should RC-4 be sorted to SC-C, it would

constitute a distracter sort. RC-4 sorted to SC-B represents the irrelevant sort for this RC.

"CC" CARDS: RC-2 (see Figure 1) is a CC card. Both the correct sort and the distracter sort are mediated by shared conceptual communalities. The car on RC-2 shares the concept of means of transportation with the airplane located in the upper right-hand corner of SC-B, which is the correct sort. The pants and chair figures on RC-2 share the concepts of clothing and furniture with the table and jacket on SC-C. This would constitute the distracter sort. If RC-3 is sorted to SC-A, an irrelevant sort is recorded.

The sorting box, of plywood construction, is divided into three compartments each containing a slot on the front of the box large enough to permit a card to be easily inserted into the compartment. Access to the interior of the box is gained from the rear to remove the sorted cards.

SUBJECTS:

The subject sample for this study was obtained at a large mid-western V.A. neuropsychiatric hospital.

The patient sample consisted of seven male process schizophrenics and 10 male reactive schizophrenics for whom Becker-Elgin scores were available by virtue of their having participated in a previous study.

These subjects had been rated by two advanced graduate psychology students one of whom was the writer. Two-rater reliability was developed by a thorough discussion of the Becker-Elgin Scale in order to establish a common frame of reference against which each case history could be evaluated. The two raters then independently rated 46 case histories and obtained a Pearsonian correlation of .913 between the ratings.

The process and reactive groups were comparable with respect to age, vocabulary (WAIS) raw scores, and educational level.

Four male psychology trainees and one male hospital aide comprised the control group. No IQ estimates were obtained for these subjects since they were quite familiar with the test.

PROCEDURE

Each subject, upon arriving at the psychology laboratory, was simply told that he had been selected for a research project and that his participation would be helpful in carrying out the research. Considerable effort was expended to reassure the patients that the results of their tests would in no way influence their course in the hospital.

DISTRACTER CARD SORT

PRETEST: The subject (S) was asked to name the figure on each of the 36 cards. S was told the correct name for incorrectly named figures. Failure to properly name any four figures eliminated the S from the study. Ss who missed less than four were shown the cards a second time. These Ss were retained only if they correctly named all of the figures on the second trial. No subjects were eliminated on the basis of the pretest.

IDENTITY SORT: The sorting box was placed upon a table in front of the S. The three SCs were placed above the three slots, on top of the sorting box, and the stack of 72 cards comprising the Identity Sort was placed before the S. The order of the SCs, from left to right remained constant for all subjects.

The following instructions were provided by the examiner (E).

Up here are three cards. (E. points to SCs or RCs as appropriate.) Down here is a pile of cards. Each card has three pictures on it like the ones you've just seen. I would like to have you put each one of these cards into the slot which you

think is the right one. To decide this, find a picture, which can be anywhere on this card which is identical to or exactly like the picture in the upper right-hand corner of one of these three cards. Then drop this card into the slot below the card you have chosen up here as the right one.

These instructions were repeated and then S was asked to tell E what he was supposed to do. When E felt that S understood the task, S was told to go ahead: "If you have trouble, just put it into the slot you think is the right one and go on to the next card. Don't spend too much time on any one card." No further comment about time was made unless S made inquiry. S was then told that speed was not important, that E was interested most in having S sort the cards correctly.

CONCEPT SORT: The same general procedure was followed for the C sort as for the I sort with the exception of the instructions for selecting the correct slot: "To decide this, find a picture anywhere on this card which is the same sort of thing or the same type as the picture in the upper right-hand corner of one of these three cards."

Upon completion of both trials, the cards were removed from the sorting box. Printed on the back of each card was an identifying code which was checked on a record blank to provide a permanent record of the subject's sortings.

VOCABULARY TEST

Upon completion of the card sorting test, each subject was given the vocabulary subtest from the Wechsler Adult Intelligence Scale in accordance with the instructions in the WAIS manual.

RESULTS:

The data were analyzed by means of the Mann-Whitney "U" test, using a two-tailed test in each instance.

A comparison between the control and reactive groups in terms of the number of correct sorts for the total test (combined Identity and

Concept sorts), revealed a tendency for the control group (mean = 143.20) to exceed the reactive group (mean = 129.30). The obtained $U = 12$; a critical value of eight is required for significance at the $P_{.05}$ level of confidence.

The control group (mean = 143.20) failed to differ significantly from the process group (mean = 138.00) in terms of total correct sorts. $U = 18$; $P_{.562}$.

The process group (mean = 138.00) and the reactive group (mean = 129.30) did not differ in terms of correct sorts for the total test. For this comparison, $U = 21$; a critical value of 14 is required for significance at the $P_{.05}$ level.

Considering just the Identity Sort, the process group (mean = 68.71) exceeded the reactive group (mean = 65.10) in correct sorts, however the difference was not significant. $U = 21$; critical value of 14 required.

The analysis of the Concept Sort revealed the process group (mean = 69.18) exceeded the reactive group (mean = 64.20) in terms of correct sorts. The obtained U of 17 was significant at the $P_{.10}$ level.

The number of distracter sorts produced by the reactive group (mean = 11.60) exceeded the process group (mean = 4.71). The mean difference was not significant. $U = 49$; a critical value of 14 is required.

The reactive group (mean = 3.00) and the process group (mean = 1.28) were comparable with respect to the number of irrelevant sorts produced, $U = 36$; a critical value of 14 is required for the $P_{.05}$ level.

CONCLUSIONS AND DISCUSSION

The results of the preliminary study revealed some interesting response tendencies to the card sorting test in the performances of the process and reactive groups. The process group tended to exceed the reactive group in ability to correctly sort the cards and consequently appears to be more similar to the control group. The reactive and

process groups produced a similar number of irrelevant sorts however the reactive group appears to be more susceptible to distracter sortings.

These findings appear to be contradictory to conclusions drawn from previous process-reactive investigations in that the performance characteristics of the process group, rather than the reactive group, tended to be similar to the performance of the control group.

It was concluded that the results of this brief study were sufficiently promising to warrant further investigation in an expanded study.

DEVELOPMENT OF THE HYPOTHESES FOR THE MAIN STUDY

In view of the above analyses and considerations, the following main hypotheses were formulated:

1. The reactive group will produce fewer correct card sorts than the control group.
2. The process group will produce more correct card sorts than the reactive group.
3. The reactive group will tend to exceed the process group in the number of distracter sorts.
4. The process group will tend to exceed the reactive group in the number of irrelevant card sorts.
5. The reactive group will tend to respond more frequently to "affect-laden" distracter figures than to "affect-free" distracters.

The decision to include a visual perceptual task in the main study was based upon two considerations: the availability of the process and reactive groups, and the observation that the results of the few studies undertaken in this area are surrounded by ambiguity and contradiction. It was therefore decided to take the opportunity to obtain some additional information about the relationship of visual perceptual behavior and the process-reactive hypothesis.

In addition to the general conclusions stated at the beginning of this chapter, three specific conclusions are relevant to the development

of the supplementary hypotheses to be tested in the second part of the main study; Pearl (1960, 1960, 1961) has demonstrated 1) a positive relationship between prognosis and sympathetic excitability, and 2) a positive relationship between sympathetic excitability and perceptual span accuracy; secondly, King (1958) concluded that reactive schizophrenics displayed increased sympathetic excitability while process schizophrenics displayed significantly less of an increase; and finally, Bartley's (1958) position on the nature of a perceptual response, e.g., an immediate discriminatory response, appears to the writer to hold more promise for empirical substantiation than some of the other positions on perception.

In view of the above considerations, the following supplementary hypotheses were formulated:

6. The reactive schizophrenic group will be inferior to the control group in terms of perceptual span accuracy.
7. The reactive group will exceed the process group in terms of perceptual span accuracy.

METHODOLOGY OF MAIN STUDY

APPARATUS

I. PERCEPTUAL SPAN TEST: A Gerbrands tachistoscope was used to present the targets. Illumination of this instrument was reduced by inserting two sheets of bond typing paper, cut to size, over each ground glass in each of the fluorescent light compartments.

The test consists of the tachistoscopic presentation of a series of 13 stimulus card (targets), each card containing a number of small circles randomly placed about the center. The cards vary from three to 15 circles. An example of a card may be found in Appendix C. The cards were presented in a pre-arranged randomized order at .05 second, then at .10, .15, .20, and .25 second, with all of the cards presented at one speed before proceeding to the next slower speed.

II. DISTRACTER CARD SORT TEST: The reader is referred to the Preliminary Study in the previous chapter for a description of the sorting test.

Although three complete sorting tests were constructed, only one was used in the main study since the use of all three sets would have considerably increased the complexity of the design as well as the number of subjects required.

SUBJECTS: The schizophrenic subjects (Ss) and the control Ss were selected from the patient population and hospital staff, respectively, of a large midwestern Veterans Administration neuropsychiatric hospital.

The pool of patients from which the subjects were drawn consisted of 436 consecutive patients who had appeared before the hospital diagnostic staff in the past year. Of this number, 234 had been classified as some form of "schizophrenia." The clinical histories of the latter

were then screened to eliminate any patient from the study for any of the following:

1. Insufficient amnestic information
2. Above 45 years of age
3. Electroshock or insulin coma treatments within the past year
4. Not currently receiving a phenothiazine tranquilizing drug
5. History of seizures, cerebral pathology, or traumatic insult to the head
6. Post-lobotomy or history of cranial surgery
7. Evidence of mental deficiency
8. Evidence of severe visual defect, e.g., loss of one eye.

The histories of 108 patients were judged to be adequate, of which 98 were subsequently rated to attain the goal of 60 subjects.

CLASSIFICATION OF SUBJECTS

The writer re-established two-rater reliability with a second colleague by replicating the procedure described in the Preliminary Study. A Pearson r of .841 ($N = 38$) was accepted as satisfactory. Sixty additional patients were rated only by the writer.

It became necessary to test 77 patients to obtain 60 Ss who met the pre-established criteria. Of the 17 rejected, nine achieved estimated IQs below 80, six Ss, subsequent to being rated, were either taken off medication or changed to other than phenothiazine drugs, and two were found to have visual acuity less than 20/50.

Upon completion of the testing of 60 Ss, each S was assigned to one of three groups on the basis of his Abbreviated Becker-Elgin Scale score (ABES). This procedure, in addition to being the most expedient, served to guard against the development of biases, on the examiner's part. Advance knowledge of a subject's classification might have influenced

the examiner-subject relationship during the testing. The distribution of ABES scores for 98 patients along with the respective classification or disposition of each subject may be found in Appendix B.

REACTIVE GROUP (N = 20): This group was comprised of the 20 subjects with the lowest ABES scores. It consisted of 16 whites and four Negros, of whom 10 were married, six were single, and four were either separated or divorced. Their ages ranged from 23 to 42 with a mean of 32.25 years. The mean vocabulary raw score was 44.65; mean educational level was 11.85 years; and the mean visual acuity ratio was 20/33.75. The average reactive S accumulated 2.30 hospital admissions, spent 5.01 months in hospital in the past three years; remained out of hospitals for 39.20 months between the previous and present hospitalizations; and participated in this study 17.20 weeks following his admission. Hospital diagnoses included 14 schizophrenic reactions unclassified type, four paranoid type, one catatonic type, and one schizo-affective type.

PROCESS GROUP (N= 20): This group was comprised of the 20 subjects with the highest ABES scores. It consisted of 16 whites and four Negros, of whom 18 were single and two were either separated or divorced. The absence of married men in the process group is not surprising since one characteristic of the typical process schizophrenic is thought to be an inability to enter into a stable heterosexual relationship. Their ages ranged from 19 to 45 with a mean of 29.60 years. The mean vocabulary raw score was 47.00; mean educational level was 11.60 years; and the mean visual acuity ratio was 20/31.25. The average process patient accumulated 2.55 hospital admissions; spent 12.16 months

in hospitals in the past three years; remained out of hospitals for 20.90 months between the previous and present hospitalizations; and participated in this study 17.45 weeks following his admission. Hospital diagnoses included 10 schizophrenic reactions unclassified type, seven paranoid type, and one each of the hebephrenic, catatonic, and schizophrenic reaction, acute types.

MIDGROUP (N = 20): The 20 subjects whose ABES scores fell in the middle of the distribution, between the process and reactive cut-off points, comprised this group. The writer is unaware of any previous studies in which a midgroup was included. Although no hypotheses were formulated with respect to this group, the decision was made to include these subjects in the analysis since their data were available. The group consisted of 16 whites and four Negroes, of whom five were married, six were single, and nine were separated or divorced. Their ages ranged from 24 to 45, with a mean of 35.40 years. The mean vocabulary score was 44.10; mean educational level was 11.05; and the mean visual acuity ratio was 20/28.75. The average midgroup subject accumulated 2.25 hospital admissions, spent 5.98 months in hospitals in the past three years; remained out of hospitals for 28.70 months between the previous and present hospitalizations, and participated in this study 21.25 weeks following his admission. Hospital diagnoses included 11 schizophrenic reactions unclassified type, seven paranoid type, and two catatonic type.

SCHIZOPHRENIC GROUP (N= 60): This group refers to the 60 schizophrenic subjects, without regard for ABES scores, cast into a single, undifferentiated group to provide a heterogeneous group for comparisons with the control group in the analysis of the test data.

Figure 2. Distribution of Abbreviated Becker-Elgin Scores for 98 Schizophrenic Patients.

N = 98							
X = One patient							
					X		
				X	X		
				X	X		
		X		X	X		
		X	X	X	X		
		X	X	X	X		
		X	X	X	X		
	X	X	X	X	X		
	X	X	X	X	X		
	X	X	X	X	X		
	X	X	X	X	X		
	X	X	X	X	X		
	X	X	X	X	X		
	X	X	X	X	X	X	
	X	X	X	X	X	X	
	X	X	X	X	X	X	
	X	X	X	X	X	X	
X	X	X	X	X	X	X	
X	X	X	X	X	X	X	X

-5.1 10.0	-10.1 15.0	-15.1 20.0	-20.1 25.0	-25.1 30.0	-30.1 35.0	-35.1 40.0	-40.1 45.0
--------------	---------------	---------------	---------------	---------------	---------------	---------------	---------------

CONTROL GROUP (N = 20): This group was comprised, in the main of 18 males who had recently taken employment at the hospital and were temporarily working as custodians, awaiting the beginning of a training course to qualify them as nursing assistants. Consequently, these men were quite naive to the hospital milieu since at the time of testing they had no formal contacts with mental patients. Nineteen men were tested; however, one man's vocabulary score was too low to be retained in the group.

The remaining two control subjects were temporary clerical employees in the Psychology Service, also naive to hospital routines at the time they were tested.

The control group was comprised of 16 whites and four Negroes, of whom 16 were married, three were single, and one was divorced. Their ages ranged from 18 to 43, with a mean of 26.85 years. The mean vocabulary score was 40.00; mean educational level was 11.20 years; and the mean visual acuity ratio was 20/28.75. All of the control subjects denied the use of any form of tranquilizers at the time of testing.

CHARACTERISTICS OF THE SAMPLE

Those characteristics relevant to both control and schizophrenic subjects are summarized in Table 1. With the exceptions of the age and visual acuity variables, the subjects were quite comparable with respect to the variables examined.

Table 1. Characteristics of the Sample

	Control	Schizophrenic	Reactive	Midgroup	Process
Number of Ss	20	60	20	20	20
<u>AGE</u>					
Mean	26.85	32.40	32.25	35.40	29.55
S.D.	7.03	5.57	5.53	4.85	6.24
<u>MARITAL STATUS</u>					
Single	3	30	6	6	18
Married	16	15	10	5	0
Separated	0	3	1	1	1
Divorced	1	12	3	8	1
<u>RACE</u>					
Negro	5	12	4	4	4
White	15	48	16	16	16
<u>EDUCATIONAL LEVEL</u>					
Mean	11.20	11.50	11.85	11.05	11.60
S.D.	2.16	2.31	2.17	2.25	2.44
<u>VOCABULARY SCORE</u>					
Mean	40.00	45.25	44.65	44.10	47.00
S.D.	10.40	15.15	13.91	15.03	16.27
<u>VISUAL ACUITY</u>					
Mean	20/28.75	20/31.25	20/33.75	20/28.75	20/31.25

The results of age comparisons between the several groups are presented in Table 2. The control group, the youngest, differed significantly from the schizophrenic group ($P_{.01}$); the reactive group ($P_{.05}$); and the midgroup ($P_{.01}$). The process group, the youngest of the three schizophrenic subgroups, differed significantly ($P_{.01}$) from the midgroup, the oldest. Although the mean difference between the process and reactive groups was not significant, it is not surprising that the process subjects tend to be the younger in view of the early onset of the disorder in the lives of these patients.

Although a significant difference between the control and schizophrenic groups in visual acuity was not found, the reactive vs. midgroup comparison proved to be significant at the $P_{.05}$ level of confidence, suggesting that the vision of the reactive subjects was generally less adequate than the midgroup. With this exception, the groups appear to be comparable with respect to visual acuity (Table 3).

No significant differences were observed between the several groups on either vocabulary performance or educational level (Tables 1 and 2 in Appendix D). To the extent these measures reflect intellectual potential, it may be concluded that the subjects were quite comparable.

It is rather difficult to conceptualize or to specify the degree of "sickness" in one mental patient as compared with another. One such measure might be the extent to which hospitalization is necessary. For example, one patient with several brief hospitalizations may be considered "less sick" than one continuously hospitalized for several years. A summary of four hospitalization measures is presented in Table 4.

The first measure, number of admissions, was evaluated by a median test, dichotomizing admissions into "two or less" and "three or more" categories. The obtained chi square of .143 ($df = 2$) was not significant.

Table 2. "t"-Test for Mean Age Differences Between Paired Groups

Groups	Mean Age 1st Group	Mean Age 2nd Group	t	df	Level of Signifi- cance*
Control (N=20) vs Schizophrenic (N=60)	26.85	32.40	3.50	78	.01
Control (N=20) vs Reactive (N=20)	26.85	32.25	2.63	38	.05
Control (N=20) vs Midgroup (N=20)	26.85	35.40	4.36	38	.01
Control (N=20) vs Process (N=20)	26.85	29.55	1.25	38	N.S.
Reactive (N=20) vs Midgroup (N=20)	32.25	35.40	1.86	38	N.S.
Reactive (N=20) vs Process (N=20)	32.25	29.55	1.41	38	N.S.
Midgroup (N=20) vs Process (N=20)	35.40	29.55	3.23	38	.01

*Two-tailed tests.

Table 3. Mann-Whitney "U" Test for Mean Differences in Visual Acuity Between Paired Groups

Groups	Mean Acuity 1st Group	Mean Acuity 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	28.75	31.25	691.5	2548.5	718.5(z=1.37)	N.S.
Control vs Reactive	28.75	33.75	344.0	476.0	134.0	N.S.
Control vs Midgroup	28.75	28.75	401.5	418.5	191.5	N.S.
Control vs Process	28.75	31.25	366.0	454.0	156.0	N.S.
Reactive vs Midgroup	33.75	28.75	483.0	337.0	127.0	.05
Reactive vs Process	33.75	31.25	452.0	368.0	158.0	N.S.
Midgroup vs Process	28.75	31.25	367.5	452.5	157.5	N.S.

*Two-tailed test.

Table 4. Hospitalization Characteristics for the Schizophrenic Subjects

	Reactive	Midgroup	Process
<u>Number of Hospitalizations</u>			
Number of Subjects	20	20	20
Mean Number of Hospitalizations	2.30	2.25	2.55
 <u>Number of Months Hospitalized</u>			
<u>In Past Three Years</u>			
Mean	8.14	9.44	12.16
S. D.	5.01	5.98	9.66
Number of Subjects	20	20	20
 <u>Months Out of Hospitals From Last</u>			
<u>Discharge To Present Admission</u>			
Number of Subjects	16	15	16
Mean	39.20	38.70	20.90
S. D.	48.50	38.60	26.40
 <u>Weeks From Admission to Date</u>			
<u>Of Testing</u>			
Number of Subjects	20	20	20
Mean	17.20	21.25	17.45
S. D.	13.35	14.70	12.50

The second measure was total hospitalization time (not counting trial visits, or leaves) in the past three years. The reference period of three years was arbitrarily selected. A significant ($P_{.05}$) Hartley F max test indicated heterogeneous variances within the groups, consequently the non-parametric "U" test was used to evaluate the data. No significant differences were observed between the three subgroups. The trend suggested however, is not surprising, with the reactive group requiring the least hospitalization, followed by the midgroup, and finally, the process group with the greatest time (see Table 3 in Appendix D).

The third measure, the length of time between the patient's last discharge and present admission date, failed to differentiate the three groups. The trend suggested, in order of decreasing time, was the reactive group, followed by the midgroup, and process group. This summary is presented in Table 4 in Appendix D.

The fourth measure, length of time from present admission date to date of testing, also failed to differentiate significantly the three groups (Table 5 in Appendix D). Time-wise, therefore, equal opportunities were available to each group for participation in the hospital therapeutic programs.

In summary, the absence of significant differences between the three subgroups on these hospitalization measures may be viewed as evidence to the effect that the schizophrenic patients participating in this study were comparable in regard to "degree of sickness."

To determine the possibility of an overloading of one schizophrenic subtype within one of the three subgroups, the data were subjected to a chi square analysis, comparing the three subgroups with three diagnostic categories, unclassified, paranoid, and other. Due to small frequencies, the subtypes catatonic, hebephrenic, schizo-affective, and acute reaction, were pooled in the "other" category. The obtained chi square of

2.04 ($df = 4$) was not significant. It may be concluded that the distribution of classical diagnostic subtypes was uniform throughout the subgroups.

The decision to restrict tranquilizing medication to members of the phenothiazine group stemmed from Pearl's (1961) observations that these drugs reduce perceptual span accuracy scores. A breakdown of medications in the three subgroups may be found in Table 6 in Appendix D. Drugs and dosages were stabilized for at least seven days prior to testing. The drugs were cast into the dichotomy, "Thorazine" and "Other phenothiazines," which was tested against the three subgroups. The obtained chi square of .96 ($df = 2$) was not significant. The subgroups were therefore comparable with respect to chemotherapeutic treatment.

PROCEDURE

The procedure followed in the main study was similar to that of the preliminary study with the following additions and modifications.

I. VISUAL ACUITY TEST: After obtaining the subject's (S) cooperation, he was told that first his eyes would be checked. A Snellen Eye Chart, illuminated by a 10 foot-candle light source (measured by a Weston Master II light meter) was viewed by S from a distance of 20 feet. Beginning with the 20/50 line, S was asked to read aloud each successive smaller line down the chart. The estimate of S's acuity was taken as the smallest line read without an error. Failure to correctly read all of the letters in the 20/50 line eliminated the S from further participation in the study. Two patients were so eliminated. This test was included to provide a measure of visual control for the perceptual span test.

II. PERCEPTUAL SPAN TEST: This test was introduced to the S as a different type of vision test. S was then told that the tachistoscope was an instrument in which pictures could be made to appear and disappear in a flash. Test card number 2 was then briefly displayed to illustrate a circle pattern. The examiner (E) then said:

I will show you several cards, one at a time. Each card will have some circles on it similar to the one you just saw. All you have to do is keep your eyes up to the two openings and tell me how many circles you see after each flash. Before each flash appears, I will say 'ready' to let you know when to expect the flash.

The subject was encouraged to guess even though he was not sure of the number. The five trials were then presented, beginning with the fastest (.05") and concluding with the slowest (.25").

A correct response was recorded by E as an "X" in the appropriate space on the record blank. An incorrect response was recorded by writing in the number reported by S. The perceptual span accuracy score was obtained by counting the number of correct responses in the five trials. This test was conducted in a semi-darkened room. External illumination was reduced by drawn window shades and extinguished lights.

III. DISTRACTER CARD SORT TEST

A. PRETEST: The procedure described in the Preliminary Study (see page 23) was adhered to in the Main Study.

B. NEUTRAL CARD SORT: This sort, which utilized the same 36 cards employed in the Pretest, was added to provide a basal measure of conceptual sorting ability.

The pile of 36 cards was placed upon the table in front of S. S was then told to sort the cards into piles so that the cards in each pile belonged together or were alike in some way. A record of the sort was made by noting the cards placed in each pile. The Neutral Card Sort score was obtained by allowing one point for each correct placement. A perfect score of 36 indicates the cards were sorted into nine categories, each category containing the appropriate four cards.

C. IDENTITY SORT: The same procedure described in the Preliminary Study (see page 23) was employed with the following modification.

The writer had observed, in the course of the Preliminary Study, that Ss tended to vary, sometimes considerably, in the time required to sort the cards. In view of this observation, the decision was made to obtain a record of the time required for each sort without S having any knowledge about his being timed. As S dropped the first card into a slot, E, standing behind S, activated a stopwatch which had stopped as the last card was dropped into the sorting box. The same procedure was followed for the Concept sort.

D. CONCEPT SORT: The same procedure employed in the Preliminary Study (page 24) was adhered to except that the sort was timed as described above.

E. RETEST: Information relative to the reliability of a test is frequently sought by those who wish to critically evaluate the merits of a given test. This is especially true when a novel or unfamiliar test is employed. An attempt was made to shed some light on the reliability question by having the Ss sort the cards a second time to obtain test-retest data.

After completing the Concept Sort, the Ss were given a Time Knowledge Inventory, constructed by Rabin, and asked to complete the statements as accurately as they could. This task occupied S while E recorded the card sort and re-ordered the cards for the second trial. Approximately 15 minutes were required for this clerical work which provided sufficient time for the majority of Ss to complete the paper-pencil task.

E then asked S to sort the cards a second time, repeating the instructions given previously. While the majority of Ss accepted the retest without serious complaint, two Ss refused to sort the cards the second time.

F. VOCABULARY TEST: The same procedure employed in the Preliminary Study (see page 24) was adhered to in the Main Study.

RESULTS OF MAIN STUDY

NEUTRAL CARD SORT

These results are presented in Table 5. As a consequence of heterogeneity of variances within the groups ($F_{\max} = 7.33$; $k=4$; $N=20$; $P_{.01}$), the non-parametric Mann-Whitney "U" test was employed in the analysis, using two-tailed tests.

The mean number of correct sorts produced by the control group (34.10) exceeded the mean of the schizophrenic group (31.48) at the $P_{.05}$ level of confidence. Paired group vs. group comparisons revealed a significant ($P_{.05}$) difference between the control group (34.10) and the reactive group (32.40). None of the remaining two group comparisons were significant at or beyond the $P_{.05}$ level of confidence.

These results support the assertion that some schizophrenics are generally inferior to control ("normal") Ss with respect to performance on conceptual sorting tasks. When the schizophrenics are cast into three subgroups, along the process-reactive continuum, the reactive group, in contrast to the middle and process groups, represents those Ss whose sorting ability differs significantly from that of the controls.

DISTRACTER CARD SORT TEST

I. RELIABILITY: The Identity and Concept Sorts were readministered following a time lapse of approximately 15 minutes to obtain information relative to the reliability of the test. One reactive S and one process S refused to sort the cards the second time, thus $N=78$ for the retest sample, considering the control and schizophrenic Ss as one group.

A Spearman Rank-Order correlation of .53 which is highly significant beyond the $P_{.0005}$ level of confidence was obtained between the two trials for the number of correct sorts in the total test.

Table 5. Mann-Whitney "U" Test for Mean Differences in Neutral Card Sorts Between Paired Groups

Groups	Mean Score 1st Group	Mean Score 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	34.10	31.48	987.0	2253.0	423.0(z=2.03)	.05
Control vs Reactive	34.10	32.40	489.5	330.5	120.5	.05
Control vs Midgroup	34.10	31.55	455.5	364.5	154.5	N.S.
Control vs Process	34.10	30.50	462.0	358.0	148.0	N.S.
Reactive vs Midgroup	32.40	31.55	376.0	444.0	166.0	N.S.
Reactive vs Process	32.40	30.50	392.5	427.5	182.5	N.S.
Midgroup vs Process	31.55	30.50	417.0	403.0	193.0	N.S.

* Two-tailed test.

II. TREATMENT OF DISTRACTER CARD SORT DATA: The data generally were analyzed in accordance with two general principles, the first of which refers to the treatment of the subjects. Comparisons were initially drawn between the control group and the schizophrenic group in order to determine "main effects" between controls and "schizophrenics." This analysis was followed by two-group comparisons between the control, reactive, middle, and process subgroups to (a) determine the contributors to an observed main effect, or (b) to determine the presence of differences between the three schizophrenic subgroups which might cancel out and thereby fail to produce a main effect between the controls and "schizophrenics."

The second principle refers to the treatment of the task. The analytic procedure described above was initially applied to sortings for the "Total test" (I + C Sorts) which refers to the combined Identity and Concept Sorts, treated as one sort, to obtain information about the test as a whole.

The second and third analyses were concerned with the Identity Sort (I Sort) and Concept Sort (C Sort), respectively, in order to identify group differences relative to the type of task, i.e., matching (Identity Sort) or conceptualizing (Concept Sort).

ANALYSIS OF CORRECT SORTS

A summary of this analysis for the total test is presented in Table 6. Significantly ($P_{.05}$ one-tailed test) more correct sorts were made by the control group (mean = 141.80) than by the schizophrenic group (mean = 130.10). This supports the assertion that schizophrenic Ss tend to be inferior to "normals" in conceptual sorting ability.

Group vs. group comparisons (Table 6) disclosed that the control group mean (141.80) significantly exceeded the reactive group mean (128.95) at the $P_{.025}$ level of confidence, using the one-tailed test.

Table 6. Mann-Whitney "U" Test for Mean Differences in Correct Sorts (I + C Sorts) Between Paired Groups

Groups	Mean Sorts 1st Group	Mean Sorts 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	141.80	130.10	947.5	2292.5	462.5 (z=1.60)	.05
Control vs Reactive	141.80	128.95	495.0	325.0	115.0	.025
Control vs Midgroup	141.80	125.30	441.0	379.0	169.0	N.S.
Control vs Process	141.80	136.05	431.5	388.5	178.5	N.S.
Reactive vs Midgroup	128.95	125.30	386.0	434.0	176.0	N.S.
Reactive vs Process	128.95	136.05	355.0	465.0	145.0	N.S.
Midgroup vs Process	125.30	136.05	396.0	424.0	186.0	N.S.

* One-tailed test.

Hypothesis 1. The reactive group will produce fewer correct card sorts than the control group.

Hypothesis 1 was confirmed.

Hypothesis 2. The process group will produce more correct card sorts than the reactive group.

As predicted, the process group mean of 136.05 exceeded the reactive group mean of 128.95. The mean difference however, failed to reach a significant level. Hypothesis 2 was not confirmed.

In summary, a comparison between the control group and the schizophrenic group revealed a significant difference in the total number of correct sorts in favor of the former group. When the control group was compared with each one of the three subgroups, only the reactive group was found to be significantly different. The three subgroups did not differ among themselves.

The Identity Sort failed to differentiate significantly the Ss with respect to correct sorts. This summary may be found in Table 7 in Appendix D.

The Concept Sort analysis (Table 8 in Appendix D) disclosed essentially the same results as the analysis for the total test. The control group mean of 71.20 significantly exceeded both the schizophrenic group mean of 64.13 and the reactive group mean of 63.75. Both tests were significant at the $P_{.05}$ level of confidence using a one-tailed test. Although the process group (mean = 67.40) produced more correct sorts than the reactive group (mean = 63.75), the mean difference was not significant. The remaining subgroup comparisons were also insignificant.

It was noted previously that significant age differences obtained between the several groupings of subjects. In order to determine the existence of a possible relationship between age and the ability to correctly sort the cards, a correlational analysis between age and total number of correct sorts was carried out for each group of subjects.

The following Spearman Rank Order correlations were obtained, none of which were significant at the $P_{.05}$ level of confidence: control group, .0857; reactive group, $-.0276$; midgroup, .2726; and process group, $-.0339$. Age does not appear to be a significant variable in the production of correct card sorts.

SORTING TIME ANALYSIS: The control group mean sorting time (377.00") was significantly less than the mean sorting times for the schizophrenic group (518.73" : $P_{.001}$); the reactive group (648.35" : $P_{.002}$); the midgroup (473.45" : $P_{.02}$); and the process group (434.40" : $P_{.05}$). All tests were two-tailed. Furthermore, the reactive group required significantly more time to sort the cards than either the midgroup ($P_{.05}$) or process group ($P_{.02}$). The midgroup vs. process comparison was insignificant. This summary may be found in Table 7.

Summaries for the analyses of the Identity and Concept Sorts may be found in Tables 9 and 10, respectively, in Appendix D. In each case, as above, in order of increasing times, the control group was followed by the process, midgroup, and reactive group.

In order to determine a possible relationship between sorting time (speed) and the number of correct sorts (accuracy), a Spearman Rank Order correlation was obtained for each subject group. A value of $-.5209$, significant beyond the $P_{.02}$ level of confidence, was obtained for the control group. None of the obtained correlations for the schizophrenic subgroups were significant at the $P_{.05}$ level, using a two-tailed test (reactive group, $-.4100$; midgroup, $-.3473$; and process group, .1166). These results indicate that in the case of the control group the fastest sorters tended to be more accurate than the slower sorters. Speed and accuracy do not appear to be related in the schizophrenic subjects.

Finally, the question of a possible relationship between sorting time and age was posed. The following Rank Order correlations were

Table 7. Mann-Whitney "U" Test for Mean Differences in Sorting Time (seconds) for I + C Sorts Between Paired Groups

Groups	Mean Time 1st Group	Mean Time 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	377.00	518.73	519.0	2721.0	891.0 (z=3.23)	.001
Control vs Reactive	377.00	648.35	283.0	537.0	73.0	.002
Control vs Midgroup	377.00	473.45	324.0	496.0	114.0	.02
Control vs Process	377.00	434.40	332.0	488.0	122.0	.05
Reactive vs Midgroup	648.35	473.45	490.0	330.0	120.0	.05
Reactive vs Process	648.35	434.40	505.5	314.5	104.5	.02
Midgroup vs Process	473.45	434.40	427.5	392.5	182.5	N.S.

* Two-tailed test.

obtained: control group, .0965; reactive group, .3805; midgroup, .1824; and process group, -.2267. None of these values were significant at the $P_{.05}$ level, using two-tailed tests. These results indicate that speed of sorting is independent of the age variable.

DISTRACTER ANALYSIS

Having analyzed the correct sortings, the next step is to examine the incorrect or error sorts. The first type of incorrect sort to be examined is the distracter sortings. Following this, the irrelevant sorts will be examined.

An overall evaluation of distractibility may be obtained by examining the frequency of distracter sorts across the total test. This summary may be found in Table 8. The mean number of distracter sorts produced by the schizophrenic group (9.98) significantly ($P_{.03}$) exceeded the control group mean of 1.85. The reactive group (mean = 12.50) produced significantly more distracter sorts than either the control group ($P_{.01}$), or the process group (mean = 4.00 : $P_{.05}$ all tests were one-tailed tests). The remaining two group comparisons were not significant.

Hypothesis 3: The reactive group will tend to exceed the process group in the number of distracter sorts.

Hypothesis 3 was confirmed.

When the task consisted of matching figures, as was the case in the Identity Sort, no significant differences were observed between the several groups in terms of distracter sorts (Table 11 in Appendix D).

The Concept Sort, once again, proved effective in differentiating the subjects (Table 12 in Appendix D). The control mean of .50 and the schizophrenic mean of 4.78, differed significantly at the $P_{.007}$ level of confidence. It was observed further that the reactive group mean of 6.75 differed significantly from the control group mean at the $P_{.01}$ level

Table 8. Mann-Whitney "U" Test for Mean Differences in Distracter
Sorts (I + C Sorts) Between Paired Groups

	Mean Sorts 1st Group	Mean Sorts 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	1.85	9.98	656.5	2583.5	733.5 (z=1.85)	.03
Control vs Reactive	1.85	12.50	324.0	496.0	114.0	.01
Control vs Midgroup	1.85	13.45	359.0	461.0	149.0	N.S.
Control vs Process	1.85	4.00	393.5	426.5	183.5	N.S.
Reactive vs Midgroup	12.50	13.45	433.0	387.0	177.0	N.S.
Reactive vs Process	12.50	4.00	479.5	340.5	130.5	.05
Midgroup vs Process	13.45	4.00	444.0	376.0	166.0	N.S.

* One-tailed test.

and from the process group mean of 1.75 at the $P_{.05}$ level. Finally, the means of the control and midgroups, .50 and 5.85, respectively, differed significantly at the $P_{.05}$ level of confidence. All tests were one-tailed.

To summarize the analysis of distracter sorts: 1) the schizophrenic Ss were more distractible than the control Ss; 2) the reactive group was more distractible than either the control or process groups; and 3) distractibility appears to vary with the nature of the task confronting the schizophrenic, especially the reactive schizophrenic.

The above analysis was made without regard for the type of distracter figure involved in the distracter sorts. We were concerned only with the presence or absence of distractibility per se, holding the type of task constant, i. e., Identity or Concept Sorts. We turn now to an examination of distractibility from the viewpoint of the distracter figures, recalling that two types of distracters, identity and concept, were built into the test. The initial comparisons were made between the several groups in terms of distracter sorts for the combined II + CI cards and for the combined IC + CC cards. These analyses were undertaken to obtain information about the relative effectiveness of the two types of distracters.

The summary of the analysis of identity distracters (II + CI cards) is presented in Table 9. The control group made significantly ($P_{.05}$) fewer distracter sorts than the schizophrenic group; means were 1.60 and 6.63, respectively. This analysis further revealed that the reactive group (mean = 8.15) produced significantly more distracter sorts than either the control group (mean = 1.60: $P_{.02}$) or the process group (mean = 2.50: $P_{.05}$). These tests were two-tailed tests.

Table 10 presents the summary of the concept distracters. The control group (mean = .25) produced significantly ($P_{.04}$) fewer distracter sorts than the schizophrenic group (3.35). Further comparisons revealed

Table 9. Mann-Whitney "U" Test for Mean Differences in Identity Distracter (II + CI Cards) Sorts Between Paired Groups

Groups	Mean Sorts 1st Group	Mean Sorts 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	1.60	6.63	650.0	2590.0	760.0 (z=1.95)	.05
Control vs Reactive	1.60	8.15	321.0	499.0	111.0	.02
Control vs Midgroup	1.60	9.25	354.0	466.0	144.0	N.S.
Control vs Process	1.60	2.50	395.0	425.0	185.0	N.S.
Reactive vs Midgroup	8.15	9.25	430.5	389.5	179.5	N.S.
Reactive vs Process	8.15	2.50	484.0	336.0	126.0	.05
Midgroup vs Process	9.25	2.50	453.5	366.5	156.5	N.S.

*Two-tailed test.

Table 10. Mann-Whitney "U" Test for Mean Differences in Concept Distracter (IC + CC Cards) Sorts Between Paired Groups

Groups	Mean Sorts 1st Group	Mean Sorts 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	.25	3.35	668.0	2572.0	742.0 (z=2.04)	.04
Control vs Reactive	.25	4.35	335.5	484.5	125.5	.05
Control vs Midgroup	.25	4.20	364.0	456.0	156.0	N.S.
Control vs Process	.25	1.50	388.5	431.5	178.5	N.S.
Reactive vs Midgroup	4.35	4.20	430.5	389.5	179.5	N.S.
Reactive vs Process	4.35	1.50	461.0	359.0	149.0	N.S.
Midgroup vs Process	4.20	1.50	436.0	384.0	174.0	N.S.

* Two-tailed test.

a significant ($P_{.05}$) difference between the control group (mean = .25) and reactive group (mean = 4.35) in the number of distracter sorts involving concept distracters. These tests were two-tailed tests.

In summary, both types of distracter figures were effective in distracting the schizophrenic subjects, especially the reactive subjects.

Having established that some subjects respond to distracters, we turn to an examination of the content of the distracter figures to determine the relative "pull" of the "affect-laden" and "affect-free" figures upon just those subjects who were distracted. The number of Ss in each group who produced distracter sorts were as follows: control, 7; schizophrenic, 31 (broken down into reactive, 13; midgroup, 10; and process, 8).

A summary of the "affect-free" distracter analysis for the total test is presented in Table 11. A significant ($P_{.03}$) mean difference between the control Ss (mean = 1.86) and the schizophrenic Ss (mean = 7.58) was obtained. Additional comparisons revealed that the midgroup Ss (mean = 10.8) significantly ($P_{.01}$) exceeded the control Ss (mean = 1.86). No other significant two group comparisons were observed. These tests were one-tailed tests.

The analysis of affect-free distracter sorts within the Identity Sort failed to demonstrate a main effect between the control and schizophrenic subjects (Table 13 in Appendix D). It may be noted, however, that the midgroup Ss (mean = 4.70) exceeded the control Ss (mean = 1.43), significant at the $P_{.05}$ level of confidence, using one-tailed tests.

Finally, the Concept Sort analysis (Table 14 in Appendix D) disclosed a significant ($P_{.03}$) difference between the control Ss (mean = .43) and schizophrenic Ss (mean = 4.22). Once again it was the midgroup Ss (mean = 6.10) differing significantly ($P_{.05}$) from the control Ss whose mean was .43. These tests were one-tailed tests.

It may be concluded that the pull of the affect-free distracters was uniform among the control, reactive and process subjects who

Table 11. Mann-Whitney "U" Test for Mean Differences in Affect-Free Distracter Sorts (I + C Sorts) Between Paired Groups

Groups	Mean Sorts 1st Group	Mean Sorts 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control (N=7) vs Schizophrenic (N=31)	1.86	7.58	86.0	655.0	159.0(z=1.93)	.03
Control (N=7) vs Reactive(N=13)	1.86	6.92	55.0	155.0	27.0	N.S.
Control (N=7) vs Midgroup (N=10)	1.86	10.80	37.5	115.5	9.5	.01
Control (N=7) vs Process (N=8)	1.86	4.62	49.5	70.5	21.5	N.S.
Reactive (N=13) vs Midgroup (N=10)	6.92	10.80	138.5	137.5	47.5	N.S.
Reactive (N=13) vs Process (N=8)	6.92	4.62	150.5	80.5	44.5	N.S.
Midgroup (N=10) vs Process (N=8)	10.80	4.62	118.0	58.5	22.5	N.S.

*
One-tailed test.

responded to distracter figures. For the midgroup Ss however, the pull was quite strong as evidenced by their significantly larger production of affect-free distracter sorts in comparison with the control Ss.

This brings us to a consideration of the "affect-laden" distracters. Again we are concerned only with those Ss who produced distracter sorts. From Table 12 it may be seen that the schizophrenic Ss (mean = 11.74) exceeded the control Ss (mean = 3.43), significant at the $P_{.05}$ level of confidence, for the total test. The subsequent group vs. group comparisons failed to disclose any mean differences that were significant. These tests were one-tailed tests.

The Identity Sort failed to differentiate the subjects (Table 15 in Appendix D).

The summary of the Concept Sort Analysis may be found in Table 16 of Appendix D. A significant ($P_{.03}$) main effect was obtained between the control Ss (mean = 1.00) and the schizophrenic Ss (mean = 5.03). This analysis also indicated that both the reactive Ss (mean = 6.54) and the midgroup Ss (mean = 5.60) differed significantly from the control Ss (mean = 1.00), both tests significant at the $P_{.05}$ level of confidence. These tests were one-tailed tests.

The following conclusions appear tenable for those subjects who responded to distracter figures: 1) the affect-laden stimuli exert a greater pull upon the schizophrenic Ss than the control Ss when the subjects are engaged in a conceptual task as opposed to simpler matching tasks; 2) among the three schizophrenic subgroups, this effect is most pronounced in the reactive and midgroup subjects; 3) the control Ss and process Ss were similarly affected by the pull of the affect-laden distracters.

Hypothesis 5: The reactive group will tend to respond more frequently to "affect-laden" distracter figures than to "affect-free" distracters.

Table 12. Mann-Whitney "U" Test for Mean Differences in Affect-Laden Distracter Sorts (I + C Sorts) Between Paired Groups

Groups	Mean Sorts 1st Group	Mean Sorts 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control (N=7) vs Schizophrenic (N=31)	3.43	11.74	94.5	646.5	150.5 (z=1.60)	.05
Control (N=7) vs Reactive (N=13)	3.43	11.92	54.0	156.0	26.0	N.S.
Control (N=7) vs Midgroup (N=10)	3.43	12.40	48.5	104.5	20.5	N.S.
Control (N=7) vs Process (N=8)	3.43	10.62	48.0	72.0	28.0	N.S.
Reactive (N=13) vs Midgroup (N=10)	11.92	12.40	158.5	117.5	62.5	N.S.
Reactive (N=13) vs Process (N=8)	11.92	10.62	153.0	78.0	42.0	N.S.
Midgroup (N=10) vs Process (N=8)	12.40	10.62	100.5	70.5	37.5	N.S.

* One-tailed test.

The test for this hypothesis entailed comparisons between two measures on each subject rather than between subjects. Since this test involved related measures within groups in which variances were previously found to be heterogeneous, the statistic of choice was the Wilcoxon Matched-Pairs, Signed-Ranks test. The summary is presented in Table 13. The affect-laden and affect-free distracters were responded to equally by the control, process, and middle groups as indicated by the absence of significant differences between the means of the two types of distracters in the groups listed. These results were uniform for the total test and for the Identity and Concept Sorts considered individually. The schizophrenic group, however, responded to significantly ($P_{.02}$) more affect-laden distracters in the total test. Means were 6.07 for affect-laden and 3.92 for affect-free distracters. The results of the Identity Sort analysis, for the schizophrenic group, were in the same direction with means of 3.48 and 1.73 which differed significantly at the $P_{.01}$ level of confidence. The Concept Sort comparisons for the schizophrenic group failed to yield significant differences between the two types of distracters. All tests were two-tailed tests.

The results of the analysis of the reactive group confirmed Hypothesis 5. With respect to the total test, the reactive group produced significantly ($P_{.01}$) more affect-laden distracter sorts (mean = 7.75) than affect-free distracter sorts (mean = 4.50). Similar results obtained for the Identity Sort comparison; means were 3.80 and 2.00; $P_{.02}$). The Concept Sort, however, failed to elicit a significant difference between the two distracter types, although a tendency was noted for the reactive Ss to favor the affect-laden over the affect-free figures.

The conclusions drawn are: 1) reactive schizophrenics stand apart from the control Ss and the midgroup and process schizophrenic Ss in that the reactive Ss appear to be more responsive to affect-laden distracter figures than to the affect-free figures; and 2) as the level of

Table 13. Comparison of Affect-Free With Affect-Laden Distracter Sorts Within Each Subject Group

	Mean of Affect- Laden Sorts	Mean of Affect- Free Sorts	"T"	N	Level of Signifi- cance*
<u>Control</u>					
I + C Sorts	1.20	.65	3	6	N.S.
I Sort	.85	.50	3	6	N.S.
C Sort	.35	.15	1	1	N.S.
<u>Schizophrenic</u>					
I + C Sorts	6.07	3.92	120	30 (z=2.31)	.02
I Sort	3.48	1.73	35	23	.01
C Sort	2.60	2.18	68	19	N.S.
<u>Reactive</u>					
I + C Sorts	7.75	4.50	8	12	.01
I Sort	3.80	2.00	2	8	.02
C Sort	4.25	2.50	11	9	N.S.
<u>Midgroup</u>					
I + C Sorts	6.20	5.40	19.5	10	N.S.
I Sort	5.25	2.35	6	8	N.S.
C Sort	2.80	3.05	13	7	N.S.
<u>Process</u>					
I + C Sorts	4.25	1.85	13.5	9	N.S.
I Sort	1.40	.85	7.5	7	N.S.
C Sort	.75	1.00	3	3	N.S.

* Wilcoxon Matched-Pairs, Signed-Ranks Test; Two tailed test.

difficulty of the task increases (from identity to concept sortings), requiring increased attention of the subjects, this selectivity tends to disappear.

A final analysis was undertaken to determine the distribution of distracter sorts within the Identity Sort and the Concept Sort. A comparison of the number of distracter sorts between the first third and the third third, in each sort, disclosed no significant differences.

These findings indicate that distracter sorts were uniformly distributed throughout the two sorts. Such evidence suggests that this type of incorrect sort was elicited by some factor such as distractibility, rather than by reactive inhibition, decreasing motivation, or boredom.

IRRELEVANT SORT ANALYSIS

The mean number of irrelevant sorts was not significantly different between the control group (.35) and the schizophrenic group (3.92) for the total test. Table 14 presents this analysis.

Hypothesis 4: The process group will tend to exceed the reactive group in the number of irrelevant card sorts.

Hypothesis 4 was not confirmed since the difference between the process group (mean = 3.95) and the reactive group (mean = 2.55), although in the predicted direction, failed to be significant.

The results of the analyses of the Identity and Concept Sorts were essentially similar to the results presented for the total test; i. e., the several groups were comparable with respect to irrelevant sorts.

Considering only those subjects who made irrelevant sorts, it was observed that the control Ss made significantly ($P_{.005}$) fewer irrelevant sorts (mean = 1.17) than the schizophrenic Ss (mean = 9.40). This summary is presented in Table 15. Each of the three subgroups differed significantly from the control group, but did not differ from each other.

Table 14. Mann-Whitney "U" Test for Mean Differences in Irrelevant Sorts (I + C Sorts) Between Paired Groups

Groups	Mean Sorts 1st Group	Mean Sorts 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	.35	3.92	690.5	2549.5	719.5(z=1.52)	.N.S.
Control vs Reactive	.35	2.55	364.0	456.0	154.0	N.S.
Control vs Midgroup	.35	5.25	373.0	447.0	163.0	N.S.
Control vs Process	.35	3.95	373.5	446.5	163.5	N.S.
Reactive vs Midgroup	2.55	5.25	405.0	415.0	195.0	N.S.
Reactive vs Process	2.55	3.95	409.0	411.0	199.0	N.S.
Midgroup vs Process	5.25	3.95	418.5	401.5	191.5	N.S.

* Two-tailed test.

Table 15. Mann-Whitney "U" Test for Mean Differences in Irrelevant Sorts (I + C Sorts) Between Groups (Only Subjects Making Irrelevant Sorts)

Groups	Mean Sorts 1st Group	Mean Sorts 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control (N=6) vs Schizophrenic (N=25)	1.17	9.40	46.5	449.5	124.5 (z=2.55)	.005
Control (N=6) vs Reactive (N=9)	1.17	5.67	32.0	88.0	11.0	.05
Control (N=6) vs Midgroup (N=8)	1.17	13.12	28.0	77.0	7.0	.02
Control (N=6) vs Process (N=8)	1.17	9.88	28.5	76.5	7.5	.02
Reactive (N=9) vs Midgroup (N=8)	5.67	13.12	66.0	87.0	21.0	N.S.
Reactive (N=9) vs Process (N=8)	5.67	9.88	70.0	83.0	25.0	N.S.
Midgroup (N=8) vs Process (N=8)	13.12	9.88	76.5	59.5	23.5	N.S.

* One-tailed test.

The process Ss tended to make more errors than the reactive Ss as predicted in hypothesis 4, however, the difference was not significant.

The Identity Sort elicited a comparable number of irrelevant sorts in each group as indicated by an absence of significant differences in the group vs. group comparisons.

In the analysis of the Concept Sort (Table 17 in Appendix D), it is interesting to note the similarity between the control and reactive Ss in terms of irrelevant sorts; means were 1.00 and 3.33, respectively. The process Ss (mean = 7.12) made significantly ($P_{.03}$) more irrelevant sorts than the control Ss (mean = 1.00), but failed to significantly exceed the reactive Ss.

A final analysis was made to determine the distribution of irrelevant sorts within the Identity Sort and the Concept Sort. A comparison of the number of irrelevant sorts between the first third and the third third in each sort revealed no significant difference.

These findings indicate that irrelevant sorts were uniformly distributed throughout each of the two sorts, which, in turn, would suggest that the subjects' motivation for complying with the instructions was maintained throughout the sorts.

To summarize the irrelevant sort analysis, no differences were found between the control group and the schizophrenic group in the number of irrelevant sorts produced. Similarly, no differences were observed between the three schizophrenic subgroups, either in comparison with each other or with the control group. Finally, the distribution of these sorts was observed to be uniform throughout the two sorts. Confirmation for Hypothesis 4 was not obtained.

Restricting the analysis to only those subjects who made irrelevant sorts served to differentiate significantly the control Ss and schizophrenic Ss in that the latter erred (committed irrelevant sorts) more frequently. It was observed further that irrelevant sorts were increased as the task

became more difficult. This held for all groups; however, the reactive Ss' increase was considerably less than the other groups.

PERCEPTUAL SPAN TEST ANALYSIS

The mean difference between the control group (mean = 19.40) and the schizophrenic group (mean = 20.02) was not significant. The mid-group (mean = 21.10) demonstrated the highest degree of accuracy, followed by the reactive group (mean = 20.40), the control group (mean = 19.40), and the process group (mean = 18.55). No significant differences were obtained in the group vs. group comparisons (see Table 16).

Hypothesis 6: The reactive group will be inferior to the control group in terms of perceptual span accuracy.

No support was obtained for hypothesis 6.

Hypothesis 7: The reactive group will exceed the process group in terms of perceptual span accuracy.

Although the reactive group (mean = 20.40) slightly exceeded the process group (mean = 18.55) as predicted, the mean difference was not significant ($t = .94$; $df = 38$). Hypothesis 7 was not confirmed.

The above analysis was concerned with the total number of correct responses for the 13 cards over the five trials. The data were also examined with respect to the adequacy of the estimates.

Figure 3 graphically presents a comparison between the control and schizophrenic groups. Group mean estimates for each card were plotted against the correct number of circles. With the exceptions of the cards with six and eight circles, both groups tend to overestimate on the cards with less than ten circles. Both groups uniformly underestimated the correct number of circles on those cards with ten or more circles, with the schizophrenic group producing the greater underestimates.

Table 16. "t"-Test for Mean Differences in Perceptual Span Accuracy Scores Between Paired Groups

Groups	Mean Score 1st Group	Mean Score 2nd Group	"t"	df	Level of Significance*
Control vs Schizophrenic	19.40	20.02	.37	.78	N.S.
Control vs Reactive	19.40	20.40	.50	38	N.S.
Control vs Midgroup	19.40	21.10	.80	38	N.S.
Control vs Process	19.40	18.55	.44	38	N.S.
Reactive vs Midgroup	20.40	21.10	.32	38	N.S.
Reactive vs Process	20.40	18.55	.94	38	N.S.
Midgroup vs Process	21.10	18.55	1.22	38	N.S.

* One-tailed test.

Figure 3. Average estimates for five trials on perceptual span test for control and schizophrenic groups.

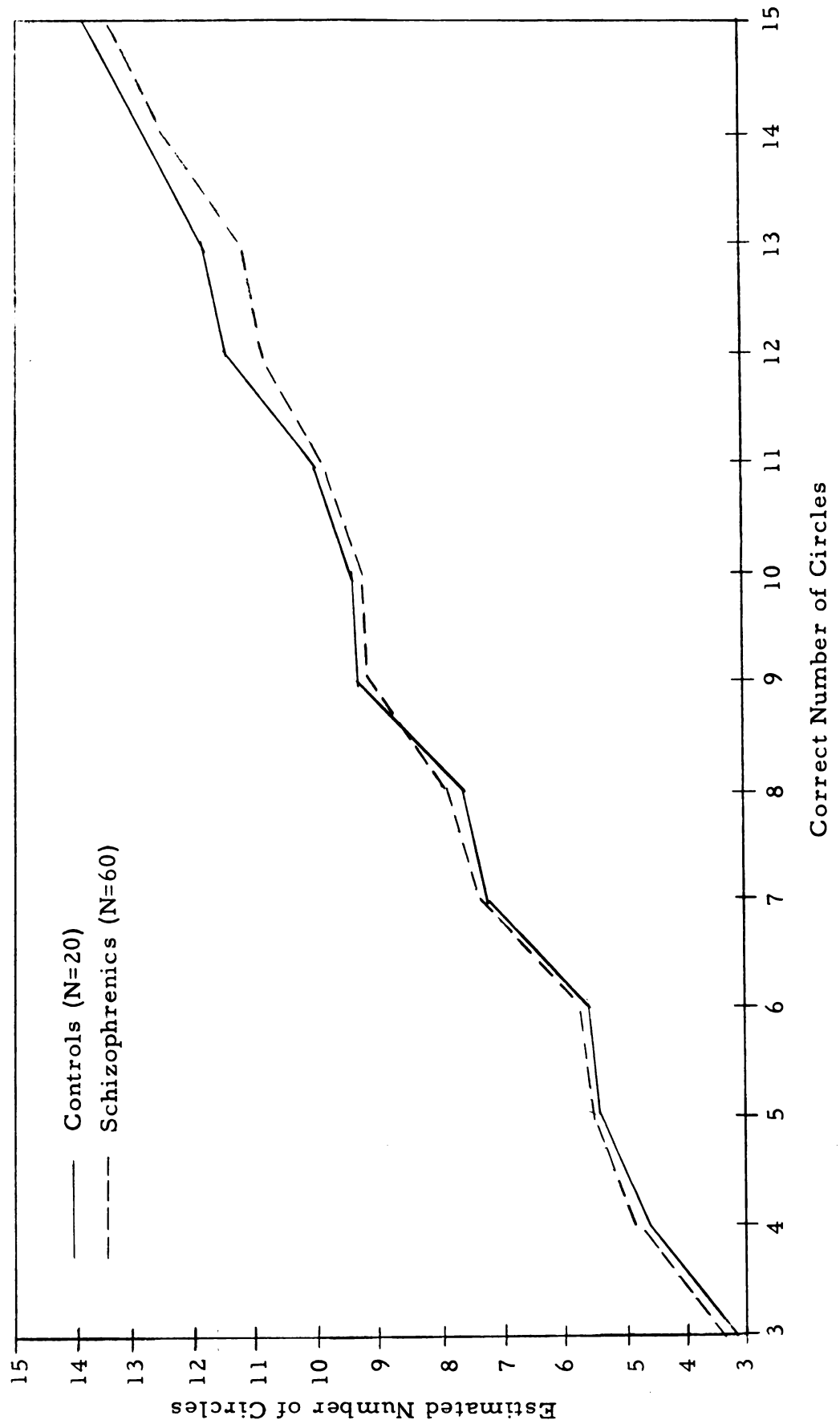
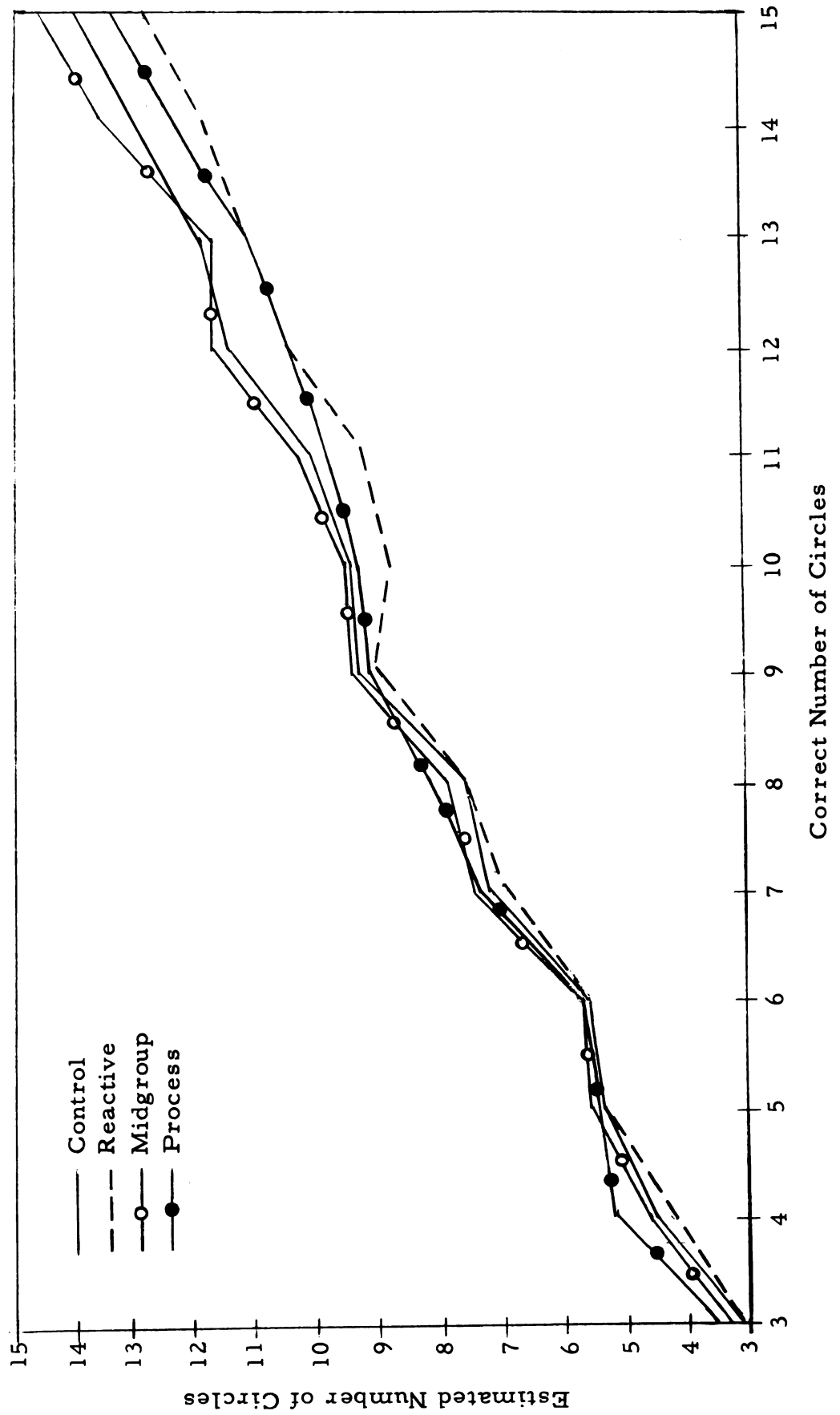


Figure 4. Average estimates for five trials on perceptual span test for control, reactive, middle, and process groups.



The difference between the two groups in terms of the average estimate for cards nine through fifteen, was not found to be significant.

Figure 4 presents a similar graphic comparison between the control group and each of the three subgroups. Again the estimated number of circles for each card is plotted against the correct number. The estimates of the reactive group tend to be lower than those for the other groups. The midgroup, in comparison with the process and reactive groups, appears to be most similar to the control group.

To summarize: 1) the control subjects and schizophrenic subjects did not differ in terms of number of correct responses (accuracy), or in terms of adequacy of estimates for the entire 65 responses; 2) no significant differences were observed between any of the three subgroups when compared with each other or with the control group either for accuracy or adequacy of estimates; 3) the midgroup demonstrated the highest degree of accuracy, followed by the reactive, control, and process groups; and 4) in terms of adequacy of estimates, the control and three subgroups were quite comparable on patterns containing less than 10 circles, generally overestimating; on patterns 10 through 15, the reactive group tends to underestimate to a greater extent than any other group.

DISCUSSION

PERCEPTUAL SPAN ACCURACY (PSA) TEST

The failure of the PSA test to differentiate the process and reactive schizophrenics was not altogether surprising; however, the failure to differentiate the control and schizophrenic subjects was rather unexpected.

The hypothesized superiority of the reactive subjects in contrast to the process subjects was envisioned as a logical derivation from the observations of Pearl (1961) and King (1958). It must be acknowledged however, that this hypothesis (7) was advanced somewhat skeptically by the writer. While Pearl's studies have consistently demonstrated a positive relationship between sympathetic excitability and perceptual span accuracy, King's conclusion that heightened sympathetic excitability characterizes reactive schizophrenic subjects has been contradicted by Grosz and Miller (1958). Hopefully, additional research will clarify the relationship between sympathetic excitability and the process-reactive hypothesis. Until such a time, further attempts to tie together physiological and psychological findings toward the goal of an increased understanding of the process-reactive hypothesis would not appear to yield very fruitful results.

Unfortunately neither McDonough (1958, 1960) nor Fine and Zimet (1959) have spelled out their conceptualization of perception which makes it difficult to draw comparisons between these two studies and the present study. Nevertheless, the similar performances of the process and reactive subjects on the PSA test appear to lend support to McDonough's observation of no differences between his process and reactive subjects on either the critical flicker or spiral aftereffect tests. In turn, these

two studies fail to support the Fine and Zimet study which reported "perceptual maturity" differences between the two groups.

From the standpoint of Bartley's conceptualization of perception as an immediate discriminatory response, it is suggested that the "brass instruments" utilized in the present study and in McDonough's study represent more appropriate tests of perception than the Rorschach technique employed by Fine and Zimet. Therefore, the evidence would appear to indicate that process and reactive schizophrenia are indistinguishable in terms of a visual perceptual variable.

The hypothesized superiority of the control group in relation to the reactive group was based upon the following evidence and considerations: 1) phenothiazine drugs depress PSA, and 2) the theoretical and empirical evidence which holds that perception may be altered by transient and more enduring personality disturbances. The obtained results not only failed to confirm Hypothesis 6, but were in the opposite direction from that predicted. By way of comparison, McDonough obtained a significant difference between his control and reactive groups in terms of critical flicker frequency threshold, but failed to differentiate the two groups on the spiral aftereffect test. The Fine and Zimet study cannot be compared since they did not examine a control group.

One might speculate about a possible canceling effect between the depressant action of the medication and the increased PSA associated with heightened sympathetic excitability characteristic of the reactive schizophrenic, with the resultant PSA similar to that for the control subjects. This argument loses force however, in view of the aforementioned ambiguity surrounding the relationship between reactive schizophrenia and sympathetic excitability.¹

¹Pearl's (1961) observation of a positive relationship between autonomic reactivity and perceptual span accuracy was obtained from schizophrenics who were receiving no tranquilizing medication. Since the patients in the present study were all receiving some form of phenothiazine medication, a design in which process and reactive subjects without medication would be compared with normals might clarify the relationship between PSA and the process-reactive hypothesis.

One might also speculate about the affective state of the control subjects at the time of testing and the probable effects upon their performance. These men, as described previously, were quite naive and many were initially apprehensive about the outcome of their tests as possibly effecting the future of their hospital employment. While most of their doubts were allayed as the testing progressed, they were rather pronounced during the PSA test which was the initial test. It is consequently possible that this situation-engendered anxiety served to reduce the PSA scores for these subjects.

It is probable that a different situation existed for the patients since many had previously visited the laboratory to participate in other research activities. Consequently they were familiar with the surroundings and less naive with respect to psychological test situations.

A third possibility exists that there are, in fact, no visual perceptual differences between normal and schizophrenic subjects. This conclusion, of course, contradicts the empirical evidence that perception is a function of the total organism and consequently is subject to alteration by needs and presses within the person. However, in view of the lack of agreement as to what constitutes perception and a perceptual response, it is difficult to categorically reject either view.

Solly and Murphy (1960) have observed that "perception can be legitimately conceptualized in a number of theoretical ways, each approach being as 'true' as any other...[and, therefore,]...it is imperative to explicitly state [one's] conceptualization of perception...(p. 1). Perhaps until more investigators specify their position on perception, it will be difficult to draw comparisons between perceptual studies.

Perhaps the most logical and parsimonious conclusion to be drawn from this study would be that no evidence was found to suggest that normals and schizophrenics differ, or that schizophrenic subgroups differ with respect to perception as conceptualized and measured in this study.

DISTRACTER CARD SORT TEST

In each instance, similar analyses in the Preliminary and Main studies revealed group differences in the same direction.

The initial analysis of the total test disclosed that the control group produced significantly more correct sorts than the undifferentiated schizophrenic group. Subsequent analyses revealed that differences in the same direction were also significant for the Concept Sort but not for the Identity Sort. These results lend support to previous studies which have shown that "normals" exceed "schizophrenics" in concept formation ability (Cameron 1944, Whiteman 1952, Epstein 1953, McGaughran and Moran 1956, and Chapman 1956, 1956, 1958).

When the schizophrenic group was broken down into three subgroups along the process-reactive continuum, only the reactive group produced significantly fewer correct sorts than the control group. No significant differences were found between the three subgroups. Therefore it may be concluded that the reactive subjects represent those schizophrenic subjects who differed significantly from the control subjects in concept formation ability.

Analyses of the error sorts revealed that the schizophrenic group produced significantly more distracter sorts than the control group but the two groups did not differ significantly in the number of irrelevant sorts produced. Consequently the schizophrenics were more susceptible to distraction than the controls. This fact accounted for the majority of error sorts produced by the patients. The additional finding that the patients produced significantly more distracter sorts involving conceptual figures than controls is interpreted as evidence that some schizophrenics can form concepts. These findings support Chapman's (1956, 1956, 1958) contention that some schizophrenics can form concepts and that distraction is responsible for the poor performance of some schizophrenics at least, on concept formation tasks.

Further analyses disclosed that the reactive group produced significantly more distracter sorts than either the control or process groups; and, in comparison with the process group, they responded to significantly more affect-laden distracter figures. In contrast, no significant differences were obtained between the control and process groups for either correct sorts or for distracter sorts.

In view of the above evidence, it is apparent that the performance characteristics of the reactive group are quite different from those of the process group. Furthermore, this difference appears to be attributable to the greater proclivity towards distraction on the part of the reactive subjects rather than an inability to form concepts.

The schizophrenic subjects selected for this study were comparable except for the age variable and the independent variable, the Becker-Elgin scores. Consequently the obtained differences in conceptual performance may reflect some rather fundamental differences between process and reactive schizophrenic patients.

One such distinguishing feature is the affect. It is postulated that process schizophrenia represents the culmination of a life-long history of inadequacy, apathy, and withdrawal, stemming from severe interpersonal conflicts encountered in the earliest stages of personality formation. The mechanism of withdrawal serves to isolate the person from affective involvements to avoid additional anxiety. Consequently, the affect instead of becoming an integrated useful force within the personality structure, becomes detached or split-off. Thus, the process schizophrenic is described as withdrawn, disinterested in his environment, and affectively flat or dull.

In contrast, the typical reactive schizophrenic has been more fortunate in avoiding severe interpersonal difficulties throughout the formative years. Consequently, affect has been utilized in a more-or-less constructive fashion as an integrated force within the personality structure.

Suddenly, however, a traumatic event overwhelms the ego, shattering the personality organization, and flooding the ego with anxiety. With such a loss of control, affect becomes "free-wheeling," so to speak, and may be heightened, inappropriate, explosive, etc.

In view of the above considerations, it is not surprising that the process subject sorts the cards in an automaton-like manner, not being disturbed or distracted by the affect-laden distracters because his capacity for affective arousal has long since been curtailed.

On the other hand, the reactive subject's heightened affectivity apparently interferes with his efforts to attend or concentrate upon a task. Consequently, the presence of affect-laden stimuli peripheral to the central task cannot be ignored and, in the test situation, elicits the distracter sort. In the present study, the Concept Sort required closer attention than the Identity Sort which involved only matching figures; and it was the more difficult Concept Sort that elicited the greater number of distracter sorts.

The observed differences in sorting times may be explained as a function of the relative efficiencies of the two groups. Again, the process subject methodically sorts the cards, uninterrupted by peripheral affective involvements, and therefore requires less time than the reactive subject. The latter, while attempting to maintain the set for correct sorts, must also contend with his heightened feelings of anxiety and the ever-present distracter stimuli. The net result is a loss of efficiency manifested by the significantly longer sorting times.

Finally, a word about the midgroup. In comparisons with the process and reactive groups, the midgroup produced slightly fewer correct sorts; about the same number of distracter sorts as the reactive group; slightly more irrelevant sorts; and the length of time for sorting was second only to the reactive group. The most interesting characteristic noted was their significantly greater number of responses to the affect-free

distracters. The control, reactive, and process groups were comparable in this respect.

The members of this group, whose Becker-Elgin ratings place them in the middle of the process-reactive continuum, present an admixture of process-like and reactive-like characteristics. Presumably, the group performance patterns would be expected to fall between those of the process and reactive groups. Such was not the case in this study.

Perhaps this reflects a basic defect in the Elgin Scale. However, the writer is more inclined to attribute this to inadequate case history information for some of these subjects. During the course of rating the subjects, it was observed that histories sometimes lacked sufficient evidence to permit a valid judgment for the relevant scale item. As a grounds rule, such items were assigned the middle value on the assumption that an accumulation of middle values would, in turn, assign the subject to the middle group. This practice served to eliminate such subjects with inadequate histories from both the process and reactive groups.

NEUTRAL CARD SORT

This sort was included to provide a basal measure of each subject's ability to sort into conceptual categories the 36 test figures in the absence of distracter elements.

The control group significantly exceeded the schizophrenic group in correct sorts; however, only the reactive group produced significantly fewer correct sorts than the control group.

As in the distracter card sort, the reactive subjects stand apart from the other schizophrenics. It is suggested that, in this test, too, the poorer performance of the reactive subjects may be attributed to distractibility resulting from heightened states of affectivity. The procedure followed by most of the subjects was initiated by their spreading out the cards before them and then forming the several conceptual stacks.

Therefore, although each card contained but one figure, the subject's visual field most probably included the remaining cards which functioned as distracter elements, eliciting distraction in a manner similar to that described in the distracter card sort discussed above.

In this study, distraction has been viewed as the inability to maintain a state of directed attention presumed necessary for the successful completion of the card sorting task. An attempt was made to relate this inability to the heightened affectivity ascribed to reactive schizophrenic subjects by current process-reactive theory.

In the absence of previous studies specifically concerned with the question of concept formation in process and reactive schizophrenia, evidence to support or contradict the findings of this study most likely will have to be obtained from future investigations. In a more general sense, this study does not lend support to the generalization derived from previous process-reactive studies that reactive schizophrenics typically respond more favorably than process schizophrenics. The process group was clearly the more similar to the control group in this study.

Reisman (1958) observed that his reactive subjects sorted playing cards in such a manner as to avoid having to look at magazine pictures judged to represent frustration, conflict, and/or threat themes. The process subjects sorted the cards so as to enhance their being shown the pictures. This differential responsiveness was attributed to an affect prepotency in the reactive subjects. Reisman also noted longer sorting times for the process group in comparison with the reactive and control groups and concluded that this reflected a "defect of motivation" in the process subjects.

In the present study, the reactive subjects greater response to the affect-laden distracter figures was also explained as a function of affect prepotency; however, instead of avoiding these stimuli, these patients were seemingly attracted towards them. Perhaps this represents an

obsessive-compulsive type of attempt to cope with a disturbing situation which cannot be ignored. Although one might attribute the longer sorting times of the reactive subjects to a hesitation (avoidance) in handling the cards, it was suggested above that this reflects a loss in efficiency in the reactive subjects which stems from their heightened state of anxiety. This observation receives support from the observations noted at the time of testing. The reactive subjects, more so than the process subjects expressed disgust towards the nude test figures, complained of getting confused and nervous, and, at times, were observed to actually vacillate between the "correct" and "distracter" slots before finally dropping the card into one of the slots.

It is suggested, in view of the above considerations, that although the Reisman study and the present study initially appear to present somewhat contradictory findings, closer examination reveals an essential area of agreement, in that both studies attribute group differences to affect prepotency in the reactive group.

There appears to be considerable empirical support for the position that affectivity is a major differentiating variable between process and reactive schizophrenia. It is consequently quite conceivable that the nature of the task employed in any given study would be a significant factor in determining whether the process or the reactive subjects would respond the more "favorably."

It is concluded that distractability, rather than an inability to form concepts, is responsible for the poor performance of some schizophrenic subjects on conceptual sorting tasks; and that this distractability is found predominately among those schizophrenic patients described as being the most reactive-like.

SUGGESTIONS FOR FUTURE RESEARCH

The ultimate goal of research is an understanding of that which was previously unknown. One of the first steps towards such understanding

typically involves an identification and classification of the unknown. At the present time, our understanding of schizophrenia is fragmentary and the adequacy of the traditional classification has been questioned. Perhaps the latter is partially responsible for our limited advances in this area.

The available evidence converges towards the conclusion that we are confronted by schizophrenias instead of a single unitary disorder. The process-reactive variable holds forth promise as one rather effective means of conceptualizing this multiple disorder view. Consequently this writer would like to see further attempts made in the direction of exploring and refining this hypothesis.

The criticism has been voiced, perhaps justifiably in some cases, that observed differences between process and reactive groups may actually reflect differences between chronic and acute schizophrenics. It is difficult to pinpoint the onset of the psychosis even if one could restrict his subjects to those entering a hospital for the first time. It is also frequently apparent that a patient has displayed psychotic behavior for a considerable period of time before his relatives acknowledge the disorder or give up trying to control him before admitting him to a hospital. Consequently it would appear to be desirable to develop some type of control(s) for "duration of psychosis" to guard against process and reactive groups being overloaded with chronic and acute patients, respectively. An attempt was made in this direction, in the present study, by comparing the patients on four hospitalization measures.

If the multiple disorder view of schizophrenia is further substantiated, it is conceivable that the so-called pathognomonic sign of defective concept formation would not be present in all forms of the disorder. Therefore, additional investigations to further our understanding of concept formation behavior as related to the schizophrenias would appear to be in order. We need to know much more about this process. Can this process be

disturbed, or is the intact process just side-tracked by distraction or other variables as suggested by the Chapman studies and the present study? Similar studies need to be conducted in other psychotic groups and in neurotic groups. Distraction may be idiosyncratic for some schizophrenics; but it may represent a defect in mental disorders generally.

Vinacke (1951) has even questioned the occurrence of concept formation in adults. He suggests that concepts are acquired primarily in childhood and that "the adult does not typically acquire new concepts so much as he applied concepts which he already possesses--or learns new variations, hierarchies, etc., of those concepts" (p. 8). It would appear that this is a potentially fruitful area for further investigation.

Much of what has been suggested for future investigations of concept formation in schizophrenia also applies to the problem of perception in schizophrenia. The majority of the perceptual studies reported to date have dealt with the visual modality. Similar comparisons between process and reactive schizophrenics in terms of the auditory and tactual modalities should enable us to either extend our generalizations of perception or perhaps point-up the need to restrict generalizations in this area. Finally, the writer feels that if future investigators would explicitly state their conceptualization of perception and then attempt to employ appropriate perceptual tests, considerable headway could be made toward clarifying the general problem of perception and the specific problem of perception in schizophrenia.

SUMMARY

The major part of this study was concerned with an investigation of the role of distraction in concept formation by means of a card sorting task designed to elicit in addition to correct sorts, distracter sorts, and irrelevant sorts.

The second part of the study was concerned with an investigation of visual perception by means of the Perceptual Span Accuracy Test. This test consisted of the tachistoscopic presentation, at five different exposure times, of a series of thirteen cards, each containing a pattern of small circles which varied from three to fifteen in number.

A sample of 60 male schizophrenic patients in a Veteran Administration hospital was broken-down into process, middle, and reactive groups, each comprised of 20 subjects assigned on the basis of Abbreviated Becker-Elgin Scale scores which were obtained by rating the individual case histories. In addition, 20 male hospital employees served as a control group.

The four groups did not differ with respect to mean vocabulary scores or educational level; however, significant age differences were observed between the groups. The three schizophrenic subgroups did not differ with respect to four hospitalization measures, diagnostic classification, or tranquilizing medication.

The results of a brief preliminary study suggested the following hypotheses which were formulated for the Main Study: 1) the reactive group will produce fewer correct card sorts than the control group; 2) the process group will produce more correct sorts than the reactive group; 3) the reactive group will tend to exceed the process group in the number of distracter sorts; 4) the process group will tend to exceed the reactive group in the number of irrelevant card sorts; and 5) the

reactive group will tend to respond more frequently to affect-laden distracter figures than to affect-free distracters.

Hypothesis 1 was confirmed ($P_{.025}$), hypothesis 3 was confirmed ($P_{.05}$), and hypothesis 5 was confirmed ($P_{.01}$), but hypotheses 2 and 4 were not confirmed.

Two supplementary hypotheses were formulated for the perceptual investigation: 1) the reactive schizophrenic group will be inferior to the control group in terms of perceptual span accuracy, and 2) the reactive group will exceed the process group in terms of perceptual span accuracy. Neither hypothesis was confirmed.

The results were discussed in relation to certain theoretical distinctions between process and reactive schizophrenia. It was concluded that the observed group differences in conceptual performance reflected a differential susceptibility to distraction between the process, middle, and reactive groups, rather than an inability to form concepts. A positive relationship between distraction and affective level was postulated to account for the differential distractability between the groups.

REFERENCES

- Allport, F. H. Theories of Perception and the Concept of Structure. New York: Wiley, 1955.
- American Psychiatric Association. Diagnostic and Statistical Manual: Mental Disorders. APA Mental Hospital Service, Washington, 1952.
- Arieti, S. Interpretation of Schizophrenia. New York: Brunner, 1955.
- Ash, P. The reliability of psychiatric diagnoses. J. Abnorm. & Soc. Psychol., 1949, 44, 272-276.
- Attneave, F. Application of Information Theory to Psychology. New York: Holt, 1959.
- Bartley, S. H. Principles of Perception. New York: Harper, 1958.
- Becker, W. C. The relationship of severity of thinking disorder to the process-reactive concept of schizophrenia. Unpublished doctoral disser., Stanford University, 1955.
- _____. A genetic approach to the interpretation and evaluation of the process-reactive distinction in schizophrenia. J. Abnorm. & Soc. Psychol., 1956, 53, 229-236.
- _____. The process-reactive distinction--A key to the problem of schizophrenia. A paper read before the Amer. Psychol. Assn., 1958.
- _____. Personal Communication, 1961.
- Bellak, L. (Ed.). Schizophrenia: A Review of the Syndrome. New York: Logos Press, 1958.
- Benjamin, J. D. A method for distinguishing and evaluating formal thinking disorders in schizophrenia. In Language and Thought in Schizophrenia. Kasanin, J. S. (Ed.), Berkeley: Univ. California Press, 1946.

- Bleuler, E. Dementia Praecox or the group of schizophrenias. New York: International Universities Press, 1950 (Orig. publ. in 1911).
- Brackbill, G. A. Studies of brain dysfunction in schizophrenia. Psych. Bull., 1956, 53, 210-226.
- Brackbill, G. A. and Fine, H. J. Schizophrenia and central nervous system pathology. J. Abnorm. & Soc. Psychol., 1956, 3, 310-313.
- Cameron, N. The functional psychoses. In Hunt, J. McV. (Ed.), Personality and the Behavior Disorders. New York: Ronald, 1944.
- Cavanaugh, D. K. Improvement in the performance of schizophrenics on concept formation tasks as a function of motivational change. J. Abnorm. & Soc. Psychol., 1958, 57, 8-12.
- Chapman, L. J. Distractibility in the conceptual performance of schizophrenics. J. Abnorm. & Soc. Psychol., 1956, 53, 286-291.
- _____. The role of type of distracter in the "concrete" conceptual performance of schizophrenics. J. Pers., 1956, 25, 130-141.
- _____. Intrusion of associative responses into schizophrenic conceptual performance. J. Abnorm. & Soc. Psychol., 1958, 56, 374-379.
- Coons, W. H. Abstract ability in schizophrenia and the organic psychoses. Canada J. Psychol., 1956, 10, 43-50.
- DeVault, S. Physiological responsiveness in reactive and process schizophrenia. Unpubl. doctoral disser., Michigan State University, 1955.
- Epstein, S. Overinclusive thinking in a schizophrenic and a control group. J. Cons. Psychol., 1953, 17, 384-388.
- Eysenck, H. J., Granger, G. W., Brengelmann, J. C., Perceptual Processes and Mental Illness. Maudsley Monog. No. 2. New York: Basic Books, 1957.
- Feldman, M. J. and Drasgow, J. A visual-verbal test for schizophrenia. Psychiat. Quart. Suppl., 1951, 25, 55-64.

- Fine, H. and Zimet, C. Process-reactive schizophrenia and genetic levels of perception. J. Abnorm. & Soc. Psychol., 1959, 59, 83-86.
- Flavell, J. H. Abstract thinking and social behavior in schizophrenia. J. Abnorm. & Soc. Psychol., 1956, 52, 208-211.
- Funkenstein, D., Greenblatt, M., and Solomon, H. Autonomic nervous system changes following electric shock treatment. J. Nerv. Ment. Dis., 1948, 108, 409-422.
- _____. Psychophysiological study of mentally ill patients. Part 1. Amer. J. Psychiat., 1949, 106, 16-28.
- _____. Anautonomic nervous system test of prognostic significance in relation electric-shock treatment. Psychosom. Med., 1952, 14, 347-362.
- Garmezy, N., and Rodnick, E. H. Premorbid adjustment and performance in schizophrenia: Implications for interpreting heterogeneity in schizophrenia. J. Nerv. Ment. Dis., 1959, 129, 450-466.
- Geocaris, K. and Kociker, J. Blood pressure responses of chronic schizophrenic patients to epinephrine and mecholyl. Amer. J. Psychiat., 1956, 112, 808.
- Goldstein, K. Methodological approach to the study of schizophrenic thought disorders. In Kasanin, J. S. (Ed.). Language and Thought in Schizophrenia. Berkeley: Univ. California Press, 1944.
- _____. Language and Language Disturbances. New York: Grune & Stratton, 1948.
- _____. Concerning the concreteness in schizophrenia. J. Abnorm. & Soc. Psychol., 1959, 59, 146-148.
- Graham, C. H. Visual Perception. In Stevens, S. S., Handbook of Experimental Psychology. New York: Wiley, 1951.
- Grosz, H. J. and Miller, I. Two factors limiting the reliability of the mecholyl test: Variability in day-to-day responses and dissimilarity between simultaneous bilateral determinations. J. Nerv. Ment. Dis., 1958, 127, 417-429.

- Hirschstein, R. The significance of characteristic autonomic nervous system responses in the adjustment, change, and outcome of schizophrenia. J. Nerv. Ment. Dis., 1955, 122, 254-262.
- Johnson, D. M. The Psychology of Thought and Judgment, New York: Harper, 1955.
- Kantor, R., Wallner, J., and Winder, C., Process and reactive schizophrenia. J. Cons. Psychol., 1953, 17, 157-162.
- Kaufman, E. L., Lord, M. W., Reese, T. W., and Volkman, J. The discrimination of visual number. Amer. J. Psychol., 1949, 62, 498-525.
- King, G. F. Research with neuropsychiatric samples. J. Psychol., 1954, 38, 383-387.
- _____. Differential autonomic responsiveness in the process-reactive classification of schizophrenia. J. Abnorm. & Soc. Psychol., 1958, 56, 160-164.
- _____. The diagnosis of schizophrenia. Amer. J. Psychiat., 1951, 108, 123-125.
- Lewis, N. D. C. Research in dementia praecox, National Committee for Mental Hygiene, New York, 1936.
- McDonough, J. Perceptual indices of organicity as related to process-reactive schizophrenia. Unpubl. doctoral disser., Michigan State University, 1958.
- _____. Critical flicker frequency and the spiral aftereffect with process and reactive schizophrenia. J. Cons. Psychol., 1960, 24, 150-155.
- McGaughran, C. S. and Moran, L. J. Conceptual level vs conceptual area analysis of object-sorting behavior of schizophrenics and normals. J. Abnorm. & Soc. Psychol., 1956, 52, 43-50.
- McReynolds, P. Anxiety, perception, and schizophrenia. In Jackson, D. D. (Ed.), The Etiology of Schizophrenia. New York: Basic Books, 1960.
- Meadow, A. and Funkenstein, D. H. The relationship of abstract thinking to the autonomic nervous system in schizophrenia. In Hoch, P. and Zubin, J. (Eds.) Relation of Psychological Tests to Psychiatry, New York: Grune & Stratton, 1952.

- Mehlman, B. The reliability of psychiatric diagnoses. J. Abnorm. & Soc. Psychol. 1952, 47, 577-578.
- Miller, G. A. The magical number seven, plus or minus two: some limits on our capacity for processing information. Psychol. Rev., 1956, 63, 81-97.
- Osgood, C. E. Method and Theory in Experimental Psychology. New York: Oxford, 1953.
- Payne, R. W. Cognitive Abnormalities. In Eysenck, H. J. (Ed.), Handbook of Abnormal Psychology. New York: Basic Books, 1961.
- Pearl, D. Unpublished manuscript, VA Hospital, Battle Creek, 1961.
- _____. Phenothiazine Effects in Chronic Schizophrenia, J. Clin. Psychol. 1962, 18, 86-89.
- _____. Personal Communication, 1962.
- _____ and Vanderkamp, H. Unrelatedness of mecholyl chloride autonomic reaction indices. Amer. J. Psychiat., 1960, 117, 77.
- Phillips, L. Case history data and prognosis in schizophrenia. J. Nerv. Ment. Dis., 1953, 117, 515-525.
- Rabin, A. I. and King, G. F. Psychological studies (in schizophrenia). In Bellak, L. (Ed.), Schizophrenia--A Review of the Syndrome. New York: Logos Press, 1958.
- Rapaport, D., Gill, M., and Schafer, R. Diagnostic Psychological Testing. Vol. I. Chicago: Yearbook, 1946.
- Reisman, J. M. Response differences between process and reactive schizophrenics as induced by magazine photographs. Unpub. doctoral disser., Michigan State University, 1958.
- _____. Motivational differences between process and reactive schizophrenics. J. Pers., 1960, 28, 12-25.
- Schulman, I. Concept formation in the schizophrenic child. J. Clin. Psychol., 1953, 9, 11-15.
- Siegel, S. Nonparametric Statistics: For the Behavioral Sciences. New York: McGraw-Hill, 1956.

- Smith, W. O. Rotary pursuit performance in reactive and process schizophrenics. Unpubl. doctoral disser., Michigan State University, 1959.
- Solley, C. M. and Murphy, G. Development of the Perceptual World. New York: Basic Books, 1960.
- Vanderkamp, H., Norgan, A., Wilkinson, G., and Pearl, D. Mecholyl as a prognostic indicator in insulin coma therapy. J. Clin. Exper. Psychopath. and Qtrly. Rev. Psychiat. and Neurol., 1958, 29, 303.
- Vinacke, W. E. The investigation of concept formation. Psych. Bull., 1951, 48, 1-31.
- Walker, H. M. and Lev, J. Statistical Inference. New York: Holt, 1953.
- Webb, W. W. Conceptual ability of schizophrenics as a function of the threat of failure. J. Clin. Psychol., 1955, 50, 221-224.
- Whiteman, M. The performance of schizophrenics on social concepts. J. Abnorm. & Soc. Psychol., 1954, 49, 266.
- Winder, C. L. Process-reactive schizophrenia. A paper read at the Amer. Psychol. Assn., 1958.
- _____. Some psychological studies of schizophrenics. In Jackson, D. D. (Ed.). The Etiology of Schizophrenia. New York: Basic Books, 1960.
- Wittman, P. Scale for measuring prognosis in schizophrenic patients. Elgin State Hospital Papers, 1941, 4, 20-33.
- Woodworth, R. S. and Schlosberg, H. Experimental Psychology. New York: Holt, 1954.
- Zlotowski, M. and Bakan, P. Binary guessing behavior in process and reactive schizophrenics. A paper read at the Amer. Psychol. Assn., 1959.
- Zlotowski, M. The uniqueness, novelty, complexity, and variability of response in process and reactive schizophrenics. Unpubl. doctoral disser., Michigan State University, 1960.

Zlotowski, M. Personal Communication, 1962.

Zuckerman, M. and Grosz, H. J. Contradictory results using the
mecholy test to differentiate process and reactive schizophrenia.
J. Abnorm. Soc. Psychol., 1959, 59, 145.

APPENDICES

APPENDIX A

ABBREVIATED BECKER-ELGIN PROGNOSTIC SCALE

A. Defects of Interest Versus Definite Display of Interest:

0. Keen ambitious interest in some of the following; home, family, friends, work, sports, arts, pets, gardening, social activities, music, dramatics.
2. Moderate degree of interest in several activities, e.g. social gatherings, sports, music, opposite sex, etc.
4. Mild interest in a few things such as job, family, quiet social gatherings. The interest is barely sustaining.
6. Withdrawn and indifferent toward life interests of average individual. No deep interests of any sort.

B. Insidious Versus Acute Onset of Illness:

0. Development over a period of 0-1 months with sudden, dramatic divorcement from more or less commonplace living.
1. Development over a period of 2-4 months with marked personality changes from relatively commonplace living.
2. Development over a period of 5-7 months with moderate personality changes. May be some accenting of previous trends but personality changes also.
3. Changes have taken place over a period of 8-12 months, with noticeable personality modifications, but primarily an accenting of existing trends.
4. Slow development of symptoms, but possible to detect personality changes in 2 years prior to onset.
6. Very slow development of symptoms so that final disorder appears as an exaggeration of already strongly accentuated personality traits. Indications even prior to adolescence.

C. Shut-in Personality:

General: The psychotic condition is simply an exaggeration of the peculiar type of personality shown all through childhood. Stormy childhood often with over-protection and anxiety, a difficult adolescence characterized by inability to get along with and mix with other children.

5. Very much as described above.
3. Moderately the picture described above.
1. Only mildly this way, but some resemblance to pattern.
0. Apparently normal childhood, little evidence of shyness or unusual difficulty.

D. Heterosexual Contact:

0. Purposefully contacts the other sex, dates frequently, makes successful effort to be attractive in manner, dress, accessories, etc., so as to be popular with women.
2. Dates when situation affords. Maybe marries but has difficulties in compatibility. Wants to interact with other sex, has some techniques, but not completely successful.
3. If married, apt to divorce or separate. Generally this is rated as a mid-point between 2 and 4.
4. Moderate lack of heterosexual contact. Tends to avoid dates and dances, but has on occasion participated in same. Might think he would like to marry someday, but little enthusiasm for it.
6. No association with the opposite sex. Never had any dates. Avoids dances and social gatherings which require the intermingling of men and women.

E. Careless Indifference Versus Worrying, Self-conscious Type:

0. A worrier; subjectively sensitive, critical of self, preoccupied with own conflicts, but shows little of the extreme bizarre, unusual, mysterious or socially unacceptable in behavior.
2. Some concern and preoccupation with difficulties--a moderate position. Also rate here if he is neither indifferent nor a worrier.
4. Withdrawal and disinterest in social surroundings, careless of social requirements, given to day-dreaming and eccentricity, dirty, disheveled appearance, profane language, unacceptable habits.

F. Exclusive Stubborn Traits Versus Insecurity and Inferiority Feelings:

0. Timid, lacks self confidence, feels insecure and inferior. Very sensitive and critical of self; feels certain problems in life but participates and does not accept his lot passively or without regret and struggle.
1. Moderately like 0. above.
2. Neither timid nor stubborn.
3. Moderately stubborn.
4. Complete withdrawal from surroundings and interests, inadequate in meeting life, but stubborn and opinionated, refuses to change, even if suggested, to achieve a more adequate adjustment. Opinionated and egocentric.

G. Precipitating Conditions (Situational Reaction):

0. A strong relationship between onset of symptoms and situational problems that would require definite and continued effort to adjust satisfactorily; i. e. death, failure, loss, interpersonal strife. The average person would definitely try to flee such a situation rather than attempt to change it.

1. Marked stresses related to onset, but not as severe as 0.
2. Moderate stresses related to onset such as financial problems, interpersonal discord, etc., which would cause considerable worry to the average individual.
3. Mild stresses that the average person would react to in some way but which would not usually lead to a breakdown.
4. Onset of psychotic symptoms not related to any disturbances or difficulty in the patient's situation--or a disturbance of such a trivial nature that it would be ignored or quickly forgotten by the average person.

H. Duration of Psychosis since First Onset:

- | | |
|--------------------|------------------|
| 0. Under 2 months. | 4. 10-12 months |
| 1. 2-4 months | 5. 1-2 years |
| 2. 4-6 months | 6. 2-3 years |
| 3. 6-8 months | 7. Over 3 years. |

I. Hebephrenic Symptoms: extreme indifference, complete divorce between ideas and affect; extreme carelessness in appearance and reaction with untidiness in some cases, silly behavior, often silly laughter without appropriate stimulation.

0. Not as above
1. Mildly as above
2. Moderately as above
3. Markedly as above
4. Very markedly as above.

J. Physical Interpretation of Delusions: The patient has certain feelings (possibly hallucinations) that are linked up with definite delusional ideas; for instance, that there is a snake in his stomach, that food passes right through his body, that someone is passing electrical currents through his body, that the food he eats is poisoned, etc.

0. Not as above
1. Mildly as above
2. Moderately as above
3. Markedly as above
4. Very markedly as above.

APPENDIX B

Distribution of Abbreviated Becker-Elgin Scores For 98 Schizophrenic Subjects

Patient	Rater No. 1 Becker Score	Rater No. 2 Becker Score	Average Score for 2 Raters	Classification or Disposition
1. NC	9	-	9	Reactive (R-1)
2. CK	9	10	9.5	Trial Visit
3. JC	11	-	11	Reactive (R-2)
4. JW	13	-	13	IQ too low
5. WE	14	12	13	Reactive (R-3)
6. CN	10	17	13.5	Reactive (R-4)
7. RH	15	12	13.5	Trial Visit
8. TZ	14	-	14	Poor Vision
9. JZ	14	-	14	Reactive (R-5)
10. FR	14	-	14	Medication
11. JK	15	13	14	Reactive (R-6)
12. DA	14	15	14.5	Reactive (R-7)
13. BP	14	16	15	Discharged
14. CB	16	14	15	Reactive (R-8)
15. AE	15	-	15	Trial Visit
16. RP	16	15	15.5	Reactive (R-9)
17. RM	14	17	15.5	Trial Visit
18. NW	16	-	16	Reactive (R-10)
19. KC	15	18	16.5	Reactive (R-11)
20. CB	21	13	17	AWOL
21. KL	17	-	17	Reactive (R-12)
22. HG	17	-	17	Reactive (R-13)
23. RR	17	18	17.5	Reactive (R-14)
24. DL	17	18	17.5	Trial Visit
25. JC	20	15	17.5	AWOL
26. AB	18	-	18	Reactive (R-15)
27. WV	18	-	18	Reactive (R-16)
28. AB	18	19	18.5	Reactive (R-17)
29. HH	14	23	18.5	Reactive (R-18)
30. RM	19	-	19	Reactive (R-19)
31. TM	19	20	19.5	Reactive (R-20)
32. AR	20	-	20	Midgroup (M-1)
33. MR	20	-	20	Too Sick
34. RH	23	18	20.5	Midgroup (M-2)
35. WL	21	-	21	Too Sick
36. JW	21	-	21	Midgroup (M-3)
37. JM	22	-	22	Midgroup (M-4)

APPENDIX B - Continued

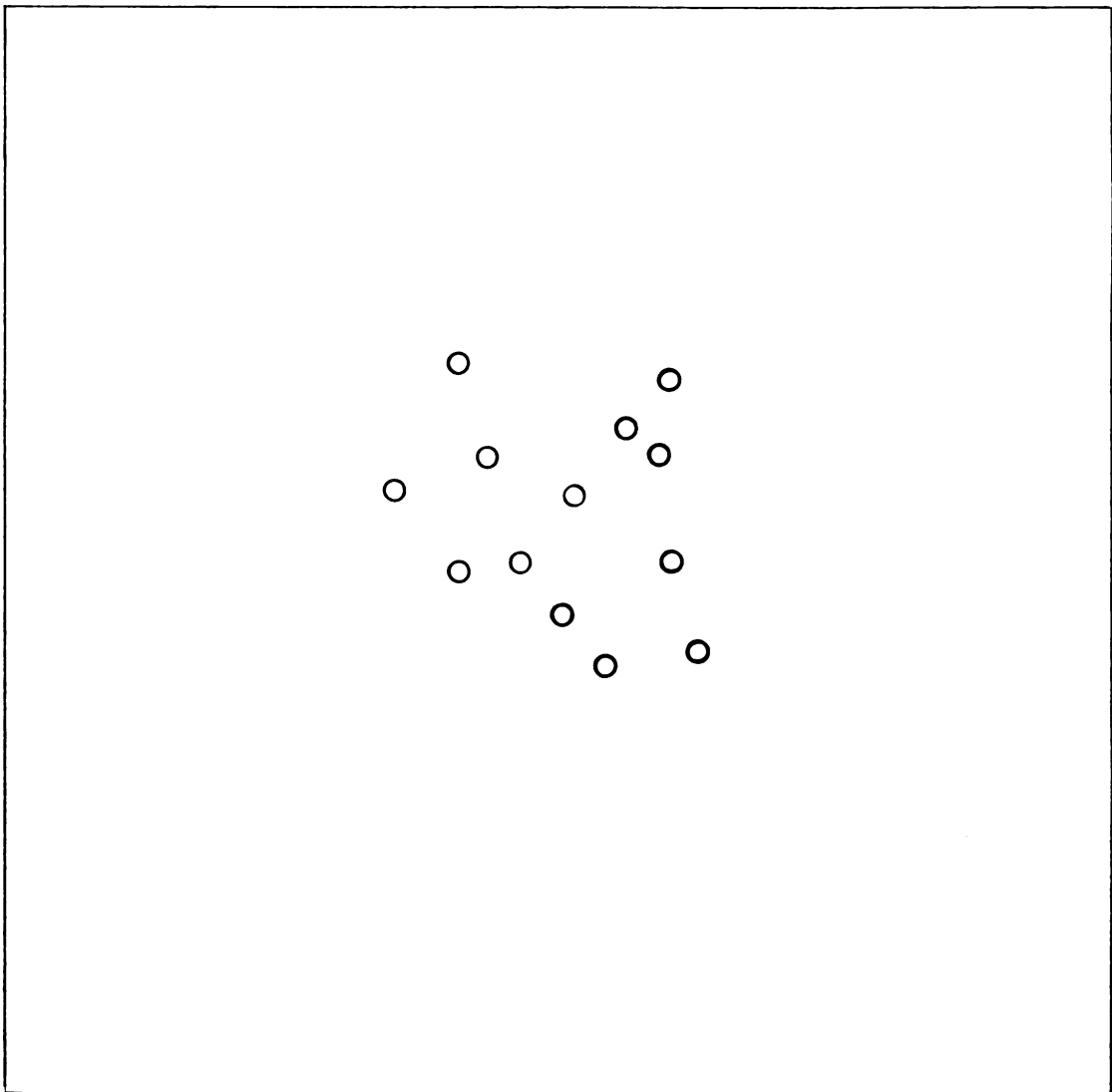
Patient	Rater No. 1 Becker Score	Rater No. 2 Becker Score	Average Score for 2 Raters	Classification or Disposition
38. JM	22	-	22	Midgroup (M-5)
39. AR	22	-	22	Midgroup (M-6)
40. GB	22	-	22	Midgroup (M-7)
41. FC	26	19	22.5	Discharged
42. RN	23	-	23	Midgroup (M-8)
43. LF	23	-	23	Midgroup (M-9)
44. GG	22	25	23.5	Midgroup (M-10)
45. CA	23	24	23.5	Medication
46. RG	23	25	24	Discharged
47. CH	24	25	24.5	Medication
48. WN	25	-	25	Discharged
49. AM	25	-	25	IQ too low
50. JH	25	-	25	Midgroup (M-11)
51. DH	20	31	25.5	Trial Visit
52. HM	23	28	25.5	Midgroup (M-12)
53. MH	26	26	26	Midgroup (M-13)
54. MN	27	25	26	Trial Visit
55. WH	26	-	26	IQ too low
56. SW	28	24	26	IQ too low
57. CS	31	22	26.5	Midgroup (M-14)
58. BW	29	24	26.5	Midgroup (M-15)
59. PB	25	28	26.5	Midgroup (M-16)
60. OR	28	-	28	Poor Vision
61. CK	28	-	28	Midgroup (M-17)
62. MG	28	-	28	Midgroup (M-18)
63. CC	28	28	28	Midgroup (M-19)
64. RL	29	-	29	IQ too low
65. DC	32	26	29	Midgroup (M-20) (Coin flip)
66. FM	29	-	29	Process (P-1)
67. EW	29	30	29.5	Medication
68. MS	30	-	30	Process (P-2)
69. EL	30	-	30	Process (P-3)
70. HM	33	27	30	Discharged
71. GB	31	-	31	IQ too low
72. RR	31	-	31	Refused
73. AP	31	-	31	Process (P-4)
74. ME	32	31	31.5	Process (P-5)
75. RL	32	-	32	Process (P-6)

APPENDIX B - Continued

Patient	Rater No. 1 Becker Score	Rater No. 2 Becker Score	Average Score for 2 Raters	Classification or Disposition
76. AS	32	-	32	Process (P-7)
77. WB	32	-	32	AWOL
78. DF	32	33	32.5	Process (P-8)
79. KK	33	-	33	Process (P-9)
80. JK	33	-	33	Refused
81. WL	34	-	34	Process (P-10)
82. NM	34	-	34	Process (P-11)
83. GC	34	-	34	Process (P-12)
84. JB	35	-	35	Process (P-13)
85. JA	35	-	35	Medication
86. HB	35	-	35	Process (P-14)
87. VG	35	-	35	IQ too low
88. MS	35	-	35	Process (P-15)
89. NL	35	-	35	Process (P-16)
90. CC	35	-	35	Process (P-17)
91. VP	35	-	35	Process (P-18)
92. JK	36	-	36	Medication
93. KM	36	-	36	Too sick
94. PP	37	-	37	IQ too low
95. MM	38	-	38	Medication
96. WS	39	-	39	IQ too low
97. FK	39	-	39	Process (P-19)
98. JB	41	-	41	Process (P-20)

APPENDIX C

Figure A. Perceptual Span Card for 13 Circle Pattern



APPENDIX D
SUPPLEMENTARY TABLES

Table 1. "t"-Test for Mean Differences in Vocabulary Raw Scores
Between Paired Groups

Groups	Mean 1st	Mean 2nd	"t"	df	Level of Significance*
Control vs Schizophrenic	40.00	45.25	1.40	78	N.S.
Control vs Reactive	40.00	44.65	1.18	38	N.S.
Control vs Midgroup	40.00	44.10	.99	38	N.S.
Control vs Process	40.00	47.00	1.59	38	N.S.
Reactive vs Midgroup	44.65	44.10	.12	38	N.S.
Reactive vs Process	44.65	47.00	.47	38	N.S.
Midgroup vs Process	44.10	47.00	.57	38	N.S.

*Two-tailed test.

Table 2. "t"-Test for Mean Differences in Educational Level Between Paired Groups

Groups	Mean 1st Group	Mean 2nd Group	"t"	df	Level of Significance [*]
Control vs Schizophrenic	11.20	11.50	.16	78	N.S.
Control vs Reactive	11.20	11.85	.93	38	N.S.
Control vs Midgroup	11.20	11.05	.21	38	N.S.
Control vs Process	11.20	11.60	.53	38	N.S.
Reactive vs Midgroup	11.85	11.05	1.13	38	N.S.
Reactive vs Process	11.85	11.60	.33	38	N.S.
Midgroup vs Process	11.05	11.60	.72	38	N.S.

^{*} Two-tailed test

Table 3. Mann-Whitney "U" Test for Mean Differences in Time in Hospital (Months) in the Past Three Years Between Paired Groups

Groups	Mean 1st Group	Mean 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Reactive vs Midgroup	8.14	9.44	387.5	432.5	177.5	N.S.
Reactive vs Process	8.14	12.16	369.5	450.5	159.5	N.S.
Midgroup vs Process	9.44	12.16	393.0	427.0	183.0	N.S.

*Two-tailed test.

Table 4. "t"-Test for Mean Differences in Time Out of Hospital Between Previous and Present Admissions Between Paired Groups

Groups	Mean 1st Group	Mean 2nd Group	"t"	df	Level of Significance *
Reactive (N=16) vs Midgroup (N=15)	39.19	38.71	.08	29	N.S.
Reactive (N=16) vs Process (N=16)	39.19	20.94	1.35	30	N.S.
Midgroup (N=15) vs Process (N=16)	38.71	20.94	1.50	29	N.S.

* Two-tailed test

Table 5. "t"-Test for Mean Differences in Length of Hospitalization
From Admission to Test Between Paired Groups

Groups	Mean 1st Group	Mean 2nd Group	"t"	df	Level of Significance*
Reactive vs Midgroup	17.20	21.25	.89	38	N.S.
Reactive vs Process	17.20	17.45	.06	38	N.S.
Midgroup vs Process	21.25	17.45	.86	38	N.S.

* Two-tailed test.

Table 6. Phenothiazine Medication Breakdown in Schizophrenic Subgroups

Medication	Reactive	Midgroup	Process
Thorazine	8	6	11
Thorazine and Tofranil	1	2	1
Thorazine and Stelazine	1	4	1
Trilafon	1	2	5
Trilafon and Tofranil	1	0	0
Trilafon and Stelazine	0	1	0
Stelazine	1	2	1
Stelazine and Tofranil	2	0	0
Compazine	1	0	1
Sparine	0	1	0
Mellaril	2	2	0
Mellaril and Tofranil	2	0	0
Total	20	20	20

Table 7. Mann-Whitney "U" Test for Mean Differences in Correct Sorts ("I" Sort) Between Paired Groups

Groups	Mean 1st Group	Mean 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	70.60	65.97	908.0	2332.0	502.0 ($z=1.19$)	N.S.
Control vs Reactive	70.60	65.20	467.0	353.0	143.0	N.S.
Control vs Midgroup	70.60	61.35	442.0	378.0	168.0	N.S.
Control vs Process	70.60	68.65	419.0	401.0	191.0	N.S.
Reactive vs Midgroup	65.20	61.35	382.5	414.5	195.5	N.S.
Reactive vs Process	65.20	68.65	363.5	457.0	153.0	N.S.
Midgroup vs Process	61.35	68.65	390.0	430.0	180.0	N.S.

* One-tailed test

Table 8. Mann-Whitney "U" Test for Mean Differences in Correct Sorts
(C Sort): Between Paired Groups

Groups	Mean 1st Group	Mean 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	71.20	64.13	942.0	2298.0	468.0 (z=1.66)	.05
Control vs Reactive	71.20	63.75	481.0	339.0	129.0	.05
Control vs Midgroup	71.20	61.25	441.5	365.5	168.5	N.S.
Control vs Process	71.20	67.40	432.5	387.5	177.5	N.S.
Reactive vs Midgroup	63.75	61.25	394.0	426.0	184.0	N.S.
Reactive vs Process	63.75	67.40	370.0	450.0	160.0	N.S.
Midgroup vs Process	61.25	67.40	390.0	430.0	180.0	N.S.

* One-tailed test.

Table 9. Mann-Whitney "U" Test for Mean Differences in Sorting Time
(I Sort) Between Paired Groups

Groups	Mean Time 1st Group	Mean Time 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	205.70	248.73	589.0	2651.0	821.0(z=2.46)	.01
Control vs Reactive	205.70	277.55	310.0	510.0	100.0	.02
Control vs Midgroup	205.70	244.25	345.0	475.0	135.0	N.S.
Control vs Process	205.70	224.40	306.5	513.5	96.5	.02
Reactive vs Midgroup	277.55	244.25	447.5	372.5	162.5	N.S.
Reactive vs Process	277.55	224.40	462.5	357.5	147.5	N.S.
Midgroup vs Process	244.25	224.40	421.0	399.0	189.0	N.S.

* Two-tailed test.

Table 10. Mann-Whitney "U" Test for Mean Differences in Sorting Time
(C Sort) Between Paired Groups

Groups	Mean Time 1st Group	Mean Time 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	171.30	270.00	500.5	2739.5	909.5(z=3.44).	.00006
Control vs Reactive	171.30	370.80	276.5	543.5	66.5	.002
Control vs Midgroup	171.30	229.20	316.0	504.0	106.0	.02
Control vs Process	171.30	210.00	328.0	492.0	118.0	.05
Reactive vs Midgroup	370.80	229.20	487.0	333.0	123.0	.05
Reactive vs Process	370.80	210.00	507.5	312.5	102.5	.02
Midgroup vs Process	229.20	210.00	426.0	394.0	184.0	N.S.

* Two-tailed test.

Table 11. Mann-Whitney "U" Test for Mean Differences in Distracter Sorts (I Sort) Between Paired Groups

Groups	Mean 1st Group	Mean 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	1.35	5.28	713.5	2526.5	696.5(z=1.20)	N.S.
Control vs Reactive	1.35	5.90	357.0	463.0	147.0	N.S.
Control vs Midgroup	1.35	7.70	371.5	448.5	161.5	N.S.
Control vs Process	1.35	2.25	405.0	415.0	195.0	N.S.
Reactive vs Midgroup	5.90	7.70	417.0	403.0	193.0	N.S.
Reactive vs Process	5.90	2.25	364.5	455.5	154.5	N.S.
Midgroup vs Process	7.70	2.25	380.5	439.5	170.5	N.S.

* One-tailed test.

Table 12. Mann-Whitney "U" Test for Mean Differences in Distracter Sorts (C Sort) Between Paired Groups

Groups	Mean 1st Group	Mean 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control vs Schizophrenic	.50	4.78	638.5	2601.5	771.5 (Z=2.46)	.007
Control vs Reactive	.50	6.75	320.5	499.5	110.5	.01
Control vs Midgroup	.50	5.85	347.5	472.5	137.5	.05
Control vs Process	.50	1.75	390.5	429.5	180.5	N.S.
Reactive vs Midgroup	6.75	5.85	433.0	387.0	177.0	N.S.
Reactive vs Process	6.75	1.75	479.0	341.0	131.0	.05
Midgroup vs Process	5.85	1.75	366.0	454.0	156.0	N.S.

* One-tailed test.

Table 13. Mann-Whitney "U" Test for Mean Differences in Affect-Free Distracter Sorts (I Sort) Between Paired Groups (Only Subjects Distracted)

Groups	Mean 1st Group	Mean 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control (N=7) vs Schizophrenic (N=31)	1.43	3.35	102.5	638.5	142.5(z=1.32)	N.S.
Control (N=7) vs Reactive (N=13)	1.43	3.08	62.5	147.5	34.5	N.S.
Control (N=7) vs Midgroup (N=10)	1.43	4.70	42.5	110.5	14.5	.05
Control (N=7) vs Process (N=8)	1.43	2.12	53.5	66.5	25.5	N.S.
Reactive (N=13) vs Midgroup (N=10)	3.08	4.70	138.5	137.5	47.5	N.S.
Reactive (N=13) vs Process (N=8)	3.08	2.12	152.0	79.0	43.0	N.S.
Midgroup (N=10) vs Process (N=8)	4.70	2.12	112.0	59.0	31.0	N.S.

* One-tailed test.

Table 14. Mann-Whitney "U" Test for Mean Differences in Affect-Free Distracter Sorts (C Sort) Between Paired Groups (Only Subjects Distracted)

Groups	Mean 1st Group	Mean 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance [*]
Control (N=7) vs Schizophrenic (N=31)	.43	4.22	92.5	648.5	152.5 (z=1.82)	.03
Control (N=7) vs Reactive (N=13)	.43	3.85	54.5	155.5	26.5	N.S.
Control (N=7) vs Midgroup (N=10)	.43	6.10	45.0	108.0	17.0	.05
Control (N=7) vs Process (N=8)	.43	2.50	49.0	71.0	21.0	N.S.
Reactive (N=13) vs Midgroup (N=10)	3.85	6.10	146.5	129.5	55.5	N.S.
Reactive (N=13) vs Process (N=8)	3.85	2.50	152.0	79.0	43.0	N.S.
Midgroup (N=10) vs Process (n=8)	6.10	2.50	108.5	62.5	26.5	N.S.

* One-tailed test.

Table 15. Mann-Whitney "U" Test for Mean Differences in Affect-Laden Distracter Sorts (I Sort) Between Paired Groups (Only Subjects Making Distracter Sorts)

Groups	Mean 1st Group	Mean 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control (N=7) vs Schizophrenic (N=31)	2.43	6.74	117.5	623.5	127.5 (z=.73)	N.S.
Control (N=7) vs Reactive (N=13)	2.43	5.85	63.0	147.0	35.0	N.S.
Control (N=7) vs Midgroup (N=10)	2.43	10.50	55.5	97.5	27.5	N.S.
Control (N=7) vs Process (N=8)	2.43	3.50	55.0	65.0	27.0	N.S.
Reactive (N=13) vs Midgroup (N=10)	5.85	10.50	151.5	124.5	60.5	N.S.
Reactive (N=13) vs Process (N=8)	5.85	3.50	154.5	76.5	48.5	N.S.
Midgroup (N=10) vs Process (N=8)	10.50	3.50	101.5	69.5	33.5	N.S.

* One-tailed test

Table 16. Mann-Whitney "U" Test for Mean Differences in Affect-Laden Distracter Sorts (C Sort) Between Paired Groups (Only Subjects Making Distracter Sorts)

Groups	Mean 1st Group	Mean 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control (N=7) vs Schizophrenic (N=31)	1.00	5.03	91.0	650.0	154.0(z=1.86)	.03
Control (N=7) vs Reactive (N=13)	1.00	6.54	48.0	162.0	20.0	.05
Control (N=7) vs Midgroup (N=10)	1.00	5.60	46.0	107.0	18.0	.05
Control (N=7) vs Process (N=8)	1.00	1.88	53.0	67.0	25.0	N.S.
Reactive (N=13) vs Midgroup (N=10)	6.54	5.60	157.5	118.5	63.5	N.S.
Reactive (N=13) vs Process (N=8)	6.54	1.88	165.0	66.0	30.0	N.S.
Midgroup (N=10) vs Process (N=8)	5.60	1.88	110.5	60.5	32.5	N.S.

* One-tailed test.

Table 17. Mann-Whitney "U" Test for Differences in Irrelevant Sorts
(C Sort) Between Paired Groups (Only Subjects Making Irrelevant
Sorts)

Groups	Mean 1st Group	Mean 2nd Group	Sum of Ranks 1st Group	Sum of Ranks 2nd Group	"U"	Level of Signifi- cance*
Control (N=6) vs Schizophrenic (N=25)	1.00	7.40	53.5	442.5	117.5(z=2.16)	.02
Control (N=6) vs Reactive (N=9)	1.00	3.33	38.5	81.5	17.5	N.S.
Control (N=6) vs Midgroup (N=8)	1.00	12.25	27	78	6	.01
Control (N=6) vs Process (N=8)	1.00	7.12	30	75	9	.03
Reactive (N=9) vs Midgroup (N=8)	3.33	12.25	59.5	93.5	14.5	.02
Reactive (N=9) vs Process (N=8)	3.33	7.12	67	86	22	N.S.
Midgroup (N=8) vs Process (N=8)	12.25	7.12	78	58	22	N.S.

* One-tailed test.

ROOM USE ONLY

2-159
JUN 9 1982

MICHIGAN STATE UNIVERSITY LIBRARIES



3 1293 03145 1994