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LEARNING INVOLVING CONCEPT FORMATION IN SELECTED SCHIZOPHRENIC GROUPS

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CHAPTER I

INTRODUCTION

The use of tests of concept-formation to investigate thinking processes in schizophrenics proceeded from previous studies of organically brain-damaged individuals (16). An essential similarity of some schizophrenics to brain-damaged persons, represented by the loss of the "abstract" attitude and dependence upon a "concrete" approach in problem solving, suggested a basis of physiological or anatomical dysfunction for such schizophrenic types. This work was reported and summarized by Goldstein (20).

The present experiment was an effort to expand such an approach to problems of schizophrenia. By means of focusing attention on memorization of nine simple but related abstract designs, learning processes involving concept-formation were studied in paranoid schizophrenics, schizoaffective psychotics, and a control group of non-psychotics.

On the one hand, the experiment employed a "learning" method, thus obtaining results of a quantitative nature; on the other hand, there was an effort to apply these operational criteria to both diagnostic and theoretical problems of schizophrenia. With respect to the first objective, an attempt was made to develop a simple but multi-dimensional instrument with which to study the processes, or lack of processes, involved in concept-formation. With respect to the latter objective, the experiment was concerned with testing hypotheses suggested by both previous work with concept-formation tests applied to schizophrenics, as well as hypotheses derived from a pilot study using this instrument.

The results of the pilot study referred to indicated that in acute untreated states of paranoid schizophrenia, psychological deficit existed for forming concepts which organized simple abstract designs in a spatial context. The previous work of Goldstein (18), Scheerer (39), Hanfmann and Kasanin (22), Vigotsky, et al (47), had focused attention on loss of the "abstract" attitude in some schizophrenics, without which spontaneous formation of concepts was at a minimum or not at all present. Thus, there seemed to be some connection between "brain-damaged" schizophrenic types and acute, untreated paranoid schizophrenics.

No breakdown of the schizophrenic population used in Goldstein's study was given. The pilot study, on the other hand, used only the paranoid type of schizophrenia. A contrasting clinical population, therefore, was needed to determine whether psychological deficit for this problem was confined to the paranoid type, whether some paranoids and some patients of other schizophrenic types showed the loss, or whether the tendency to deficit was universal as long as schizophrenia was contained in the diagnosis. Such a contrasting group should also bear close symptomatic relationships to the paranoid group, yet be distinct enough to warrant a different diagnostic labeling. The clinical picture presented by "Schizoaffective Psychosis" seemed to meet these requirements.

The major problem was formulated in terms of the following hypothesis:

> In Paranoid Schizophrenia there is a significant loss in ability to form concepts that organize non-verbal stimuli in spatial relationships.

Each of the terms in this hypothesis required careful definition, preferably in operational form, if criticisms of the work of other clinical investigators mentioned were to be avoided.

The following were the major types of criticism, applied mostly to the work of Goldstein and Scheerer (19), and Hanfmann and Kasinin (22), but of such general importance that any further work in this area should attempt some solutions: (1) lack of quantitative measures (Hunt) (25); (2) overgeneralization (Hunt) (25); (3) arbitrary or pre-determined solutions to a problem-solving task (Cameron) (8); (4) permanence of the deficit state (Cameron) (8), (Shakow and Huston) (26).

The next Chapter (II), then, contains a discussion of the following concepts, insofar as they relate to this experimental problem: (1) "paranoid," "schizophrenia," and "schizoaffective" as clinical entities or concepts; (2) psychological deficit; (3) concept-formation, as related to study of psychopathology.

Where possible, the discussions of each of the above problems were rephrased as further experimental hypotheses.

Summary

This experiment continues research into aspects of learning involving concept-formation, similar deficits for which have been reported for organically brain-injured persons and some schizophrenics. In the present experiment, by means of focusing attention on memorization of nine simple but related abstract designs, learning processes involving concept-formation were studied in paranoid schizophrenics, schizoaffective psychotics, and a control group of non-psychotics. An attempt was made to embody constructively criticism of previous work in this area, such as overgeneralization, arbitrary or pre-determined solutions to problems, and lack of

quantitative measures. The experimental hypothesis stated that a significant loss in ability existed in paranoid schizophrenics for forming concepts that organize non-verbal stimuli in spatial relationships.

CHAPTER II

SOME PROBLEMS OF PSYCHODIAGNOSTICS

The Method of "Blind Diagnosis:" Intrinsic Factors

Relationships between clinical psychologists and psychiatrists have determined to some degree the assumptions, techniques, and theoretical implications of psychodiagnostic studies.

Practical operating conditions have led generally to the idea of the "Psychiatric Team," wherein various aspects of diagnosis, background material, therapy, and periodic assessment have been divided between a psychiatric social worker, a clinical psychologist, and a psychiatrist. The particular functions served by the clinical psychologists have been subject to variations, but the following formulation has seemed generally applicable: "The primary mission of the clinical psychologist is to provide data and professional interpretations to assist the neuropsychiatrist in the processes of diagnosis, classification, therapy, and recommended disposition of patients who are hospitalized (or who are out-patients) for reasons of neuropsychiatric evaluation and treatment" (9).

Also, generally speaking, two different methods of accomplishing such ends were utilized. One was the differential referral technique, wherein the clinical psychologist received a request from the neuropsychiatrist to substantiate one, or one of several, diagnostic possibilities. Such a request might be accompanied by records of all previous work done on the patient. The other method was what was known as "blind diagnosis." When operating in this fashion, the psychologist did not avail himself of any previous formulations regarding diagnostic possibilities or background material, but attempted to apply one or more psychological tests, assessed their results for quantitative and qualitative patterns, and upon the basis of previous formulations regarding discrete patterns for various psychopathological conditions, made a diagnosis.

The present study developed as a result of operating under the "blind diagnosis" method. The application of this method was a purposeful decision reached by the Clinical Director and the Chief Psychologist, Longview State Hospital, Cincinnati, Ohio. The philosophy of the Clinical Director toward functions of the clinical psychologist in the diagnostic area is given as follows.*

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*Personal communication to the author.

> Over a period of years of observing and treating psychotic patients, clinicians become aware of certain "organic" features of such illness, particularly deviations of perceptual function. Present clinical psychology hardly more than touches on this area. By further development of academic physiologic psychology for clinical application it is hoped that these deviations will be sharply differentiated in detail, particularly in relation to varying sensory modality or modalities, time relationships, motor function and organization of these, and through such knowledge arrive at clear understanding of psychologic dynamics in functional psychoses and necessarily at the same time diagnostic grouping of real significance.

A practical outcome of such a viewpoint was the relative autonomy of the clinical psychologist. He pursued his investigations guided by his test results, presented his findings and final diagnostic conclusions at weekly diagnostic conferences independently of results or viewpoints of psychiatrists or other medical diagnosticians.

Hospital practice "accepted" cases where conditions could be plainly traced to organic causes or senility. The other cases--major psychoses, alcoholisms, choreas, neuroses, etc.,--were scheduled for diagnostic work-up. Every such case was assigned for psychological as well as psychiatric assessment and independent findings were presented at the diagnostic conference. At such time, the patient was brought in, briefly interviewed for significant pathology, staff discussion followed, and finally a vote was taken of all physicians. The majority viewpoint represented the final diagnostic label for this occasion.

A significant area of divergent opinions between psychologist and psychiatrists occurred as follows. On the one hand, diagnoses of "Paranoid Schizophrenia" made by the psychologist from Wechsler-Bellevue (49) qualitative and quantitative analysis, differed too often from the variety of diagnoses made by staff decisions. On the other hand, different characterological aspects derived from Wechsler results, associated with some kind of schizophrenic process but not with "signs" (49) for paranoid schizophrenia, led to diagnoses by the psychologist such as "Schizoaffective" psychosis, or "Hysterical" Psychosis; while more often than not the final staff diagnosis was "Paranoid Schizophrenia."

The first of these difficulties mentioned, that of psychological diagnosis of "Paranoid Schizophrenia" and some other diagnosis by staff, can be amplified as follows. (1) The paranoid element, determined by such criteria as "overalertness," "homoeroticism," and "front" as typical examples, appeared in alcoholic psychosis, manic-depressive psychosis, exaggerated neurotic conditions, schizoaffective psychosis, remissive catatonic schizophrenia, and other conditions. (2) The Schizophrenic element, as determined by contaminated responses, confabulations, clang associations, neologisms, arbitrary perceptual organizations, etc., appeared with post-partum psychosis, involutional psychosis, early senile psychosis, manic-depressive psychosis, alcoholism, etc.

The second type of difficulty, wherein the staff called many varieties of characterological conditions "Paranoid Schizophrenia," seemed particularly vexatious. Schafer's qualitative and quantitative patterns on the Wechsler-Bellevue for paranoid schizophrenia were being followed. Schafer (38) says:

> The most striking feature of the scatter in the records of acute cases is likely to be a more or less general drop of the Performance level; Block Designs, however, still tend to obtain the highest of the Performance scores. The Comprehension score is usually not strikingly lowered--a feature distinctively paranoid in its implications once the diagnosis of schizophrenia has been established elsewhere, since it reflects good preservation. Although some of these cases show extreme scatter of the general schizophrenic variety (great drops of the Comprehension, Arithmetic, and Picture Completion scores), in general it is the <u>paranoid</u> schizophrenics who yield little scatter. The greatly scattering paranoid cases are likely to be

> confused; the cases with little scatter other than a Performance drop are likely to be apathetic and retarded. A relatively high Arithmetic or Picture Completion score, or both, in a schizophrenic setting are indicative of paranoid overalertness. A relatively high Similarities score also indicates prominent paranoid features.

Following this patterning, and including all the qualitative features of a record, necessitated calling some cases just "schizophrenia" and tacking on characterological features, the suggestion being that the prodromal character make-up of the patient was "hysteria," or "neurasthenic," or "anxiety." These cases could not be called paranoid schizophrenia by Schafer's formulations because the Performance Scale results would be fifteen to twenty I.Q. points above the Verbal Scale results. Another type of scatter quite confusing was the "organic" type, where Information and Vocabulary remained quite high and other tests deviated below this level up to six or eight weighted score points. Yet all of these types were classified by the psychiatric staff vote as "Paranoid Schizophrenia."

The difficulties associated with differential diagnosis based on scatter patterns alone are well known. Rabin and Guertin (35), summarizing the results of studies of scatter and diagnosis of schizophrenia which appeared in the literature between 1945 and 1950, say:

> The findings concerning the use of the W-B in the diagnosis of schizophrenia are, in the main, negative. The results concerning discrepancy between VS and PS in schizophrenia remain inconclusive, since they differ from study to study. Individual differentiating subtests are not discriminating between schizophrenics and other groups. Several scatter approaches (mean scatter, vocabulary scatter, etc.) do not demonstrate the reliability of a specific schizophrenic pattern. Despite repeated warnings in the literature, many significant factors remain uncontrolled in many of the studies. Wechsler's "sign" approach did not prove fruitful in differential diagnosis. Judges utilizing Wechsler's diagnostic hints were somewhat more successful. Apparently a combined approach in which quantitative data are utilized along with "clinical insight" is most practical in the diagnostic process.

It has been recognized, of course, that most systems of "signs" have been particularly negligent in their lack of etiological conclusiveness. Schafer's book omits organic conditions and manic-depressive psychosis. This omission seems particularly unfortunate since both types of disorder can be confused with paranoid schizophrenia.

The plan of "blind diagnosis" had to be modified after considerable effort proved it to be unsuccessful. If type of schizophrenia was disregarded, the correlation between psychological diagnosis and staff decision was fairly high. If type was included, the correlation fell down considerably, due mainly to the predominance of diagnosis of "Paranoid Schizophrenia" by the staff. This situation focused attention strongly on the differential diagnostic difficulties of paranoid schizophrenia.

Extrinsic Factors: Personnel, Theories, Patients

A realization grew that psychological psychodiagnostics had to contend not only with the intrinsic factors just discussed, but that other factors contributed strongly and intimately. An enumeration and brief description of these factors follows.

(1) A rotating plan for resident students from another hospital introduced a different approach to psychiatric problems. "Oral narcissistic character disorder" does not correlate precisely with either alcoholism or psychopathic personality. The latter type concepts belong to a symptomatological approach, while the former derive from a motivational-dynamic approach. This difference in conceptual viewpoint often tended to produce controversy about meanings. Particularly was this true of cases of paranoid schizophrenia, where material suggesting latent homosexual tendencies sometimes influenced a positive diagnosis, sometimes drew rebellious alternative diagnoses.

(2) Changes in the permanent staff of the

hospital resulted in shifts from experienced personnel to often relatively inexperienced personnel. The majority vote tended to restore direction, although this was not always true (see #3 below).

(3) A particularly vocal, or strong personality often unduly influenced diagnostic decisions. Particularly was this encountered in psychiatrists who had centered their theoretical orientation upon opinions of one author (Bleuler: 4 ; Freud: 14 ; Noyes: 31 ; etc.).

(4) Not all members of the Psychological Department were equally interested, nor versed, in diagnostic problems. While the Chief of Diagnostic Services reviewed every case presented to staff, he could not supply the behaviors unnoticed or minimized by another examiner. This made for some unevenness of reporting, and consequently of diagnosis.

(5) Theoretical differences of interpretation of significance of test responses also existed among the psychologists. "Schools" and their approaches made for conflicting opinions, and often resulted in discussions based on different levels of a problem (Topological formulations (28) versus Freudian, for example).

(6) Most important of all, the patients seldom

behaved in the fashion described by any textbook. Overlapping of "functional" disturbances with organic conditions; the impression of a basic organic-type disturbance in patients with "functional" disturbances; the ubiquity of both paranoid and schizophrenic elements in other disturbances; and the shifting of schizophrenic processes in a patient, paranoid replacing catatonic, the presence of "mixed" features, etc.; all of these problems made for considerable hesitation in concluding that "types" of schizophrenia were actual clinical entities.

Other observers, not bound by proselytism to a particular theory--a tendency which seems deterrent to progress in this field--have arrived at similar viewpoints concerning diagnostic difficulties. Bellak (2) wrote:

> A questionnaire, sent by a French journal to a number of psychiatrists, concerning diagnostic, prognostic, and therapeutic views on dementia praecox showed a great disunity among the diagnostic concepts of the French, German, and Swiss psychiatrists. Boisen made a survey of subtypes of schizophrenia in various institutions in the United States and points out that the ratio of subtypes differs for different institutions, which leads him to believe that our present system of classification is inadequate. We see, then, that diagnoses differ from person to person and from hospital to hospital, not only as to principal diagnosis of dementia praecox but particularly as to subtype. Some hospital staffs habitually call a greater percentage of cases catatonic than do

> others, which are more partial to the diagnosis of paranoid or hebephrenic subtypes of the disease . . . . Nevertheless, efforts to sharpen the diagnostic criteria are anything but academic; a diagnosis is important, inasmuch as it implies the criteria for treatment and prognosis.

Hunt (25), in reviewing psychological deficit studies in schizophrenia, said: "The variations among the averages reported for each of the subtypes of schizophrenia may well reflect difference in diagnostic practice."

Figure 1* indicates some of the overlapping symptom formation found in patients and discussed in the preceeding pages. The central position of paranoid schizophrenia in this diagnostic overlapping is prominent. The confusion between type of schizophrenia occurs most often between paranoid and catatonic types. Of particular interest are the overlappings between manic-depressive psychosis, paranoid and catatonic schizophrenias. A common element to these three pathologies is "schizoaffective psychosis." Simple schizophrenia occasionally seems difficult to distinguish from psychosis associated with mental deficiency or psychopathic personality. Some of the differential diagnostic problems presented in this diagram are discussed in the

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*This indicates formulations of the author only and does not represent a consensus of opinion based on a summary of pertinent psychiatric literature.

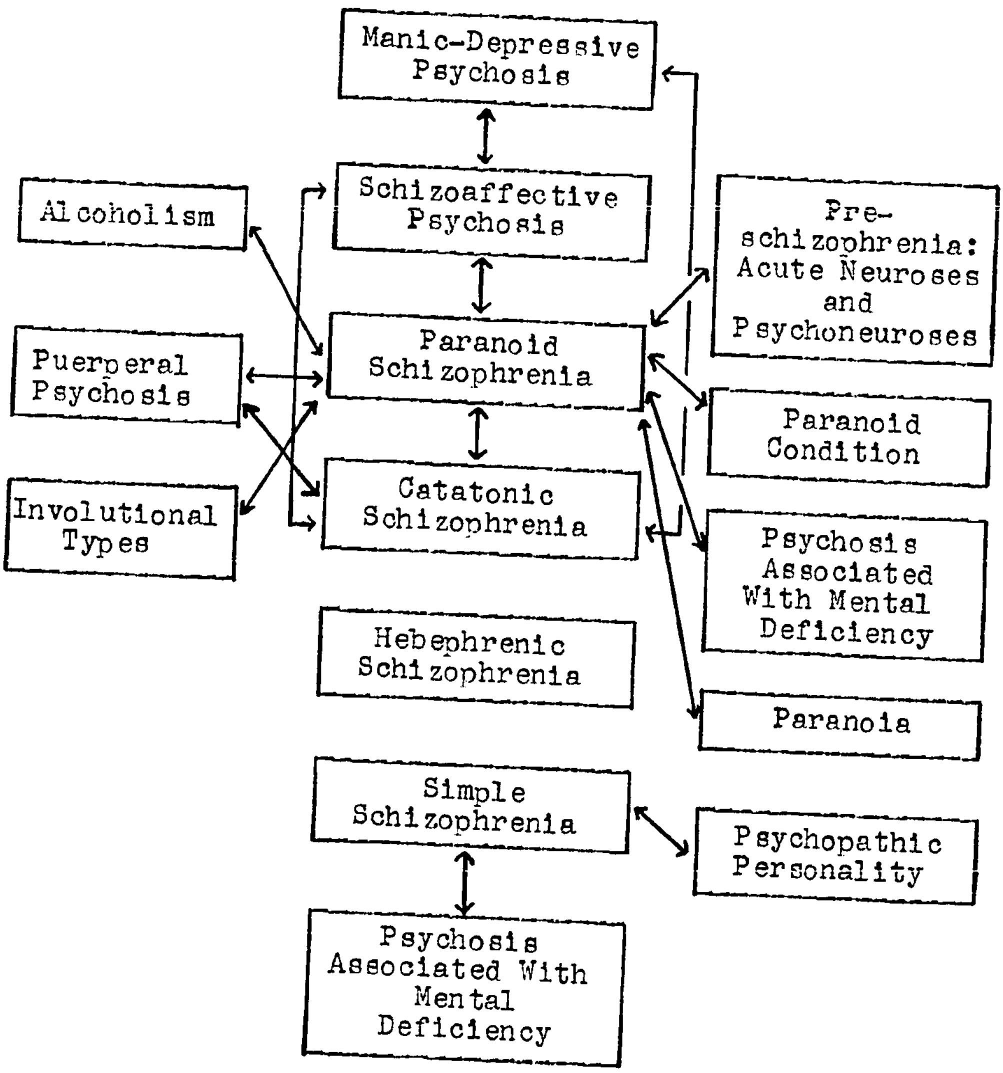

Fig. 1. Psychiatric syndromes often presenting diagnostic problems because of overlapping symptomatology.

literature. Many authorities, finding the classical division into four subtypes inadequate to account for what actually enters hospitals and clinics, add other subtypes. An example of this is Polatin's (33) further divisions into: (1) Pseudoneurotic type, (2) Acute Confusional States, (3) Hysterical Reactions, (4) Periodic or Cyclic Forms, (5) Schizo-Affective Group, (6) Depressive Forms, (7) Symptomatic Forms.

Formulations of Paranoid Schizophrenia and Schizoaffective Psychosis

The diagnosis of paranoid schizophrenia was most often made for cases exhibiting varying degrees of suspiciousness, hostility, or negativism accompanied by an otherwise bland affect; and various degrees of schizophrenic-like verbalizations, ranging from extremely "good front" behavior to voiced delusions involving persecution and/or grandiosity, accompanied by hallucinatory experiences. The other requirements were (1) a lack of any positive organic findings, (2) a lack of history of alcoholism, and (3) presence of precipitating factors in the form of schizoid pre-psychotic tendencies, history of progressive withdrawal, sexual conflict, etc.

Probably the major requirement, provided other signs of schizophrenia were present, was "bland affect."

Excitements accompanied by behaviors dangerous to others were usually diagnosed as catatonic schizophrenia. The presence of an affective tone of depression or euphoria, sometimes with presence of pressure of speech, sometimes with scattering of attention or flightiness of ideation, usually resulted in a diagnosis of schizoaffective psychosis. The tendency to make this diagnosis tended to increase as more characteristics of manic-depressive psychotic behavior increased.

The concept of schizoaffective psychosis has been used at various times and places to mean different things. Certain hospitals, emphasizing a diagnosis of manic-depressive psychosis, have used schizoaffective psychosis to mean a "mixed" type of manic-depressive disorder inclusive of certain schizophrenic-like features. Other institutions have looked upon the disorder as being basically a schizophrenia. One problem has been that of continuity or discontinuity between the major psychoses. This had historical roots in typology and the Kraepelian formulations (2). It has been vigorously argued by geneticists, such as Kallman (27), or organic theorists such as Cobb (10). Bellak (2) adopted a neutral position. He said:

> The differentiation of certain cases of dementia praecox from manic-depressive

> psychosis is a frequent diagnostic problem. The number of patients with a mixture of schizophrenic and affective features is large, and it is frequently all but a toss-up whether a case should be diagnosed schizophrenia with affective features or manic-depressive psychosis with schizophrenic features. Often a way out will be found in the diagnosis of "schizo-affective disorder." Most often it occurs as a matter of differentiation between catatonic excitement and manic excitement, inasmuch as both conditions have much in common.

The psychoanalytic formulation of the problem might be represented by Fenichel's various remarks (12).

> Psychoanalytic insight into the psychological background of schizophrenic phenomena hints at a close relationship between schizophrenia and manic-depressive disorders. Both are based on a narcissistic regression, the consecutive loss of objects, and damage of ego structure and reality testing. The dynamic similarity is reflected in a certain clinical similarity; actually there are cases that present mixed features of both diseases, as for instance in periodic catatonic states or persecutory delusions in the melancholias. This relationship supplies an argument against using the differences between schizophrenic and manic-depressive phenomena as a starting point for classifying character types in general.

Fenichel (12) referred to a later discussion regarding schizoid and cyclothymic character formulations of Kretschmer.

> Nor is Kretschmer's attempt to coordinate types of body structure and to distinguish schizoid and cycloid personalities as two

> fundamental types very attractive to the analyst. Although a difference between schizoid and cycloid behavior is sometimes striking, that which both types have in common seems of still greater importance: the tendency toward narcissistic regression. Schizophrenia and cyclothymic disorders are related to each other in the crucial features that distinguish them from the neuroses and from normality. Both together are rather to be contrasted with the more normal object-libidinal types.

The analytical viewpoint included a rejection of distinctive etiology between neuroses and psychoses. These are on a continuum; but basic to the major psychotic disorders is regression to primary infantile states, characterized as "primary narcissism."

> The infant starts out in a stage of "primary narcissism," in which the systems of the mental apparatus are not yet differentiated from each other, and in which no objects exist as yet. The differentiation of the ego coincides with the discovery of objects. An ego exists in so far as it is differentiated from objects that are not ego. Therefore, the following formulae mean one and the same thing, only varying in point of views: the schizophrenic has lost his objects; the schizophrenic has parted with reality; the schizophrenic's ego has broken down. (12)

More specifically, since the previous formulation was based on considerably more discussion elsewhere in his volume, Fenichel (12) said of neuroses and psychoses:

> Schizophrenia is today psychoanalytically understood and differentiated from neuroses adequately enough to make it probable that the role played by etiological somatic factors, though perhaps decisive, is in principle not different from that in neuroses. In the latter, it was understood that disposition and precipitating experiences form a complementary series; the physical constitution is part of the disposition, more decisive in some cases and less in others.

Somatic factors were not denied by the dynamic school, but their etiological importance was not considered differential for either neuroses or psychoses. Their formulations have been considered in many quarters an adequate basis for reformulating the Kraepelian-Bleuler concepts, for lack of interest in somatic etiological mechanics in psychosis, and for suggesting that both psychosis and neurosis form an unbroken series of upward or downward steps from mental health, as well as denying any specific distinctions between primary mental mechanisms in schizophrenia and manic-depressive psychosis.

Polatin and Hoch, mentioned by Bellak (2) in conjunction with studies of etiology of schizophrenia, also stressed the basic schizophrenic character of cases presenting affective features.

> The differential diagnosis between schizophrenia and manic-depressive

> psychosis is important. Owing to follow-up studies and finer appraisal of clinical dynamics, it is more widely acknowledged that many cases formerly diagnosed as manic-depressive psychosis are cases of schizophrenia. Some of the differential points are mentioned in the report of Hoch and Rachlin. If a patient displays manic or depressive features, the emphasis, in diagnosis is usually upon the emotional components, and not enough attention is given to the ideational material (thought content). It is still a very widespread assumption that schizophrenic patients are flat, having no affect, a conclusion which was arrived at only by observing schizophrenic patients in the terminal stage. In our observations, predominating and active projection mechanisms, with ideas of reference and persecution occuring in a manic or depressive affective setting, are very suggestive of schizophrenia. Hypochondriasis without adequate somatic complaints, is also suggestive of schizophrenia. The rapid changing of the delusional and hallucinatory content often accompanied by fluctuating affect is also more indicative of schizophrenia than manic-depressive psychosis. Rapid emotional swings from elation to depression, from passivity to excitement are much more common in catatonic mechanisms than in manic-depressive cases. The pan-anxiety described above, the marked emotional infantilism, the general tendency to insulate oneself emotionally from the environment, the phantasy-approach to reality is usually much less pronounced and in many cases completely absent in a true manic-depressive psychosis.

While other authorities could be cited, the above serve to emphasize that (1) distinctions between manic-depressive psychosis and schizophrenic types such as paranoid and catatonic have been difficult to make in many instances; (2) schizoaffective psychosis has been recognized as being a "bridge" between the two major psychoses; (3) the dynamic school has recognized the overlapping symptomatology but denies any distinctive differences in dynamic mechanisms in either psychosis; and (4) the greater tendency has been to view schizoaffective psychosis as being a variant form of schizophrenia.

As a variant form of schizophrenia, it fulfills very well the qualifications for a contrasting group to the paranoid type. It will henceforth be regarded as distinguishable from the paranoid type by the presence of a more or less marked affective display, from the catatonic type by not including generalized aggressive excitements, particularly when accompanied by homocidal intent; from hebephrenic type by lack of vegetative processes (grimacing, tics, other uncontrolled nervous system manifestations).

No psychological studies are known which have employed schizoaffective psychotics as a clinical group. An unexplored, relatively small clinical group presents certain methodological hazards. The choice of schizoaffectives involved the following logical considerations. First of all, the pilot study had suggested that paranoid schizophrenics might be similar to those schizophrenics reported by Goldstein to have concept formation deficit; a problem involved, therefore, was whether the deficit was restricted to the paranoid group, or whether another schizophrenic type would also show such deficit. Results, from this viewpoint, lead in directions of differential diagnosis. Secondly, other schizophrenic groups present disadvantages for a systematic study. The catatonics, when excited or in catatonia, rarely lend themselves to psychological tests which require introspection or delayed recall. Hebephrenics have a lower average intelligence than paranoids, when tested on admission to the hospital. Other forms of schizophrenia appeared too seldom, or represented highly speculative formulations. Thirdly, investigation of records of schizoaffectives suggested similarities to the paranoid group in terms of (1) greatest accessibility for rapport and psychological testing, (2) similar percentages in various age ranges, and (3) similar percentages in various I.Q. ranges.

Summary

This study derived, in part, from diagnostic difficulties centering about paranoid schizophrenia. When psychologists used the method of "blind diagnosis," and relied on patterning of psychopathology in terms of "signs," lack of agreement between psychological and psychiatric diagnoses often centered about concepts of "paranoid" and "schizophrenia." On the one hand, psychological diagnoses often failed to isolate fundamental morbid processes of which "paranoid" and "schizophrenic" were secondary components; on the other hand, psychiatric diagnoses tended to minimize or ignore characterological contributions to psychopathology. Other factors contributing to difficulties of agreement regarding the nature of clinical problems were discussed. Some of the literature regarding the controversial diagnosis of schizoaffective psychosis was reviewed. Symptomatology of paranoid schizophrenia and schizoaffective psychosis were formulated in terms useful for selection of two experimental groups.

CHAPTER III

RELATIONSHIPS OF CONCEPT-FORMATION STUDIES TO PSYCHOPATHOLOGY

General Theoretical Relationships

The application of concept-formation tests to clinical groups has emphasized, mainly, the problems of differential diagnosis* and theories regarding interrelationships between thinking and cortical functioning.** The latter problem more specifically stems from controversies regarding cortical specificity (dependence of function upon discrete structural areas) and cortical non-specificity ("mass action," "equipotentiality," field theories) for such a function as visual-motor learning in brain-injured persons. Indirectly, all learning is implied. Lashley's extirpation studies on rats, which established relationships of degree of extirpation of cortex to learning abilities, are a landmark in animal studies. Theoretical implications in the controversies are summarized by Girden (17):

There is another way in which the problems

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*For example, Kasanin and Hanfmann (22).

**For example, Goldstein (20).

of cerebral dynamics can be posed. Are the interneuron relationships organized responses of nerve impulses, akin to those of the telephone dialing system which works by a succession of equal, discrete, electrical impulses grouped in a temporal pattern? This approach, in one form or another, represents the "molecular," or "particle" description, based upon the patterning of discrete impulses in different neurones. This view is represented by traditional neurophysiology. To take an opposite view, are the cortical mechanisms molar field forces? Are the patterns of excitation fundamentally field functions literally akin to the physical lines of force demonstrated by soft iron filings on paper activated from below by a magnet? The molecular, and historically older, view is demonstrated in the history of the reflex arc, in the assumption of reduced synaptic resistance in learning, in the physiology of the nerve impulse, and in the several varieties of behavioristic theory. The molar approach was initially made by Gestalt psychologists in emphasizing the organized dynamics of perceptual processes and the implications of physical field concepts for psychology.

The implications of field theory with respect to cortical events have some general correspondence with formulations of Hughlings Jackson (51). "Jackson taught that in the damaged brain no single function is lost but that there occurs a process of dissolution in which there is evolved a new pattern of integration that is less complex, more stereotyped, and more automatic. Jackson defined consciousness as 'the degree of correspondence between the individual and the environment.'"

The experiment of Lashley, previously referred to, and the concepts derived, bear a close relationship to Jackson's viewpoint. The concept of "mass action" refers to the fact that amount of cortex extirpated in rats, after learning of a maze has taken place, is related to degree of impairment in learning, as measured by effort required to relearn. No specific cortical area was found that seemed to mediate such learning, so that only its removal resulted in inability to learn. And even after a considerable amount of cortex was removed, the animal could still learn the habit again, although exerting considerably more effort than a non-extirpated rat. "Equipotentiality" refers to the fact that a sensory reception area, such as the striate area, can be almost completely ablated without loss of ability, as tested by a brightness discrimination test. Any part, then, of the striate area in a rat can serve the same function as any other part, and amount of area is less important than presence of some area.

Much evidence from neurophysiology supports the Gestalt position regarding field determination of specific behavior, both for cortical action on incoming sensory stimulation as well as organized response patterns. It is with the latter, that tests of concept-formation are concerned.

In 1925, Gelb and Goldstein (16) published results of studies of concept-formation tests, involving perceptual-motor problem solving applied to cases of known organic injury. A general conclusion was that regardless of a specific type of clinical symptom, such as particularized aphasia, the patients manifested a general reduction in ability. This reduction pertained not only to a strictly intellectual performance but involved the whole organism's level of capacity. A distinction was made between abstract behavior and concrete behavior, the latter characterizing the performance of a brain-injured subject. In 1943, Goldstein (20) published a paper summarizing the application of these tests to schizophrenics. Some schizophrenics resembled organic-type patients in major behavioral ways, leading to Goldstein's tentative thinking that such schizophrenics had organic brain damage.

Goldstein's formulations regarding what has been referred to by other neurologists as "central aphasia" have been widely quoted. They have served to organize a great deal of research into cortical localization of function (see Bender and Teuber, et al) (54). Non-specificity of localization of function in humans, refers, of course, to relative cortical areas, rather than the cortex as a whole. A function, performed by a sensory area, once destroyed in humans, cannot be mediated by subcortical mechanisms to any such degree as that to which certain functions can be mediated in animals by sub-cortical mechanisms. Moreover, only certain areas serve as sensory elaboration areas in humans. Learning, as a psychological function, is regarded as independent of any sensory component, except to the degree that the sense furnishes data for the learning. Functions, however, of "generalization" and "abstractions," "concentration" and "attention," are common to elaboration of any afferent stimulation, and are often regarded as "central" mechanisms (32).

The current status of relationships between formulations of Jackson, Goldstein, and others with respect to concept-formation as a means of investigating psychological deficit, has been summarized by Scheerer. After making a distinction between deficit as an impairment of function, and deficit as an expression of interference with function, Scheerer (39) said:

> Historically similar distinctions were first implicit in Hughling Jackson's conception of heirarchically-organized levels of the nervous system and corresponding mental functions. Later, the careful psychological analyses of performance changes in the brain-injured by Henry Head, Kurt Goldstein, A. Pick and others supported Jackson's position and added new observations. While Head found

that "symbolic formulation and expression" were most readily disturbed in cortical damage, Gelb and Goldstein and their co-workers found also loss of conceptual thinking and the ability to carry out performances with abstract meaning. Such performances with abstract meaning are, for example -

(1) To demonstrate an action <u>outside</u> of its usual context - to "show how" through gesture or pantomine.

(2) To deal with directions in space abstractly, lifted out of purposeful action, so that one presents to others (or oneself) spatial relations verbally or in drawings.

(3) To deal with space or quantities in an ideational frame of reference, so that one realizes the meaning of left and right, up and down, more or less, as relational, transposable, principles or cognizes the meaning of a number as to its relational position within a metric system.

c. These findings led to a restatement of Jackson's rule that cortical impairment will first affect the higher levels in the functional heirarchy of the nervous system as well as the most recent performance acquisitions. Specifically, the comprehensive case studies by these investigators suggested that this impairment can cause a restriction of the total personality to a simpler level of functioning. The complexity of normal performance organization disintegrates; a dedifferentiation of normally integrated and differentiated behavior occurs. Thus the more difficult performances which require the functional intactness of the higher levels lack in normal integration and are also modified. This is psychologically expressed in an abnormal "concretization" of the personality as a whole which has been studied

> clinically through the use of specially devised tests, developed _in extenso_ in a monograph by Goldstein and Scheerer.

Psychological deficit, then, for Goldstein and Scheerer was concretization of behavior. This seems an overgeneralization; and a digression is necessary in order to relate an important aspect of psychological deficit to this experimental problem.

Problems Related to Intellectual Deficit

Hunt (25) adopted the term "deficit" because of its neutral implications, insofar as theories of cause of loss were concerned. "As used here, it is an operational concept. When any person performs in some situation at a level of effeciency below that expected from comparison with typical individuals or from some indicator in his own present or past behavior, that person manifests a deficit."

Some test results indicated a surprisingly small, if any, deficit reaction. This problem was considered a central one by Hebb, who reviewed several cases involving lobotomy patients. In fact, Hebb (24) claimed that little deficit was indicated for any area surgically entered outside of the speech area. "It is possible that there is always a loss of intelligence in aphasia, when the 'speech area' is seriously damaged, but this does not, of course, explain why damage elsewhere should have no effect. It would be unreasonable to suppose that most of the cortex has nothing to do with intelligence, and there are in fact definite indications that this is not true. Intelligence must be affected by any large brain injury - yet sometimes it seems not to be."

Hebb (24) pointed out that Binet type intelligence tests were least revealing of deficit. He cited cases involving ablation of large portions of frontal lobes, with retention of superior and very superior I.Q.s reported after post-operative testing. "The level of intelligence-test performance is a function of the concepts a patient has already developed. Once developed, a concept is retained, despite brain damage that, if it had occurred earlier, would have prevented the development. The patient with brain injury at maturity may continue to think and solve problems normally (in familiar fields), although his intelligence would have been far from normal if a similar injury had happened at birth."

Hunt (25) agreed, in a previous review of the problem, that deficit was difficult to uncover when the Stanford-Binet was used. He cited, however, the presence of deficit when other tests, such as "double alteration" or "Vigotsky" were used. The implication is that, when confronted by a novel situation, one not encountered previously, or having little correlation with previous learning situations, the individual with cerebral pathology will be induced to exhibit intellectual deficit.

Hunt (25) said: "We might expect patterns of selective failure and success to differentiate to some extent patients with 'organic' disorders from those with schizophrenia. Damage to cerebral structure should reduce fundamental capacity, while the 'withdrawal' of schizophrenics should leave basic capacities untouched but alter such functions as judgement. Differences in performance are actually relatively few, but those few tend to somewhat corroborate this hypothesis." However, Hunt (25) went on to mention a common pattern of results from such pertinent studies of deficit. "Common to both types also is the general pattern: highest scores on vocabulary, next on verbal tests, and lowest on performance tests . . . ."

One does not have to agree with Hunt, however, about the significance of such a trend. He favored an hypothesis that correlated "withdrawal" with loss of practical or social judgement, found to a greater degree in the test results from Stanford-Binet studies than in tests including a greater degree of performance-type tasks. Again, the hypothesis adopted depends in part upon which set of results are favored. The generality of findings regarding loss of performance-type ability for both schizophrenics and organic cases, suggested that some factors inherent in performance-type tasks are operative in creating deficit. Such a loss was reported for acute cases of paranoid schizophrenia in Schafer's clinical handbook (38).

The problem of type of deficit, the material eliciting it, and the resistance of familiar verbal tasks to deficit, resulted in a decision to explore deficit in paranoid schizophrenia by means of non-verbal stimuli in a problem involving manual performance, at least to as great a degree as is involved in the Performance Scale of the Wechsler-Bellevue.

Review of Concept-Formation Studies

The application of concept-formation tests, involving this degree of performance, and using non-verbal stimuli, had preceeded the monograph of Goldstein and Scheerer. Bolles (5), in 1937, had used sorting and matching materials. Comparisons were drawn between performances of chronic schizophrenics, institutionalized aments, and normal children averaging nine years of age. In addition to the superiority of the nine year normal child, Bolles discussed two general levels of performance: a concrete level determined primarily by sensory impressions and a conceptual or abstract performance determined primarily by categorizing methods. Weigl's study (50) employed sorting tasks and discussed concrete and categorical (conceptual) approaches. A translation of this study appeared in 1941. Weigl's form-color test has been used by other investigators, as well as having been modified by Scheerer (39) and Bolles (5). Kasanin and Hanfmann (22) used the Vigotsky Test (derived from Ach), which is a block design test employing multivariant blocks. Their findings showed significant deficit for a schizophrenic group with superior education compared to a normal group with average education. They distinguished three levels of performance, the "concrete," a mixed type, and "abstract." A test somewhat similar to the Weigl form-color, known as the Wisconsin Card Sorting Test (WCST) was used by Tobey (45) in 1949, establishing the superiority of young normal adults matched with schizophrenics for age, I.Q. and educational achievement.

Thus, a majority of the studies reported both significant deficit for performances involving sorting, matching, and classifying tasks when non-verbal stimuli material was used, and also for what is now generally called "abstract" behavior or capacity. Since the latter is particularly identified with Goldstein, Scheerer, Kasanin and Hanfmann, their major studies are more thoroughly reviewed.

Goldstein's theory related behavioral reactions, observed during performance on concept-formation tasks involving visual-motor elements, to postulated levels of total organism capacity. Two general levels of capacity were distinguished, the "concrete" and the "abstract." Goldstein (20) said: "These attitudes are neither acquired mental sets nor habits of an individual, nor do they represent specific isolable aptitudes such as memory or attention. They are rather capacity levels of the total personality, each furnishing the basis for all performances on a certain plane of reference in response to the outer world."

While abstract and concrete attitudes were considered generalized capacity levels, both referred to the response portion of a receptor-central process-response trichotomy. Goldstein (20) specifically said: "In order to avoid misunderstanding, we have to emphasize that the process of disintegration in the direction of concrete behavior does not prevent the arousal of ideas and thoughts. What the deterioration actually affects and modifies is the way of manipulating and operating them."

According to such a viewpoint, there is no "central aphasia" but a degree of apraxia. This same difficulty, of distinguishing between the response as an observable behavioral element and response as an inference concerning internal processes, is encountered in Vinacke's paper (48) on concept-formation. It is the tendency to discuss response behavior at one point as standing for inferred central-type processes, and at another point to speak directly of central-type processes. Both of these aspects of the problem have been recognized as particularly difficult problems for any behaviorism. Consider the following formulations of the concrete and abstract attitudes.

> The concrete attitude is realistic. In this attitude, we are given over and bound to the immediate experience of the given thing or situation in its uniqueness. Our thinking and acting are directed by the immediate claims made by one particular aspect of the object or situation in the environment.
>
> In the abstract attitude, we trangress the immediately given aspect or sense impression, we "abstract" from particular properties. We are oriented in our actions by a more conceptual point of view, be it a category, a class, or a general meaning under which the particular object before us falls. (20)

It is not clear, therefore, whether Goldstein meant that a concretized personality has "abstract" ideas, "thinks" them, but cannot express such ideas through motor processes; or whether the basic defect affects central processes and actually prevents "abstract" ideas from forming. Another consideration of Goldstein was that the total personality was involved, which included the problem of motivation. An assumption must be made that the motivation of such people is also concretized, in the sense of deliberate formulations of plans based on wishes and needs into the future. Such an assumption brings these schizophrenics into areas discussed by Freeman and Watts (13) regarding significance of the frontal lobes and thalamo-cortical association fibers. Also related are formulations of Bychowski (7), regarding relationships between pathology of thought and cortical pathology.

The discussion is hampered, however, by not knowing whether motivational-expressive elements stand for damaged central processes, or whether the motivational-expressive behaviors themselves are the primarily affected processes in concretized subjects. This does not seem merely a problem of semantics, nor of quibbling about cortical processes. Hebb (24) and Penfield (32) in recent publications emphasized central psychological processes whose existence may be inferred to some degree from response behavior but whose actual mechanisms are not explained in terms of only stimulus-response formulations. Nor did Hebb grant to the frontal lobes any necessary connection with so-called higher intellectual functions. "Only one thing need be added: although the frontal lobe is the favorite place in which to localize higher functions when one is speculating about these matters, it is still true that there is no proof that any single higher function depends on this part of the brain (Hebb, 1945b). At least as good a case might be made out for parietal and temporal lobes as the seat of man's distinctive psychological characteristics - if these in fact depend on one part of the brain more than another. . . . ." (24)

In line with this, the following viewpoints may be mentioned. All of them are related to the problem of the "Body Image" (41), the pathological expression of which overlaps schizophrenic processes considerably. (1) Bychowski (6): historical study of interparietal syndrome, relating it to studies in schizophrenia; (2) Galdston (15): history and formulations regarding depersonalization; (3) Schilder (40): relationships between vestibular disturbance, body-image area, and schizophrenia; (4) Angyal (1): cortical damage in body-image area and schizophrenia; etc.

Another problem of theoretical importance stems from the "dual-process" position of Goldstein, based on discontinuity between abstract and concrete attitudes. Harlow (23) summarized this problem as follows. "Within each category there is a range of behavior, but between the two categories there is no continuity, the demarcation between them is not conceived of as a difference in complexity but, rather, abstract behavior requires a 'new emergent quality, generically different from the concrete.'. . . . . ."

Scheerer (39) acknowledged the lack of experimental findings on the subject of a continuum, but still stressed discontinuity.

> As yet the question has not been experimentally decided whether the range from abstract to concrete is a measurable continuum of increasing complexity or whether it is discontinuous. Descriptively, there is however all indication that the greater difficulty of the abstract approach is not one of greater complexity in a mere quantitative sense. It is neither a synthesis of all elementary functions involved in concrete behavior taken together, nor a combination of these with some others added. The abstract approach demands a qualitatively rather different attitude of the person with a new direction in behavior. The behavior is here guided by a cognitive awareness of meaning, namely by acts of conscious intentionality.

What Scheerer meant by "cognitive awareness of meaning" is not clear. It seems to suggest the need for another element, the "knower" in back of awareness of meaning, at one time a "cognitive" knower, at another time something else. Two general observations can be made at this point. (1) Nowhere in Scheerer's discussion was mention made of the influence of unconscious processes relevant to thinking and pathology. (2) There was little emphasis on the fact that degree of complexity of processes, phrased as psychological concepts, bears the only relationship we know to complexity as well as orderliness of the universe. Such recognition would involve another concept, that of "power" or "rate" of processes, most often discussed under intelligence as a quantifiable concept. In other words, "conscious intentionality" or "cognitive awareness of meaning" are old "faculty" concepts. The <u>reduction</u> of complexities presented by both sensory processes as well as "ideas" is a direct function of central processes; in fact, they are one and the same thing. Concept-formation at any level is an aspect of such complexity-reduction processes. When such processes are involved with memory in the form of previous complex-reductions, abstractions of the highest order result. But "highest order" is still a matter of scatter from norms. In such terms, with the addition of the concept of "rate" as an expression of power of complex-reduction, there seems to be no need to deal with dual-processes. A continuum can be posited. An expression, then, of rate of learning is considered a _sine qua non_ for any further inquiry into concept-formation.

Goldstein's general conclusions (20) in 1943 were as follows. ". . . . . . . in a certain group of schizophrenics there is a characteristic impairment of the attitude toward the abstract; the patients behave much more concretely than do normals and do not learn to understand, even after demonstration, what the abstract attitude means. . . ."

This "certain group of schizophrenics" were pathologically bound to particularized experiences and external objects. Illusions, language disturbances, and other pathological reactions of the schizophrenic were explained by the tendency to concreteness of thinking. A comparison was drawn between the organic reaction type and the schizophrenic. "Phenomena described in schizophrenics as weakness of the capacity for concentration, 'Gedankenabreissen,' rigidity and distractibility, forced responsiveness to singularities, contamination, etc., all these in addition to other phenomena are observed in the same manner in irreversable organic patients and can be understood in the same way as phenomena of isolation." (20) "Loss of constancy and definiteness in the conception of the structure of objects, is equally characteristic for schizophrenic patients, as for organic." (20) Illusions and delusions were ascribed to deficient figure-ground perception. Language disturbances were explained in similar fashion.

While similarity between schizophrenic productions and those of organic patients was stressed, Goldstein (20) pointed out the differences between them as well since he would not "like to be misunderstood as considering schizophrenia to be simply an organic disease." In a discussion of this, he seemed to imply that he is a dualist of the traditional variety. "From my general position regarding the body-mind relationships, I am inclined to assume that equivalent functional changes can be produced by organic, i.e., structural or chemical as we as by psychological derangement." (20) What was meant by "psychological derangement," in terms of processes, was not explained.

"The kind and level of concreteness in schizophrenia is not identical with that in somatic cases." (20) The major difference seemed to be that the method of the somatic patients was one into which the observer could enter empathetically, i.e., he could see <u>what</u> it was that the organic could do; whereas in schizophrenia, the personal version of the patient's idea was foreign to the understanding of the observer. The physiognomic aspect of percepts was another level of concreteness found in the schizophrenic and not in organic cases.

Goldstein also discussed primary and secondary symptoms, related to formulations of Bleuler in particular. The primary changes were considered the basic, or perhaps the disease-natured changes; whereas secondary changes were psychological reactions to the primary. "There is no doubt," said Goldstein (20), "that the clinical picture of schizophrenia contains symptoms which may suggest an origin in a disturbed function of some apparatus of the brain, particularly of the frontal lobes and the subcortical ganglia, and also symptoms which are better interpreted as psychological reactions." He concluded that though evidence strongly suggests organicity, a definite answer could not as yet be stated.

Hanfmann and Kasanin (22) based their study of concept-formation on conclusions previously reached by Vigotsky "who, in brief, believed that 'the essence of the schizophrenic thought disorder and an important characteristic of schizophrenic disorder in general is a loss of ability to think in abstract concepts and a regression to a more primitive level' which he (Vigotsky) calls that of 'thinking in complexes.' By this, he means that 'objects are seen as individuals' rather than under general categories or concepts or representatives of classes. For Vigotsky, the loss of conceptual thinking is the basic disturbance."

Hanfmann and Kasanin used the Vigotsky technique and materials. The materials are twenty-two wooden blocks varying in color, shape, height, and size; classifiable into tall-large, flat-large, tall-small, and flat-small groups (note criticism of this arbitrary "correctness" of evolving concepts, made by Cameron) (8). The method includes guidance of various degrees when mistakes are made. This permitted classification into responses based on degree of guidance needed before correct concepts were formed. The three levels of response noted have already been mentioned. Sixty-two cooperative schizophrenics, ninety-five controls, twenty-four irreversible brain damaged cases were used. A major purpose of the experiment seemed to have been differential diagnosis by means of this test. A criticism of treatment of results is quoted, although the author is unknown. "Unfortunately, the authors do <u>not</u> include either the ranges or the obtained 'significances of differences' (other than to state that they were computed by 'Fisher's formula'). Because of this (as is true for any data which overlaps), one should <u>not</u>

regard the results obtained as 'completely diagnostic' . . . ." (22)

This same anonymous author (44) reviewed Kasanin and Hanfmann's conclusions regarding differential diagnosis.

> "The performance level of these organic patients is not only significantly lower than that of average controls: it falls even below that of the schizophrenic group and approaches the primitive level . . . . . with little scatter of the scores in the first two phases . . . . organic patients <u>never</u> understood the task as a classification, <u>never</u> interpret a response as <u>proving</u> that the attempted grouping was wrong, <u>never</u> concern themselves with the totality of groupings. Solution is reached purely automatically by 75% of the organic patients as compared with 36% of schizophrenics. The value of this comparison of scores is not great, because the organic group itself is at least as heterogeneous as is the schizophrenic. . . . . . We can only say on the basis of these scores that the organic patient's level of performance is at least as low as and perhaps lower than that of schizophrenics. . . There are some characteristics, however, <u>not</u> reflected in the scores, in which the performance of organic patients differed from that of schizophrenics. . . . organic patients <u>never</u> produced the physiognomic groupings which <u>were</u> prominent in . . . . some schizophrenics. They lacked also the vacillation of some of the schizophrenics. Such patients no sooner started to consider color, than their attention was drawn by shape, and, wavering between these possibilities they were unable to follow any one definite pattern of grouping. The organic patients . . . . . even when they were

> led now by one aspect of the material, now by another, remained complacent throughout and showed no conflict or hesitation. When they used trial and error . . . . as they frequently did . . . . they did so without any compunction, cheerfully assuming that this was the required way of doing it. For a schizophrenic, even performing on the lowest level, the test seemed to present more of a problem than it did for the organic patients."

Not only, then, did the two clinical groups overlap, but the evidence for similarity of disturbance between schizophrenics and organics was less striking than the differences, which maintain the clinical characteristics of both groups. The previously mentioned criticism of Cameron (8) is pertinent here.

> Cameron (1939b) later reported that, when adequate rapport and cooperation had been established, even very disorganized schizophrenics could be led to generalize rather freely and to shift their mode of attack from one method or "category" to another. Although contrary to most current reports, this is not an isolated observation. In fact, Gatewood (1909) found that shifting attitudes in memorizing problems were especially characteristic of schizophrenics; and Hunt (1936) has suggested that this may help account for their relatively poor showing in recognition and recall. Nevertheless, Hanfmann and Kasanin (1942) arbitrarily reject all the solutions which Cameron's schizophrenics offered, based on shape, color, mass, weight, material, name, type, radius, angles, opposition and equalization, apparently because these happen not to be the particular generalizations

> demanded by the Ach-Sakharov test. In effect, this is to say, "Unless you think of this problem the way I have learned to, you are not generalizing at all!"

The assumption of a permanent deficit state reported in schizophrenics for "abstract" attitudes, was also criticized by Cameron (8). This related to the 1941 monograph by Goldstein and Scheerer.

> Goldstein and Scheerer (1941) deny that the schizophrenic can spontaneously evolve groupings according to material, form, or color; but Cameron's extremely disorganized schizophrenic patients with marked asyndetic and metonymic thinking, both characteristic schizophrenic disorders, did evolve such groupings using the Ach-Sakharov materials and method, and quite without promptings or suggestions, as the verbatim shorthand records of his transactions plainly show (1939b). If one accept Goldstein and Scheerer's criteria for the "abstract capacity level" (1941), it is obvious to the writer on the basis not only of test situations but of several years devoted to daily close communication with intelligent schizophrenics of every degree of severity, that the "abstract capacity level" can be found in most schizophrenics provided the painfully patient technique necessary for effectual rapport with this group is developed. Actually the criteria for the "abstract attitude" seem to be those customarily employed in demonstrating the intervention of consciousness which, the writer believes, have no more valid application in abnormal behavior than they have in normal behavior. . . . . .

Thus Cameron made two critical points: (1) the deficit in terms of criteria advanced by Goldstein and

Scheerer for the abstract attitude, could not be considered a permanent deficit; (2) "faculty" intervention was implied. This last point has been discussed previously in terms of continuity versus discontinuity of the two behavioral levels, and a similar conclusion was reached. An experiment by Huston and Shakow (26) on permanence of the deficit state for motor-type learning problems reached the same conclusions as Cameron; namely, that with extreme patience and using every technique to gain the subject's confidence, schizophrenics can be made to improve their scores in learning past the high scores of the best schizophrenic learners.

Aware of this problem, Scheerer (39) has modified his point of view regarding similarity between organics and schizophrenics.

> A second problem encountered in clinical practice is the diagnostic meaning of test failures by psychotics, especially schizophrenics. The investigations of Bolles and Goldstein, Hanfmann and Kasanin, have demonstrated a lack of ability to conceptualize and behave abstractly on the various tests in cases of schizophrenia. Again our present knowledge is insufficient to generalize from these cases to all others, or to infer "organicity," or even irreversibility of this condition. From the studies of Bolles, Rosen and Landis, Zubin and Thompson, it is, however, apparent that the test failures are indication of <u>present concretization</u>. . . . .

Mentioned previously, in this same vein, was the distinction Scheerer made between <u>impairment</u> as a condition peculiar to organics, and <u>interference</u> as a condition peculiar to psychotics. Impairment is operationally understood much better than interference as a concept. In reviewing the literature bearing upon this present topic, one is aware that certain long and honorable philosophical problems are being skirted and in many cases disguised behind an avalanche of words. Very few investigators have attempted to treat the problem, from a somatic viewpoint, then from a psychological viewpoint, by frankly stating their position with reference to either inclusiveness or lack of inclusiveness of a concept with respect to either aspect. In psychiatric literature, Bychowski tried to formulate the problem most precisely. In clinical psychological literature, attempts to redefine the problem, so as to avoid it, have not been successful. Cameron, following a modified Behaviorism of Adolf Meyer's psychobiological approach, avoided some of the pitfalls by emphasis on longitudinal, or life-span, approach. Cameron's approach, however, was on a different level than that of Goldstein and Scheerer, Bychowski, and others. From Cameron's viewpoint, there was no necessity to deal with "abstract" and "concrete" attitudes; one dealt, instead, with interactions between the composite individual (constitution, health, training, etc.) and environment (customs, locales, press, etc.). Neither approach should exclude the other since different aspects of the problem were being investigated. Thus Cameron's additional criticism, which implied that concepts of "abstract" and "concrete" behaviors have no validity whatsoever, seems somewhat radical. Concepts, moreover, may be considerably altered during progressive experimentation and reconsideration, without detracting from their usefulness and importance. Many concepts, like generals, are now dead, but honorably buried.

The possible meaning, however, of "interference," as a modification introduced by Scheerer into his former viewpoint that organics and schizophrenics behaved similarly, was both an effort to meet criticism of overgeneralization, as well as further proof that central states, rather than just response mechanisms, were being considered in terms of these dual attitudes. In spite of Hebb's excellent criticism of psychoanalytic claims for their form of treatment in psychosis, the analytic school has advanced a more systematized effort to explain "interference" as psychological processes than the physical behaviorists.

Relationships of Concept-Formation Studies to Affectivity

The relationship of concept-formation to affectivity does not formulate a problem but merely generally describes its area. To some degree, the present experiment investigates possible relationships in this area since the two clinical groups are distinguished on the basis of differences in observed affective-type behavior, among other possible differences. A fact of considerable importance is that concept-formation has been little, if at all, studied in the affective psychotic disorders, or the character disorders. This probably has an historical basis, stemming from Bleuler's formulations that schizophrenia is primarily a disorder of thinking, secondarily of more florid affective symptoms. Rapaport presented, in a footnote, a short history of this one-sided approach.

After discussing relationships between Blueler and his debt to Freud, the background provided by Kraepelin, the followers such as Jung, Abraham, etc., Rapaport (36) said:

> Though Bleuler did not recognize that there exists a direct relationship between the primary symptoms on the one hand, and drive dynamics and Freudian mechanisms on the other, his consistent effort to find the basic symptom in a disorder of thought is of lasting value. It has fallen into undeserved oblivion, though no comparable systematic attempt to study the schizophrenic thought-disorder has been made since, not even when interest in such studies was revived

> in the middle 1930's (see Kasanin, 372). Though his conception of psychological functions and their grouping is outdated, he highlights functions (attention, autism, consciousness, etc.) to which since then unduly little attention has been paid.
>
> Bleuler's distinction between basic and accessory symptoms has become particularly fruitful in diagnostic psychological testing, where it gave rise to two fundamental questions: (a) can early symptoms of developing schizophrenia be found by testing proceedures <u>before</u> the obvious secondary symptoms set in, that is, before the more or less overt break? (b) are there indicators in tests of schizophrenics which progosticate a malignant course (Cf. Rapaport et al, 602, II 329 ff.; Hanfmann and Kasanin, 299, pp 66 ff.; Kasanin, 371, pp 46-49; Benjamin, 43, pp 66-70). One of the disadvantageous aspects of the search for the basic symptom was the inclination to elevate a single feature of the schizophrenic thought-disorder to a unique position. Vigotsky (743) went so far in this direction as to consider disorders of concept-formation the basic symptom, if not the etiological agent, of schizophrenia. He contended that affect-disorder is a consequence of conceptual disorder. . . . . For further examples see the papers published by Kasanin. . . . Bleuler himself avoided this pitfall. His clinical method and the variety of "functions" he studied, make Bleuler's book the richest single volume on the phenomena of schizophrenia thought-pathology.

Two aspects of Rapaport's own work bear upon the present discussion. The first dealt with employment, by Rapaport and co-workers, of concept-formation tests as part of a clinical battery, and the report of such findings as part of an effort to establish diagnostic criteria for various neurotic and psychotic syndromes (37). They used three tests of concept-formation, the Similarities sub-test of the Wechsler-Bellevue, a sorting test, and the Kasanin-Hanfmann version of the block design test. With respect to the last of these tests, they were particularly interested in accompanying peripheral behaviors, especially those aspects which were concerned with reaction to success and failure, difficulty, and so on. "In our experience, those aspects of thinking which are intimately bound up with reactions to success and failure, are 'flexibility,' 'fluidity,' 'persistence,' and 'rigidity.'" (37) They were interested in deductive and inductive processes, but concluded that "Actually a performance characterized exclusively by one of these modes is rare." (37) This conclusion also pertained to the factors listed previously in which they were most interested. Their general conclusion was: "The optimal condition for successful performance is the presence of flexibility and persistence, to the exclusion of rigidity and fluidity." (37)

No attempt was made to relate these concepts and findings to Goldstein's formulations. Rapaport in his most recent work (36) attempted to relate a fairly throughgoing analytical viewpoint to the general problem of thinking. His conclusions, as they pertained to concept-formation, are summarized as follows:

Concept-formation is regarded as a particularly valuable method for studying thought organization. In some phases of thinking, concept-formation appears to such a high degree that it seems to be a quasi-process. Whenever it appears, it is regarded as linked with memory and consequently with drive systems. This relates a momentary aspect of functioning to not only conscious content but unconscious processes. "The fundamental question which concept-formation answers is: What does an idea belong with?" (36) When instinctual and emotional factors are dominant in an organism's state, physiognomic conception occurs ("participation:" everything recalled shares some part of the drive state; "syncretism:" ideas merge with one another, disregarding intermediate associations; "transduction:" the reasoning process disregards conventional rules of induction, moving from parts of wholes to other parts of wholes "with the assumption that the step will hold for the whole") (36). Reality-testing is considered a secondary process. Belongingness, or concept-formation, changes to meet growing ego's requirements so that ". . . . experience is assimilated to a manifold of concept-systems in terms of every sensory and every already existing abstract quality; but particularly in terms of time, space, matter, weight, and so on. The gain from such an organization is that apparently the single idea need not be kept cathected, or only on a low level of intensity; and it is the built-up conceptual frames of reference which are cathected and highly responsive, as a whole." (36)

The relationships between these two levels of concept-formation are ones of continuous interaction, but this was presented descriptively. What Rapaport implied, and also discussed elsewhere, were familiar Freudian mechanisms of condensation, symbolization, projection, etc., by which material proper to the unconscious manifests itself in consciousness. Bleuler's emphasis upon affect-laden associations seemed rightly criticized by Rapaport. Central-type mechanisms must be considered as involving material supplied by feeling states, but the connections between "generalization" and "abstraction" and "condensation" and "symbolization" cannot be stated at present.

Reformulation of Experimental Hypotheses

The following positive considerations have been incorporated into the present study.

(1) Over-learned material, particularly of a verbal nature, has not successfully indicated the degree

of psychological deficit existing in many psychotics, particularly paranoid schizophrenics.

(2) Controversy centered about continuous or non-continuous abilities has not been productive of experimental research which might have clarified some issues. This might have been due to lack of quantitative measurements for rates of psychological processes discussed. Proponents of non-continuity have tended to over-simplify the problem by a qualitative approach, while critics of non-continuity have oversimplified the problem by tending to deny its existence.

The present study, consequently, is regarded as an exploratory study, designed to determine degrees of differences between paranoid schizophrenics, schizo-affective psychotics, and non-psychotics for quantitative and qualitative results of a learning test involving memorization of non-verbal stimuli in a spatial context. Based on such considerations, the following hypotheses have been formulated.

(1) The greatest degree of impaired functioning, manifested by such various criteria as inability to learn, inability to form concepts, inability to form spatial-type concepts, and slowest learning rates, is associated with the paranoid schizophrenic group.

(2) Schizoaffective psychotics occupy a position somewhere between the degree of deficit predicted for the paranoid group and the degree of ability manifested by the control group.

Summary

Studies of concept-formation of psychopathological individuals or groups were reviewed as they contributed to two major problems: differential diagnosis and theoretical problems of relationships between cortical structures and psychological functions in paranoid schizophrenia. Major studies of Goldstein and Scheerer, Hanfmann and Kasanin, and Rapaport were reviewed more extensively than others; and pertinent criticisms of some of this work were discussed and evaluated. Such review contained the rationale for major aspects of the present study. The desireability of discussing processes in terms of statistical and quasistatistical concepts led to rephrasing of experimental hypotheses in keeping with an exploratory study.

CHAPTER IV

METHODOLOGY

The Test of Concept-Formation Developed For This Experiment

The pilot study was already underway when Vinacke's review (48) of concept-formation appeared in the Psychological Bulletin, January, 1950. It is interesting that the test developed for this experiment should bear such marked resemblances to the type suggested by Vinacke. A drawing of Vinacke's test was included in his paper. Vinacke seemed led to formulate such a test in order to provide a technique for a multi-dimensional approach to study of concept-formation. Underwood (46) had stressed limited experimental techniques. Harlow (23), on the other hand, reviewed material from the broader base of "generalization," much of it based on animal studies, which included a greater variety of methods and materials. If the discussion were limited to humans, and particularly to concept-formation, Underwood's point seems appropriately made.

If an operational viewpoint is maintained, then Vinacke's conclusions (48) also are a propos. "Putting together all of these considerations, then, it appears that concepts should be placed in a broader, more dynamic context, than has been the case up to now. They must be regarded as selective mechanisms in the mental organization of the individual, tying together sensory impressions, thus aiding in the identification and classification of objects."

An even broader, dynamic rationale for concept-formation as forms of learning led to the construction of the present test. Various learning techniques were investigated. Generally speaking, these included: (1) spatial, manipulable material, which involved problem solving to a greater degree than learning, if tuition were excluded (Goldstein-Scheerer Tests, Ach-Vigotsky blocks, WSCT, etc.); (2) tachistoscopic studies, such as the earlier work of Hull, Heidbreder, Smoke, etc. Consideration was also given to findings relevant to the clinical groups, such as greater retention for verbal type tasks than performance. A combination of the learning necessary in the Hull-Heidbreder experiments, with performance-type tasks such as in the Goldstein-Scheerer experiments was desired. In addition, to take account of criticisms reviewed previously of concept-formation studies in clinical settings, the test should allow the greatest possible range of approach to "correct" answers, and should definitely include "rate" measurements, i.e., permit direct quantitative measurements to be made.

This led to a learning type test using non-verbal stimuli requiring some simple manipulation. It also suggested, that such a test might properly be considered, if successful, a "projective" technique of studying concept-formation.

The stimulus material evolved from simple geometrical forms. Various types of angles and curves were created in two-element figures. Complications as thickness, broken lines, direction, etc., were added. When the test was completed, however, the similarities and differences between the figures could not be immediately determined, i.e., by one or several glances. General similarity of size, constancy of broken lines, relative positions on the board, etc., made for deceptive uniformity. The pilot study quickly indicated through subject's comments and initial approaches that the task was considered often much easier than it turned out to be.

Original considerations included twelve such designs, each drawn on a two by two inch piece of cardboard which was glued to a larger sheet of cardboard. The distances between designs up and across were constant, and large enough to permit another piece of board, cut out so as to leave twelve squares, each three by three inches, for the design chips. Preliminary work with non-psychotic subjects indicated that this amount of material required too much time to learn. When the chips were reduced to nine, arranged in three horizontal and three vertical rows, when the chips were made equidistant from each other and from the borders, so that all "field" relationships were symmetrical, average and above average intelligence subjects learned the task in a reasonable length of time.

In the process of creating the designs, an effort was made to introduce more similarity among some designs than others, thus making for small groups. This organization was destroyed when the designs were reduced to nine; but a different organization of major likenesses and differences evolved, as attested to by reports of subjects. These results of the pilot study are not reviewed here, since they are amplified considerably in the "Results" section.

The material in its final form (Figure 2) resembled to some degree that of other sorting problems. The "cut-out" spaces, into which the subject had to place the design chips in order to reproduce the order on the Guidance Board, introduced a slight three dimensionality, to much greater degree involved in "pigeon-hole" apparatus (3) used in studying sorting behavior. While this three dimensional element added to the visual experience a spatial quality of depth, the depressions by their uniform distance and spacing

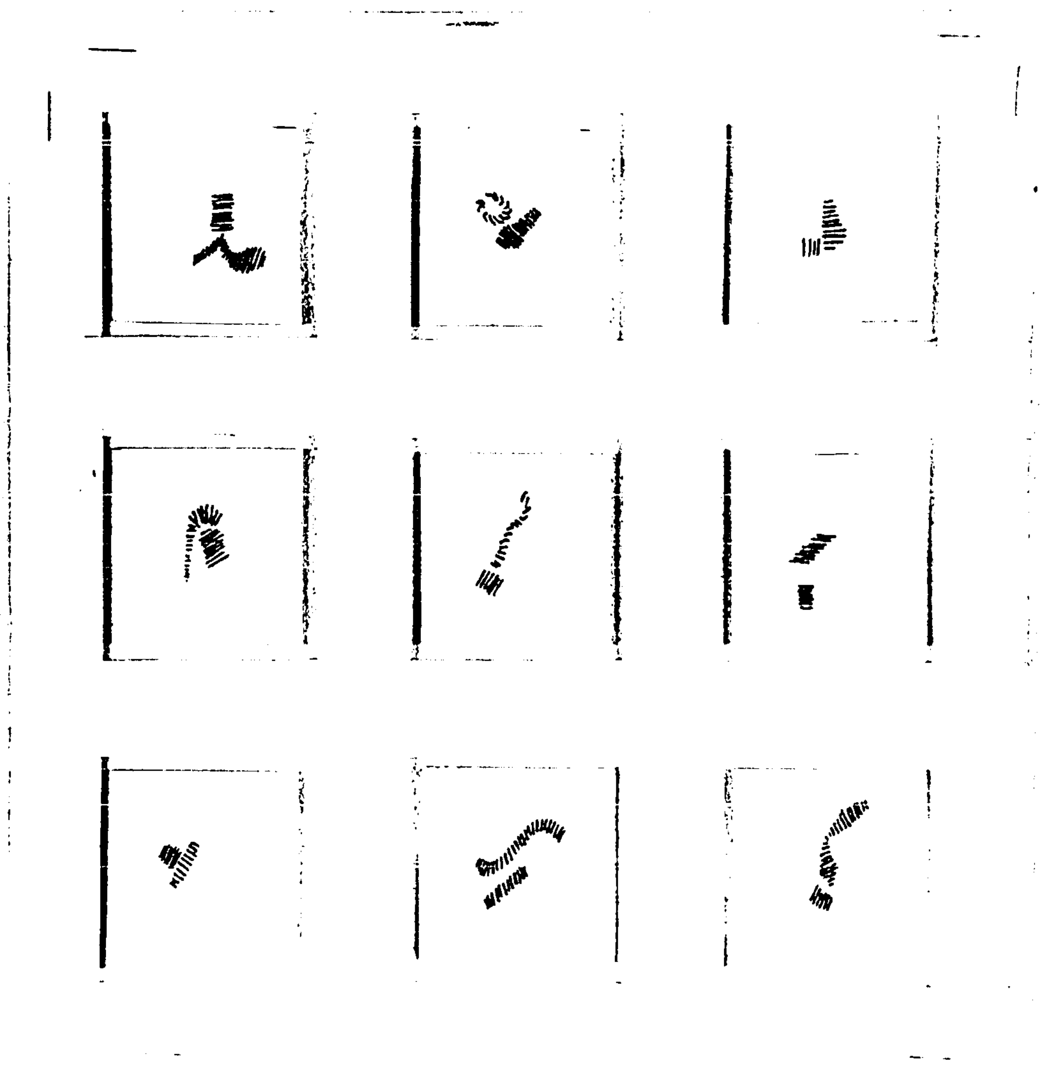

Fig. 2 Guidance board: nine designs and their positions (photograph).

introduced another overall element of similarity to the field.

From an operational viewpoint, the material involved: (1) spatial elements; (2) designs varying in degrees of similarity and dissimilarity. The task set for the subject involved reproduction from memory of the organization of these designs in a spatial field (the Guidance Board), by means of duplicate, detachable chips, containing the same designs which had to be placed on the subject's board (Learning Board). There were two logical variables involved: (1) the designs had to be perceptually distinguished and perceptually learned; (2) the position of the designs had to be learned. These could be fused in a single operation. The instructions emphasized, however, freedom to learn in any fashion, modified by an initial statement regarding "quickness" and "accuracy."

Measurement Problems

Measurement of the operations involved in learning were of two general types: (1) rate measurements (number of trials, time to learn, effort expended), which are quantitative in nature; (2) process occurrence (number, and type of concepts reported, methods of approach, etc.) which are non-quantitative.

(1) Rate measurements. Four such measurements were derived for each subject. They are:

(a) Total time, expressed in minutes, of exposure trials. By exposure trial is meant any trial during which the Guidance Board was exposed (up against the wall) for learning and the subject looked at it at least once.

(b) Total exposure time, by which is meant the summation of time for trials during which the Guidance Board was exposed for learning and the subject looked at it at least once.

(c) Total trials, which included all exposure trials, as well as memory trials (by which is meant any trial during which the Guidance Board remained face down on the table or any trial during which the Guidance Board was exposed, but the subject did not look at it at least once).

(d) Total E-G-M. E-G-M stands for eye-guidance-movements. This was a glance, made by the subject from cards held in hand, or from his Learning Board to the Guidance Board. These did not include eye-movements made by the subject from his work-cards to his work-board.

In addition to these four rate measurements, an analysis was made of the learning as indicated by successes and failures on each fourth trial, which was a Memory Trial, or any trial where the subject did not look at the Guidance Board at least once. The following problems were investigated by such analysis:

(e) Rate of acquisition for separate design elements, determining degree of difficulty for each.

(f) Degree of permanence of acquisition for design elements, or, conversely, degree or kinds of impermanence of acquisition.

(2) Qualitative Occurrences. The interview session at the conclusion of successful learning, regarding (1) how the subject learned to tell the chips apart and (2) how the subject learned to tell where the chips belonged, yielded information about type of learning, including concept-formation. The pilot study had indicated four major learning types, with various degrees of intermixture between them.

(a) Spatial Learning. By this is meant that the subject focused attention upon spatial characteristics of the field, usually in terms of rows or columns, and attempted to learn the separate designs as conditioned by their inclusiveness in the row or column. This is treated as a form of concept-formation and discussed in the results section.

(b) Inductive reasoning. This method usually involved concept-formation in the more usual sense, of a gradual appreciation, through encountering difficulties with the similarity among designs, of any one of many aspects of relationships existing between the designs. Here are included such concepts as "angularity," "curvilinearity," "size," "direction," etc. There is some reason to subdivide these categories into spatial types versus non-spatial types. The latter might include a simple numerical concept, such as number of strokes in various portions of designs.

(c) Verbalized associated imagery. By this is meant that a particular design aroused an associated image, such as "horseshoe," "circle," "L backwards," etc., and the subject used this associated image to remember the design and its position. This type of learning characterized the paranoid schizophrenic group in the pilot study. These associated images ranged from good form, in the sense of a Rorschach F+, to what seemed to be autistic-type images.

(d) Miscellaneous types. Included here are concepts such as "remainder" (where all designs had been learned except one, and this one design was placed into the only position left on the board, the subject being consciously aware of the legitmacy of such a method), sheer visual memory, etc.

These qualitative findings present certain problems for statistical manipulation. The <u>type</u> of learning observed to occur is a direct observation by the E*. The subject spread the chips on the table, or the subject did not spread chips on the table (this may be somewhat duplicated by arrangements made while holding

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*Customary abbreviations for experimenter (E) and subject (S) are used in the remainder of the paper.

the cards in the hands, when done at the start of learning). Certain difficulties might occur, however, as when a subject placed the chips in random order but later reported that he tried to learn by the row method. The observer did not see any evidence that the subject was learning in this fashion. Even more a problem of reliability were the reports of the subject concerning inductive concept-formation, where little, or no evidence of learning could be made by sheer observation of the subject. A subject reported in the pilot study that he "imagined" lines running through parts of the designs, thus connecting them and helping memorization. The problem here was the degree to which introspective reports by the subjects, after learning, could be accepted as valid data. One method for acceptance or non-acceptance of such a report, would be to accept only modal tendencies, i.e., treat reports which fell into sizeable numbers and ignore or lump all others together which were idiosyncratic. Present techniques, however, in concept-formation cannot avoid accepting such data to some degree, without sacrificing the object of the study.

There is a relationship between this problem and theoretical problems regarding central processes in thinking. The response proper, in this experiment, was often found to bear no relationship to what the subject reported "went on" in his mind during the learning.

This problem was discussed more thoroughly in the preceeding section. Observable responses were considered separately from inferred response tendencies; and this certainly added reason to the discussion of concept-formation in terms of central processes, which are inferred hypothetical concepts, than only in terms of observable behavior which might limit such concepts.

Another problem encountered was that of the subject who denied that the central processes were verbalized in nature. Some subjects reported a kind of non-verbal sign or awareness state which was verbalized only when the E asked them specifically how they had learned. A sufficient number of such cases were encountered in the pilot study to warrant a conclusion: some thinking processes are highly abstract but are not verbalized in "consciousness." Hebb (24) said of this problem: "The implication is . . . . that a concept is not unitary. Its contents may vary from one time to another, except for a central core, whose activity may dominate in arousing the system as a whole. To this dominant core, in man, a verbal tag can be attached; but the tag is not essential. The concept may function without it, and when there is a tag it may be only part of the 'fringe,' sometimes aroused with the dominant subsystem, sometimes not. . . . ." In a footnote to this opinion, Hebb added, "It seems likely that there is a great deal of conceptual activity that is unreportable (and so 'unconscious' in human thought. . . . ."

Such considerations applied particularly to those subjects who could not report any concept-formation. The subject would say, "I just tried to get a mental picture of where they go." The rapidity of learning by some of such subjects suggested that considerable fluency of central processes was involved; or that exceptional visual memory for spatially distributed design elements existed.

In the present study, then, due to complexity of the processes involved and inability to apply operational criteria to such results, the problem of verbalized or non-verbalized learning was avoided, although recognized as an important aspect of the processes studied. No attempt was made to classify the data on this basis.

The qualitative results then, were divided into logical groups, which could be operationally supported to some degree. Type of learning was more easily classified and treated statistically than reports of the subject as to how learning took place. Type of learning was primarily an observation of behaviors of the S made by E or E's assistant. Such results were treated as percentages, frequencies, etc.

Finally, an effort was made to extract relationships existing between quantitative and qualitative results, and the problem of differentiation of various groups used in the experiment.

Subjects

The subjects of this experiment were divided into three groups: paranoid schizophrenics, schizoaffective psychotics, and non-psychotics (control group). The rationale of the two clinical groups was discussed at length in the Introduction. Briefly, the following criteria applied to acceptance of a case for either clinical group.

Paranoid schizophrenics: these subjects generally had no physical abnormality, nor any disturbance of metabolic nature or circulatory system discoverable upon physical examination or laboratory reports of a routine nature. They exhibited delusions and hallucinations involving persecutory and/or grandiose elements and of varying degrees of close-knit organization. Psychological tests most often reported some thinking disturbances, such as neologisms, confabulated responses, etc. Affect was flat. Suspiciousness, negativism, verbal aggressive components could be present. No physical excited state in the sense of a catatonic excitement, or manic excitement, was present at the time the diagnosis was made. No affective elements, such as euphoria or depression were present to any great degree. No pressure, splintering of attentive processes, flight of ideas, etc., were present.

Schizoaffective psychotics: these subjects could be characterized by any of the above symptoms, included under paranoid schizophrenia, except flattened affect. They all displayed some marked affective response, such as pervading depression, mild tearfulness with mild depression, euphoria or general "happy" state. They might have had speech pressure, flightiness of ideas, etc. (which are usually associated with manic phase, manic-depressive psychosis). The greater the incidence of the latter, in conjunction with definite signs of schizophrenia such as persecutory elements, the greater was the tendency to diagnose "schizoaffective disorder."

Two major variables were in large degree controlled in this experiment. The factor of age has been considered important in at least two respects: (1) increasing age introduced an increment of psychological deficit; (2) increasing age tended to increase the incidence of other disease or process complications in the clinical groups. Women tended to appear in either clinical group as a result of the climacterium. The age range was therefore set at between 25 and 40 years of age. The decrease in performance ability has not been reported as particularly rapid during this period; this period also covered the greater number of cases seen clinically.

The factor of intelligence, as measured by Wechsler-Bellevue Intelligence Scale, Adult Forms I or II (49), was limited to Full Scale I.Q.'s between 95 and 119. Several points on the lower end, below 95, would not exclude a case, inasmuch as difficulties were encountered in filling the clinical groups, and some cases satisfactory in other respects had to be excepted for intelligence. These limits marked off average to bright normal intelligence groups, with the exception of five I.Q. points of the lower end of the average range (90 to 95). These limits were needed to insure the greatest possible degree of reality-testing of the clinical groups.

An effort was made to obtain non-psychotic subjects who had no vocational specialization in the mechanical trades. This was not entirely possible. The male control group contained a large number of subjects whose vocations involved skilled and semi-skilled visual-motor type abilities.

No effort was made to match the groups on the basis of education, marital status, sibling position, etc., all possibly significant factors in any clinical study. Enough subjects, meeting the specialized diagnostic requirements, age, and I.Q. could not be obtained who could also be controlled for the other factors mentioned.

Instructions, Recording of Data, Miscellaneous

The instructions for this experiment were generally the same as those given for the pilot study. After the necessary rapport was established, the formal instructions were given. Rapport was established differently, depending on whether the subject belonged to a clinical group or not. Clinical group patients generally were told that this test was part of a number of tests, being given to help the physicians understand the patient, the nature of the problems if the patient had problems, or establish the lack of problems. The test was not differentiated in any special way, prior to formal instructions. Control subjects, on the other hand, were informed that (1) they had been impersonally chosen as representing people who had never had head injuries, nor had been known to need psychiatric help; (2) that they were impersonally considered representative of fairly well-adjusted normal people. Such a group was needed to obtain more data concerning how certain sick people behaved in a similar situation. Not much more than this was offered as explanation or motivation. All control subjects contacted agreed to take the test and cooperated.

Formal instructions were as follows.

> This is a learning test. I want to see how quickly and accurately you can learn to do this (the Guidance Board, which had been lying on top of the Learning Board, is raised and placed against the wall). As you can see, there are nine little designs here..... and (motioning to the Learning Board) the same designs are here, in the same place (laying the Guidance Board face down on the table and starting to quickly remove the chips from the Learning Board). The only difference between the two is that these chips with the designs on them come out (start shuffling the chips as a deck of cards), and when they do, I shuffle them, mix them up, as you would a deck of cards. Then I will hand them to you and raise this board (motioning to the Guidance Board). After you have placed the last chip in the same place on your board, as it is on this one, I'll lower this board (pointing), take up the design chips, shuffle them again. We will do this until you can put all of these chips in the same place on your board(pointing) as they are on this board (pointing) without making any mistakes, <u>and without looking at this board any more to see where they belong</u>. When you can put them in correctly, twice in a row, without looking to see where they belong, we'll say that you have learned them. Now, <u>you may learn to do this any way you like</u>. <u>You may use any method of learning you want</u>. The important thing to remember is that eventually you must put your cards in the same place on your board as they are on this board, two times in a row, without looking to see where they belong. Any questions?

These instructions were progressively modified so as to reduce the problem for psychotic subjects to its simplest level. With these instructions, varied a little, but generally containing the same elements, no questions have been asked by psychotics. They understand the formal nature of the task. However, once or twice, after the first trial has started, the subject will turn to E, and ask, "Should I go ahead and put them in?" The answer was obviously, "Yes."

While shuffling the chips for the fourth trial, E said, "Now, I know that you haven't learned all these designs and where they belong yet, but you may have learned some. I am going to leave this board down, this time. See how many chips you can put into place. You may guess if you wish."

Suceeding fourth trials were prefaced merely with, "See how many you can put in correctly this time."

The majority of psychotic subjects were tested with the help of Mrs. Marguerite Howard, secretary for the Psychology Department, Longview State Hospital. The use of an additional recorder had many advantages. This recorder may be quickly trained, not only to record by special small reproductions of the design board the order of placement, but also to enter spontaneous remarks made by the subject. These were especially interesting in the psychotics, since these remarks, treated in the "Results" section, suggested in certain cases relevant similarities to organic-type catastrophic reactions. Such remarks could not be entered if only one person were recording data. Mrs. Howard also noted whether the subject selected chips, at what point this process of selection occurred, and any other unusual event taking place. The E recorded number of E-G-M, started and stopped the stop-watch, manipulated the Guidance Board up and down, removed and shuffled chips, gave instructions at the necessary points. E also conducted the interview at the end of the learning.

The subject was always motivated positively, by mild praise, such as at the end of the fourth trials, "That was well done. You had .... right." Thus, the subject was always informed of his progress, in terms of number correctly placed on these fourth trials. The subject was never given any information as to which chips had been correctly placed, nor which chips had been incorrectly placed. Such information was often asked for by the subject. The subject was also told both when he had left chips in the wrong place on Exposure Trials, as well as the number left in incorrectly.

Obviously, this relationship with the subject, and the method of fourth trial testing for learning, mild praise, continual positive encouragement, information about errors in placement on Exposure Trials, bears relationships to the results. These relationships, however, are a matter for future experimentation. An alteration in some of the proceedures could very well turn the test into an experiment on motivation, an experiment on degree of learning and degrees of tuition, etc. The present experiment held the above factors constant.

Facsimiles of the recording sheets used are shown in Figure A and B in the Appendix.

The method of the interview was as follows. After successful learning, and mild complimentation, the E said: "Now, I'd like to know how you learned to do this. How did you learn to tell the designs apart, and how did you learn where they belonged?" Various specific information is desired from the subject.

(1) Did the subject have a system of any kind, such as calling designs by their associated images, encountering difficulties in telling them apart, and after making mistakes, learning these specific designs, etc. However, extreme caution had to be used to avoid suggestion, since many of the subjects, not accustomed to introspection, and not anticipating this questioning, were not able to give much data. The general rule followed in this experiment was to avoid any positive

suggestion that might give the S a clue as to a method when he is having trouble explaining his behavior. Experience with the test, however, allowed the E to recognize certain kinds of learning helps, observed as events during the test, stored for this occasion. Such events were often the "mistake" type. S might have left chips 5 and 9 in reversed position. He was told that he had made two errors. On the next trial, he was apt to spot where he had made the errors, pay special attention to these two chips, and never confuse them again. If S did not mention profiting from mistakes, E reminded him of the event, to determine whether S remembered, and what S would say. S rarely remembered this kind of learning. Anticipating both results and discussion of results, it may be said that this is concept-formation at a basic level, often with entirely different "conscious" events reported by S as having gone on at the same time. Generally, however, no help was given to S in his effort to formulate a method of learning, beyond that mentioned above when S could report.

(2) When S could not report, certain specific questions were asked, such as: "Which ones were the hardest for you to learn?" When S answered, further inquiry was made by asking, "And why did they seem the hardest?" Then, "Which ones were easiest for you?" and "Why?"

This information was recorded by the E. Designs were always designated by numbers one through nine, beginning in the upper left hand corner, proceeding across the upper row, then second row starting from the left, then third row starting from the left. Thus, design #5 occupied the middle position on the board, design #9 the lower right hand corner.

CHAPTER V

RESULTS

Recapitulation

This study was designed to investigate a deficit in the ability of paranoid schizophrenic subjects to form concepts in a performance-type task. The association of such a loss with the disorder of paranoid schizophrenia had been one of the results found in a pilot study. The findings were considered important inasmuch as other investigators, such as Kurt Goldstein (20), had reported a similarity in behavior between certain schizophrenics and organic brain-damaged subjects. Their research showed that such subjects could not divorce themselves from a stimulus situation by means of abstract thought.

Important criticisms had been made, however, of the theory that loss in concept-formation represented "concretization" of the "abstract attitude," especially when found associated with schizophrenia and derived from qualitative results only. It was concluded that further investigation of the topic required an instrument and technique which, when applied to an investigation of processes of concept-formation, would yield quantitative as well as qualitative data.

The two general hypotheses to be tested by means of this experiment were formulated as follows: (1) the greatest loss in ability to learn, in ability to form concepts, and in speed of learning is associated with the paranoid schizophrenic group; (2) a moderate loss in these same abilities is predicted for the schizo-affective group.

Age, Intelligence, and Diagnostic Agreement

A preceeding chapter discussed the rationale of limits set for age and intelligence ranges in this experiment. Difficoulty was encountered in obtaining clinical subjects, when the adopted controls for age, intelligence, and diagnostic agreement were rigidly adhered to. Facilities of four hospitals had to be utilized. Even then, compromises had to be made in certain directions.

Complete agreement among diagnosticians could not be reached on all cases. One hospital's facilities, for example, lacked a central filing system. Individual psychiatrists had to be requested to draw up lists of subjects who they believed fitted the diagnostic descriptions provided. Such cases usually represented only one individual's diagnosis.

Of course, no lack of cases existed when the total spread of age and I.Q. were considered. Confining the required psychopathologies within limits for age and I.Q. still resulted in a shortage of cases. After considerable time had been spent in the search for cases, both ends of the age and I.Q. range were modified slightly in order to complete the goal of twenty subjects in each group.

A breakdown of the three groups of subjects for age, I.Q. and degree of diagnostic agreement is contained in Tables A, B, and C listed in the Appendix.

1. Results of diagnostic agreement. As can be seen in the appropriate tables, only six subjects could be obtained whose diagnosis of "schizoaffective psychosis" was made by all three diagnosing parties. Eleven subjects were obtained for whom the diagnosis of "paranoid schizophrenia" represented complete agreement.

Some tendency existed for a greater degree of diagnostic agreement concerning schizoaffective psychosis in males (4 males; 2 females) and paranoid schizophrenia in females (3 males; 8 females).

The general statement may be made that these two clinical groups *in toto* represent individuals who are most likely to be representative of the characteristic psychopathology being investigated. They were not all acute, new admissions, but represented, as well, treated cases whose treatment had been finished at least three months prior to testing, and who had been in the hospital during this admission not more than three years. Every effort was made not to include any cases who were being considered, in the month following testing, for convalescent status (which involved leaving the hospital as a test of recovery). All of these patients, then, represented "sick" people in varying degrees.

In terms of a "majority" diagnosis, 16 paranoid schizophrenics and 12 schizoaffective psychotics represented agreement of at least two diagnosing parties. This suggests that paranoid schizophrenia represented a somewhat simpler condition for diagnosis or that a tendency existed for making a diagnosis of paranoid schizophrenia.

2. Age differences. Frequency distributions for subjects' ages in the various groups are presented in Table D, listed in the Appendix. Frequency polygons for these distributions are found in Figure 3.

The two clinical groups split about both sides of the control group. The schizoaffective group is positively skewed, whereas the paranoid schizophrenic distribution is negatively skewed. The group of four cases in the range of 42-45 years in the schizoaffective

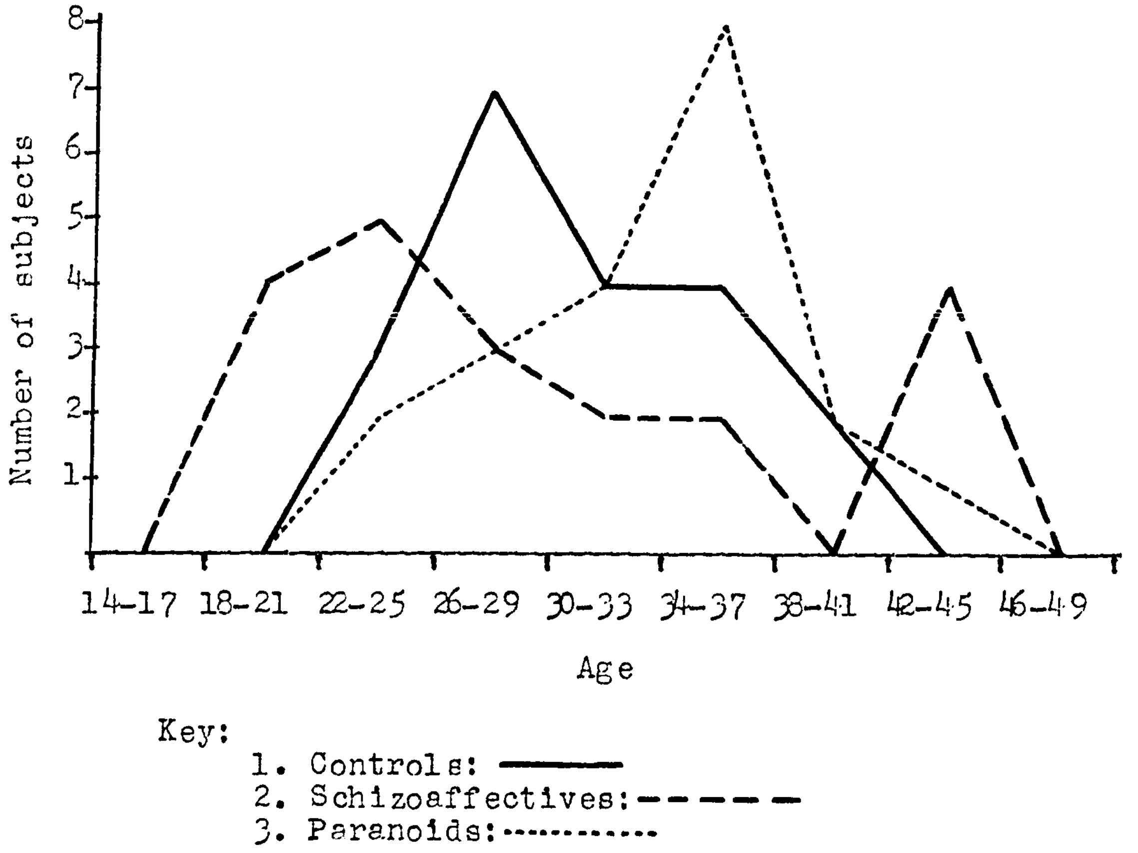

Fig. 3 Age distributions of subjects in control, schizoaffective, and paranoid schizophrenic groups.

group might suggest bimodality. Two of these four cases received only one diagnosis; one of them is a female of 43, who might have been an involutional type. Bimodality, consequently, is discounted as a characteristic of the schizoaffective group. The paranoid distribution seems to start in the range containing the mode for the schizoaffective distribution; the schizoaffective distribution tapers off in the range containing the mode of the paranoid schizophrenic distribution. It is concluded, therefore, that a characteristic of the schizoaffective group is a tendency toward greatest incidence under the age of 30 years, whereas a characteristic of the paranoid schizophrenic group is toward greatest incidence of occurrence above the age of 30.

This conclusion is effectively illustrated by Table 1 which indicates the number and proportion of

TABLE 1

CONDENSED AGE DISTRIBUTIONS AND PERCENT INCLUDED FOR THE CONTROL, TOTAL SCHIZOAFFECTIVE, MODIFIED SCHIZOAFFECTIVE, AND PARANOID SCHIZOPHRENIC GROUPS

Age Range	Control Group	Total Schizoaff. Group	Modified Schizoaff. Group	Paranoid Schiz. Group
30 or below	11 (55%)	13 (65%)	13 (81%)	5 (25%)
31 or above	9 (45%)	7 (35%)	3 (19%)	15 (75%)
Totals	20: 100%	20: 100%	16: 100%	20: 100%

each group above and below the age of 30. Two groupings of schizoaffective are given, one for the total group and the other minus the four deviate cases at the end of the distribution.

On the basis of a modified distribution for the schizoaffective group, significant differences between average ages would exist for all three groups.

A strong likelihood exists that the skewed factor in the distributions could be accounted for by the age limits set for both ends in accordance with the experimental design. The schizoaffective distribution probably extends into late adolescence; the paranoid schizophrenic distribution probably extends well into the forties. If this were so, both distributions would most likely turn out to be fairly normal ones in shape. The four deviate cases in the schizoaffective distribution have already been considered in terms of (1) representing uncertain diagnoses because of limited agreement; (2) possibility of involutional disorder being present; (3) an occasional schizoaffective type showing up at this older age. In terms, however, of tendency expressed by both modal and mean values, the distributions clearly indicated that two different age types are present, insofar as diagnosis in terms of this study are concerned. On the basis of the above considerations, the distributions were considered to derive from essentially normally distributed populations.

The hypothesis, that differences between the age distributions for the three groups represent chance

TABLE 2

MEANS, STANDARD DEVIATIONS, AND TESTS OF SIGNIFICANCE OF DIFFERENCES BETWEEN MEANS FOR AGE DISTRIBUTIONS OF CONTROL, SCHIZOAFFECTIVE, AND PARANOID SCHIZOPHRENIC GROUPS

Age Distribution	Control Group (1)	Schizo-affective Group (2)	Paranoid Schiz. Group (3)
Mean	30.9	30.1	33.9
S.D.	4.653	8.186	5.189
t_{1-3}	2.885**		
t_{2-3}	2.42*		

Numbers under t refer to numbered groups in upper line.

fluctuations of random samples from the same population, may be rejected with confidence for differences between the paranoid schizophrenic group and the control group (Table 2). The same hypothesis may be rejected with confidence at the 5% level for differences between the paranoid schizophrenic group and the schizoaffective group. Insofar as the clinical groups are concerned, there is a significant tendency for the paranoid schizophrenic group to represent older patients. If the four deviate schizoaffective cases were dropped, in favor of the general tendency existing in this group, a significant difference would exist between this group and the control group. There is a strong likelihood that such a difference does exist after consideration of cases included in the deviate group. The two clinical groups are considered, then, in addition to other factors, to be characterized by significant differences in age.

3. Intelligence differences. Frequency

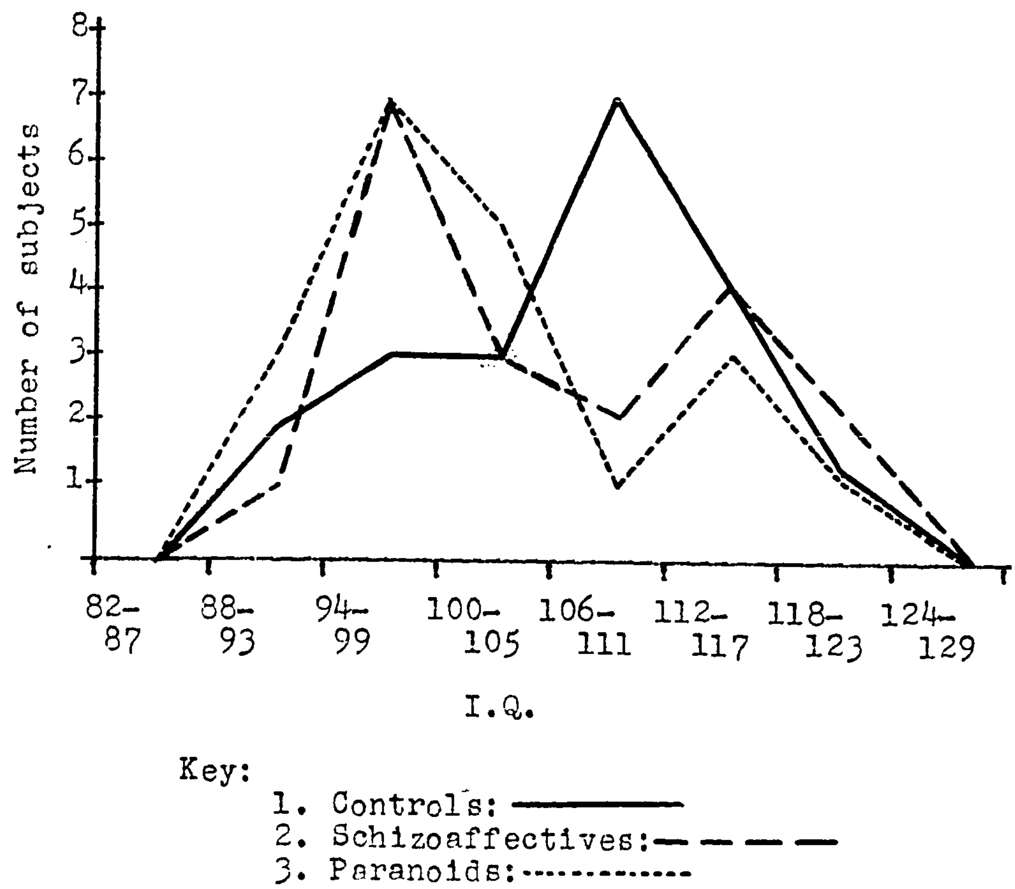

Fig. 4 I.Q. distributions for control, schizo-affective, and paranoid schizophrenic groups.

distributions for Wechsler-Bellevue Full Scale I.Q.'s are presented in Table E listed in the Appendix. The distributions are represented in frequency polygons in Figure 4.

Results contained in Table 3 verify the null hypothesis. Differences in mean I.Q.'s could represent

TABLE 3

MEANS, STANDARD DEVIATIONS, AND t TESTS OF SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS FOR I.Q. DISTRIBUTIONS OF CONTROL, SCHIZOAFFECTIVE, AND PARANOID SCHIZOPHRENIC GROUPS

I.Q.	Control Group (1)	Schizo-affective Group (2)	Paranoid Schiz. Group (3)
Mean I.Q.	106.1	105.2	102.1
S.D.	7.776	8.996	8.114
t_{1-3}	1.55		
t_{1-2}	.3321		
t_{2-3}	1.115		

Numbers under t values refer to number identifying group in top line.

chance fluctuations of random samples from a single population of such I.Q.'s, as is indicated by tests of significance of difference between means, none of which is significant. The groups, then, are considered homogeneous with respect to I.Q. distributions.

4. Summary of results: age, intelligence, and diagnostic agreement.

a) Paranoid schizophrenia represented a somewhat easier diagnostic problem in terms of agreement among different diagnosing parties than schizoaffective psychosis.

b) Agreement in diagnosis was more easily reached for female than male paranoid schizophrenics, whereas diagnostic agreement was more easily reached for male than female schizoaffective psychotics.

c) A characteristic of the schizoaffective group was a tendency toward greatest incidence of occurrence under 30 years of age. A characteristic of the paranoid schizophrenic group was toward greatest incidence of occurrence over 30 years of age.

d) The groups used in this experiment represented a homogeneous population with regard to I.Q. distributions.

Learning Methods Reported by Subjects

The analysis of the qualitative results, which are the reports of subjects concerning their learning methods, emphasized processes of concept-formation and concretization. Methods of learning related to the former were designated "spatial-type learning" and "inductive-type learning." Concretization was categorized under the heading of "discrete-type learning." These learning types were obtained by categorizing the results of Table F listed in the Appendix. This table contains all the reports of how subjects learned. Descriptions of each major category are as follows:

1. Spatial-type.

a) Whole board spatial.

b) Part board spatial. Spatial-type methods seemed to involve recognition of the spatial organization of the designs on the board into horizontal or vertical rows or occasionally into four corners. A left to right or bottom to top aspect was a corollary, and often involved a simple numeralizing even when not stated, such as "first," "second," etc. Spatial-type learning almost always involved a secondary type, which rendered designs discrete within the row or column. These other types are discussed below as "physical characteristics" and "associated-image" types.

2. Inductive type. The subject, through several trials and often as a result of recognition of errors made, seemed to become aware of similarities and differences between certain designs. Such similarities and differences were reported usually in terms of symbols for physical properties inherent in the designs. Examples of such were: (1) size, (2) direction, (3) angularity, (4) curvilinearity, (5) linearity, (6) position, etc. Numerous protocols in Table F in the Appendix substantiate the conclusion that the nature of such a method was inductive reasoning. Subject G.L. of the female control group reported at the end of the 10th trial: "It seems to be harder than at first. I know why it's so hard. I'm trying to figure out a way of learning and I haven't." Then, after learning was completed, she reported various degrees of similarity and difference between designs, such as between #5 and #9.

3. Discrete-type learning.

a) Associated image. Most subjects reported one or more of the designs in terms of an associated visual image. For example, design #7 was reported by control group female D.L.W. as "This is a camera." Design #9 "reminded me of a cat's tail." Such perceptual discrimination was very similar to that of a subject taking the Rorschach Test. Perceptual similarities to a memory image usually rendered a design discrete but seldom were found in combination with inductive types of methods. The image type, however, was associated extensively with reports of learning by the spatial-type method. An exception in the inductive group was G.L., who reported difficulty in learning designs #3, #6, and #7. She finally "figured out 3 was steps, 6 was a ladder. Steps come before a ladder." She actually contributed to the arrangement a third step not in the design.

b) Discrete physical characteristics. Some subjects recognized and learned individual designs in terms of what, for them, were outstanding physical symbol attributes. Such designs were not included in any groupings, such as were required for inclusion under "inductive" type. For example, male subject, R.A.T. of the control group said, of design #2, "circle." Control group male W.C. said, of design #6, "small part runs diagonally," the other part "runs vertically."

4. Factors relating to incomplete recall. Most subjects reported a degree of complete accounting for their learning rather than a tightly accurate picture of how they learned to place each design in its correct position. A few were able to report in the latter fashion. Many reported very little of what occurred, and these failures in recall could be grouped, if not by a subject's comment, then at least by E, under the heading of "partial recall." The factors under which incomplete recall was listed are as follows:

a) Partial recall. Partial recall primarily represented action of the E, who checked this category when a subject reported less than seven designs in terms of various learning methods. This does not necessarily imply that the subject had not used some method involving the omitted designs, but this method was not reported to E.

b) Vague explanation. Several subjects in the clinical groups reported a learning method in such vague fashion that E could not be certain S had actually used the same method reported in detail by others. Examples of such vagueness were found for spatial type learning, inductive type learning, and in other general comments.

Many subjects grouped designs #3, #6, and #7 in terms of reported similarity and difference. But subject M.L.S., in the schizoaffective female group, said of them, "I don't know what these look like. I just remembered the shapes of them." Schizoaffective female subject L.V.G. said that she had learned by horizontal rows. She did not "call" them anything. In a general way, she implied that by "shapes" she meant directional differences. Subject L.S. in the male paranoid schizophrenic group said that he concentrated on the center row. But he did this by remembering design #5, which is in the middle of the second row.

c) No recall. A few subjects were found who could not report any learning method whatsoever. A subject not included in the control group in this experiment, but tested, with an I.Q. of 120, also reported not remembering any method except just continuous looking and handling. This same subject needed only six trials in which to learn. It is possible that some subjects might possess an unusual visual memory which could account for learning without use of concepts.

d) Personalization. Instances of personalization were almost exclusively associated with the clinical groups, and even there occurred rarely and mostly in the schizoaffective group. A possible instance of it in the control group might have been the case of G.L. reported previously, in which addition of an element not at all represented in the designs or board tied together two discrete designs. Examples in the schizo-affective group were: Male, F.L., who reported learning designs #5 and #9 together because a "lot of people get mixed up. Me, I'm different. I see where they're there to trick somebody."

The addition of paranoid suspiciousness and a sort of grandiose boasting were coupled with adequate explanation of directional differences in design elements.

Other examples were female schizo-affectives L.S. and M.G. The former said of #8, "A little sea-lion. I bought a little stuffed sea-lion at the aquarium in New York. Sea-lions live at the bottom of the sea." She actually remembered the position of the design because of "bottom of the sea" and the fact that #8 was in the bottom row. Her "lucky numbers" were additional examples. M.G. saw #2 as a "jack-o-lantern," adding, "like we made in kindergarten when I was a child."

As can be seen, personalization varied from distant memory association to almost confabulation.

e) Guessing. This designation covered those cases where a subject mentioned several designs and added that they were correctly placed only by guessing where they belonged. This represented, possibly, some blocking, or other memory failure, since it would be highly unlikely that a subject could correctly place several designs only by guessing in several trials.

f) Similarity confusion. Occasionally a subject would say that he could not learn several designs because "they looked alike." This was said by control male subject E.L. of designs #6 and #8.

g) Illogical explanation. An example of this was found in L.G. in the male schizo-affective group, among others. He claimed to have used designs #3, #4, and #5 in two ways, referred to a "half-circle" "as a guide," then added that this was not used everywhere.

Distributions for the learning types and failure to account for learning are found in other sections, where the differences between groups for these criteria are statistically treated.

Concept-Formation: Differences Among the Groups

Subjects in this experiment never referred to their learning in terms of "concept-formation." A major purpose of the experimental method used was to avoid purposefully such reference, and to elicit, if possible, demonstrations of concept-formation "in the raw."

A possible source of difficulty in this connection might be the lack of agreement as to just what is a concept. In a fairly recent article, Vinacke (48), for example, said: "None of the current definitions of a concept or of concept formation is entirely satisfactory. . . ." At another point in his article, in discussing various conditions of material presentation, Vinacke (48) presented one definition of concept-formation. ". . . . is defined as the process of discovering an identifying detail, relation, or principle by means of which a series or collection of instances can be classified. . ." This definition is broader than most statements which have identified concept-formation with inductive reasoning process. Woodworth (53) headed a section in his "Experimental Psychology" with: "Induction Or Concept Formation."

Another principle, however, can be involved in concept-formation. Rapaport et al (37) wrote:

> From the point of view of logic, a concept has two variables, realm and content. To use a simile of mathematics, two types of problems can be set up, each solvable for one of the variables as an unknown. In the first problem, the realm of the concept can be given and the content is the unknown for which the problem is to be solved: as when many objectives are given, and their <u>identical</u>

> _color_ is to be discovered. In the second problem, the content is given and the realm is the unknown to be found: as when many objects are given for which only the _tools_ are to be selected. The first problem is described by logic as one requiring _induction_, and the second as one requiring _deduction_. In the first, one must reason from the actual individual cases to their common uniting principle, which should be an eminently empirical-inductive proceedure; in the second, a principle must be applied to find a result that fits it.

Another way of differentiating between these two types of formal thinking, and one that relates more to the problem at hand, might be the following:

An inductive reasoning process may occur when a high degree of similarity is present among a group of objects to which differential responses must be made and when attention is centered upon the similarity aspect. Such a conclusion is warranted from analyzing the protocols and instances in them where the subject explained the groupings made of designs.

> Control group male, W.C.: He studied the smaller element of each design, as a selective element. "If I learn the way the small ones run, the big ones come easy." Control group female, P.N.: #1, #4, and #7 designs were "similar in little lines." Control group female, V.G.: She said that she had most difficulty with designs #5 and #9, learning finally that #9 had more marks and curved to the right, "while 5 curved to the left." Etc.

The inductive process tended to be associated with a trial and error method. Using such a method the subject gradually recognized differences in the designs after grouping them by similar types. Subjects accomplished this by active search and by making mistakes.

Spatial-type learning, when it appeared, seemed to represent not only a different method, in the sense of a logical distinction, but a different psychological event. The subject approached the learning problem in terms of the total organization of the guidance board. L.S., female schizoaffective, for example, studied the guidance board for 4 minutes, then laid out the chips, and placed them row by row in the learning board. Other subjects would place the chips in randomized order for the first trial, or two, then select chips on the next trial, placing them row by row. Subjects approaching the problem in this fashion were almost always among the more rapid learners. Often this approach was combined with randomized placement. J. Hu., male control subject, used this row placement for the first three trials, then placed the chips randomly. When asked how he learned, he said, "I tried to put them in according to that order (rows)." Then he "memorized the ones that were outstanding." This would suggest that some type of spatially organized plan promoted a large initial increment of learning.

While such a method often resulted in very few learning trials, it did not proportionately reduce learning time. Subjects using the spatial-type learning were not the fastest learners.

The problem suggested was that of "trial-and-error" versus "insightful" learning. No particular advantage seemed served, however, by such a distinction, since considerable unseen trial-and-error could have been part of the "thinking" of the subject. What the spatial-type learning suggested was a skeletal deductive-type approach. The subject, first of all, seemed to attend to the entire guidance board rather than attending to the separate chips, one by one. The guidance board represented, then, a "hypothesis," in terms of its organization. Most subjects, without much overt sign of confusion, or trial-and-error searching, placed the chips in horizontal or vertical rows. This represented, it also seemed, a breaking down of the total field into related parts, within which designs were discretely recognized, or sometimes given any similarity relationship necessary to promote learning. The nature of this psychological process seemed more obscure than that of the trial-and-error method. The "lines of force" theory advanced by the Gestaltists is a possible explanation.

The important aspect of the process, however, from the viewpoint of concept-formation, seemed to be a deduction that rows of designs were only one of many <u>inherent</u> organizations of the total field. It did not seem to be an inductive concept if the emphasis upon an eminently empirical approach as formulated by Rapaport et al is followed. This latter method, as seen in this experiment, resulted in organizations of the designs based on qualities inherent in the designs rather than in their spatial organization. Only by the subject's creation of a design-based concept, such as angularity, similarities and differences, did several designs assume a "known" position. Such positions, then, were independent of any inherent organization of the spatial field.

One is tempted to inquire whether "whole" or "massed" learning is not a prerequisite for psychological processes resulting in more artificial and elaborate deductive reasoning processes, often presented as syllogisms. "Genus," seems the focus of attention at first; and "species" is differentiated, based upon "hypothesizing" about the nature of "genus."

From the viewpoint of the present experiment, then, and using the term "deductive" in the sense elaborated above, deductive reasoning also tended to occur in a problem situation where a high degree of similarity existed among elements present. It seemed to represent the result of focusing attention upon the total organization of the disparate elements initially, and of formulating a hypothesis regarding the organization of the whole field. Such hypotheses regarding the "field" in this experiment were often "rows," or "corners." Hypotheses, often, were equivalent to "schemas," and the designs were individualized in various ways within the schema, which "held" them together. Such a learning method resembled in some ways the discussion and suggestions regarding thinking advanced by Wertheimer (52).

Spatial-type learning, therefore, was considered a tendency toward formal deductive type reasoning. Grouping of designs based upon similarities and differences inherent in the designs was considered a tendency toward formal inductive reasoning.

1. Tests of differences in multiple-learning methods reported by groups. Tables G, H, and I, in the Appendix, list the incidence of deductive and inductive concept-formation types in terms of number of subjects reporting such methods. Additionally listed in these tables are two other categories, "Discrete (associated with deductive)" and "Discrete (not associated with a concept)." "Concept" in the latter category refers to a major inductive or deductive type. The former category "(associated with deductive)" represented the additional

method for individualizing designs often associated with an overall spatial type learning. For example, female control subject D.L.W. learned, she reported, by using a horizontal row method. She individualized designs in the first two rows by elements of designs which she associated with numbers, and by other concretizations for the last row.

#1: "Figured this as 1."
#2: "This had two objects so I used this as 2."
#3: "This I used as bottom part of 3."
#4: "Used as 4. This was hardest, I think. Confused with 3."
#5: "This I just knew went in the middle."
#6: "This had six lines down at the bottom."
#7: "This is a camera."
#8: "This had two lines."
#9: "Reminded me of a cat's tail."

Concretization of responses is represented by mainly the "Discrete (not associated with a concept)" category. These are dealt with in greater detail in another section.

Two different factors were tested with regard to learning types reported. Did the average of learning types differ among sections of the three groups <u>reporting</u> learning types? For example, the tabulation by categories of reports of inductive type learning (Tables J, K, and L, listed in the Appendix) indicated that 12 subjects reported 19 instances in the paranoid schizophrenic group, 14 subjects reported 26 instances in the control group, and 6 subjects reported 10 instances in the schizoaffective group. The average number of methods reported for these same groups are 1.58 (paranoid schizophrenic group), 1.86 (control group), and 1.67 (schizoaffective group). The differences seem small enough to be negligible, but tests were conducted to determine this conclusion.

The second factor related to the degree to which a group included reporting subjects. For this same criterion of learning, inductive type concept-formation, the following differences in numbers of each group reporting or not reporting inductive-type groupings were as follows:

TABLE 4

NUMBER OF SUBJECTS IN EACH GROUP REPORTING USE OF INDUCTIVE LEARNING METHODS AND NUMBER NOT REPORTING SUCH METHODS

Type of Report	Control Group	Schizo-affective Group	Paranoid Schiz. Group
Reporting Inductive Groupings	14	6	12
Not Reporting Inductive Groupings	6	14	8

Both the control and paranoid schizophrenic groups are represented by at least twice as many reporting subjects as the schizoaffective group.

The results indicate that each group is characterized by different percentages of persons who report inductive learning methods. The populations are not radically different, in that any one has <u>all</u> subjects reporting, or <u>no</u> subjects reporting.

Are differences between these groups real differences which characterize the groups, or could the differences represent chance fluctuations arising from random sampling from the same population?

Tables G, H, and I in the Appendix list the number of learning methods each subject in each group reported he used in learning. Each of the clinical groups had about the same number of subjects who could report some method of learning. The major difference between the groups was not in the number of subjects who could report learning but in the number of learning methods each subject reported. This is demonstrated by the averages reported in Table 5. These averages reflect the diversity of learning methods of reporting subjects in each group. Control group reporting subjects had the greatest diversity of learning methods. The schizo-affective group reporting subjects had the least diversity of learning method.

The predictions made from the experimental hypothesis, however, were that the paranoid schizophrenic reporting subjects would show the least diversity of learning method. "Ability," as a predicted characteristic of reporting control group subjects for degree of diversity of learning, is validated. But the remainder of the experimental hypothesis is invalidated.*

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*Properly speaking, the hypothesis being tested with a one-tailed test of significance is the experimental hypothesis quite literally. The statistical hypothesis only poses a null hypothesis for predicted differences in the direction signified by the experimental hypothesis. Since differences were rarely found in the direction predicted by the complete experimental hypothesis, statistical tests of them could not be made. If the schizo-affective and paranoid schizophrenic groups had tended to resemble each other fairly closely, a two-tailed test would be appropriate. In the qualitative results, the schizo-affective group always did less well than the paranoid schizophrenic group, and occasionally to the extent of critical differences between them. The schizoaffective group always did less well than the control group, and more often than not, to the extent of critical differences between them. The use, then, of one-tailed significance tests, stems from empirical examination of the data, rather than validation of a theoretical position taken in terms of pre-determined hypothesis, since the latter are invalidated to some degree by mere examination of the data. A one-tailed test for empirical determination of results is considered more appropriate than a two-tailed, since the latter would tend to ignore the directional character of the obtained results, and set a falsely high difference standard.

TABLE 5

RESULTS OF ANALYSIS OF DIFFERENCES BETWEEN GROUPS FOR SUBJECTS REPORTING ONE OR MORE LEARNING METHODS.

Multiple-type Learning in Reporting Subjects	Control Group (1)	Schizo-affective Group (2)	Paranoid Schiz. Group (3)
Total Number of Reports	48	31	37
Number of Subjects Reporting	20	17	18
Mean Number of Reports	2.4	1.82	2.06
t_{1-2}	1.865*		
t_{1-3}	1.344		
t_{2-3}	.779		

Numbers in top line refer to identification of groups in t test.

Table 5 indicates that the difference between the control and the schizoaffective groups was significant at the 5% point (35 d.f.). Such a difference in the direction indicated could occur less than five times in a hundred by chance alone. The difference between the control and the paranoid schizophrenic groups was significant at about the 10% point (36 d.f.). Such a difference could occur by chance alone in the direction indicated not more than about ten times in a hundred. This degree of probability, in a study primarily exploratory, is regarded as a definite trend toward significance.

The experimental hypothesis, that the control group subjects represented "ability" and the clinical group subjects loss of ability for reporting use of multiple-type learning, is validated. The predicted difference in degree of loss was invalidated. No significant differences existed between the schizoaffective and paranoid schizophrenic groups.

Analysis of the results indicated:

a) All groups had many subjects reporting more than one method of learning. Differences between groups were matters of degree rather than kind.

b) The control group was significantly characterized as having ability to report multiple methods of learning.

c) Subjects of both clinical groups showed a loss of ability for reported use of multiple learning methods. The experimental hypothesis, however, was invalidated for predicted direction of degree of loss.

d) The two types of schizophrenia are associated with a reduction in number of multiple learning methods reported used during the learning of this task.

<u>2. Factors involved in failures to account for learning.</u> Tables J, K, and L, listed in the Appendix, itemize for subject and group the failures to account for learning. As was previously mentioned, "partial recall" entries were made by E when S failed to account for three or more designs in reporting learning methods. Otherwise, the categories listed in these tables represent behaviors of some type of the S's.

As may be seen in Table 6, the average number of entries for failure in recall for each group was approximately the same. The important aspect of Table J, listed in the Appendix, is the absence in the control group of pathological-type entries ("no recall," "personalization," and "illogical explanation"). Translated into percentages, the following figures indicate that, with respect to reflecting pathological behavior, the schizoaffective group tends to have greater

TABLE 6

SUMMARY OF TOTALS, SUBJECTS, AND AVERAGES OF FAILURE TO ACCOUNT FOR LEARNING IN THE THREE GROUPS (TABLES J, K, AND L OF THE APPENDIX)

Failure to Account For Learning	Control Group	Schizo-affective Group	Paranoid Schiz. Group
Number of Subjects Listed	7	11	10
Total Number of Entries	11	16	14
Average Number of Entries	1.57	1.45	1.40

representation than the paranoid schizophrenic group:

27% of the paranoid schizophrenics represented in the "Failure to account for learning" group produced 29% of the responses contained in 5, 6, and 7 of Table L.

50% of the schizoaffectives represented in the "Failure to account for learning" group produced 44% of the responses contained in 5, 6, and 7 of Table K.

Percentages here, while they indicate clearly the greater pathology associated with "reporting behavior" in the clinical groups, represented actually rather small numbers of cases. Conclusions regarding the significance of these percentages are considered as tentative and directional. Such conclusions are: (1) the schizoaffective group tended to reflect a greater degree of psychopathology during learning than did paranoid schizophrenic subjects. Such a trend would tend to invalidate the predictions of the experimental hypotheses insofar as they relate to overt demonstrations of psychosis during learning.

3. Inductive-type learning. A distinction must be made between what was reported after learning had been finished and what ocurred during the learning itself. An analysis of aspects of learning reported in a later section indicated a high degree of probability that the schizoaffective group generally learned during their performance in the same fashion as the control group. The factors involved in reporting learning methods after the completion of the task involved differences between the two groups. These distinctions are stressed in connection with the following analysis of reports of use of inductive-type learning.

"Ability to report" use of inductive-type concepts was investigated in terms of (1) productivity of subjects in each group who reported its use, and (2) in terms of the number of such subjects in each group.

With respect to (1) above, it was hypothesized that psychosis might exercise an inhibiting effect on quantity of formulations made. In terms of the experimental hypotheses, predictions were: (1) the control subjects who reported using inductive concepts in learning would report the greatest number; (2) schizo-affective subjects who reported using inductive concepts in learning would report an average number; (3) paranoid schizophrenic subjects who reported using inductive concepts in learning would report the fewest number.

With respect to (2) above (number of such subjects in each group) it was hypothesized that the three groups might differ in terms of number of subjects who could report at all the use of inductive concepts. In terms of the experimental hypotheses, predictions were: (1) the control group would have the greatest number of subjects reporting use of inductive concepts during learning; (2) the schizoaffective group would have an average number of subjects reporting use of inductive concepts during learning; (3) the paranoid schizophrenic group would have the fewest subjects reporting use of inductive concepts during learning.

Only inductive-type learning reports including both similarity and difference concepts were listed in the tables. By this is meant, that to the greatest degree possible an effort was made to include reports which not only implied or definitely stated that grouping of designs was based on similarities, but which also grouped the designs on the basis of some concept which accounted for differences among them. For example, the most frequently reported similarity group was that of designs 5 and 9, based on their curvilinear likeness. The most frequently reported difference concept was that of the direction which part of the curves took, one going to the left, the other to the right.

The requirement that some degree of similarity and difference both be present was based on the discussion by Hebb (24) regarding the matter of "Identity" in perception.

> An irregular mass of color or a pattern of intersecting lines drawn at random has some coherence and unity, but one such figure is not readily recognized and distinguished from others when it is seen a second time, and generalization (or similarity) is not selective among a number of such stimuli. There is not a total lack of distinctiveness and of generalization, however. Two of Thorndike's figures which lack identity are not distinguishable when seen together; and mistaking one figure for another can be called generalization. Lashley and Wade (1946) distinguish between the "so-called generalization" which means only a failure to observe differences and the generalization which involves perception of both similarities and differences. The amorphous figure, lacking in identity, is generalized in the first sense only.

Similarities without differences were reported

TABLE 7

NUMBER OF ONLY SIMILARITY-TYPE CONCEPTS REPORTED

Similarity-type Grouping	Control Group	Schizo-affective Group	Paranoid Schiz. Group
Number of Similarity-type	12	5	6

by subjects. The difficulty in this matter was to determine precisely when a similarity probably implied a difference. Table 7 lists the numbers of reported similarities without reported differences for the various groups.

TABLE 8

SUMMARY OF INCIDENCE OF INDUCTIVE-TYPE LEARNING FOR THE THREE GROUPS, LISTED IN FULL IN TABLES M, N, AND O IN THE APPENDIX

Inductive-type Learning	Control Group	Schizo-affective Group	Paranoid Schiz. Group
Total Number of Subjects Reporting use of Inductive-type	14	6	12
Total Number of Instances	26	10	19

The categories into which the inductive-type learning reports were separated, the tabulation by subject and by group, are listed in Tables M, N, and O in the Appendix. A summary of these tables is found listed in Table 8.

a) Productivity in reported use of inductive concepts during learning. Table 9 indicates the results of statistical analysis of the

TABLE 9

MEANS AND TESTS OF SIGNIFICANCE BETWEEN MEANS FOR DISTRIBUTIONS OF INDUCTIVE-TYPE CONCEPTS FROM REPORTING SUBJECTS IN THE THREE GROUPS (USING 1 AND 5% POINTS FOR t)

Inductive-type Concept	Control Group (1)	Schizo-affective Group (2)	Paranoid Schiz. Group (3)
Mean	1.86	1.67	1.58
t_{1-3}	1.0646		
t_{1-2}	.5000		
t_{2-3}	.2885		

Numbers under t refer to numbered groups above.

productivity in reported use of inductive concepts during learning. The average number produced per reporting subject in each group may be seen to differ very little. Tests of significance for differences between these means indicated that all differences could be accounted for by chance fluctuations in random samples from the same population. The differences were not significant above the 10% point (which is being used as a "base-line" for trends to significance in this exploratory study).

It is concluded, therefore, that clinical group subjects who reported use of inductive concepts in learning were not distinguished from control group subjects in terms of number of concepts produced. The experimental hypothesis related to degree of productivity to be expected from each reporting group of subjects was invalidated.

b) Number of subjects reporting concept-formation in each group. It is obvious, from a glance at Table 10, that the effect of psychosis in the clinical groups on concept-formation is most apparent in terms of its reported occurrence and reported

TABLE 10

TOTALS OF SUBJECTS REPORTING OCCURRENCE AND SUBJECTS NOT REPORTING OCCURRENCE IN EACH GROUP OF INDUCTIVE-TYPE CONCEPT FORMATION AND CHI-SQUARE TESTS FOR PROBABILITY THAT THESE DISTRIBUTIONS REPRESENT RANDOM SAMPLES FROM A COMMON POPULATION

Inductive Concept-type	Control Group (1)	Schizo-affective Group (2)	Paranoid Schiz. Group (3)
Reporting Occurrence	14	6	12
Not Reporting Occurrence	6	14	8
Total Number In Group	20	20	20
χ^2_{1-3}	.427		
χ^2_{1-2}	5.000*		
χ^2_{2-3}	2.525		

Numbers under χ^2 refer to numbered groups in upper line.

non-occurrence. Most striking differences are found, but not in the direction predicted by the experimental hypothesis. The schizoaffective subjects, not paranoid subjects, show the greatest loss. The control and paranoid schizophrenic groups both have at least twice as many subjects reporting use of inductive concepts during learning as does the schizoaffective group. The significance of this difference is represented by results of a chi-square test for degree of probability that the obtained distributions represent random samples from the same population.

Testing this hypothesis for distribution differences between the control and schizo-affective groups, a probability of less than 5% is found that such obtained distributions represent chance fluctuations in random samples from the same population. The null hypothesis may be rejected and the differences are regarded as between "significant" and "highly significant."

The chi-square obtained for distribution differences between the paranoid schizo-phrenic group and the schizoaffective group does not represent a test of the experimental hypotheses. The predicted difference here was invalidated by mere inspection of the results. The difference associated with empirical examination of the data is significant at about the 10% point of probability, indicating that such differences in distribution could be found about 10 times in a hundred in this direction by chance alone. A probability obtained at about the 10% level was regarded, while not significant, as indicating a trend toward significance.

It is concluded, therefore, that of the three groups studied, the schizo-affective group contained considerable fewer subjects able to report use of inductive concepts in learning. Both the control and paranoid schizophrenic groups contained at least twice as many reporting subjects as were found in the schizo-affective group.

4. Discrete-type learning (concretization). The two categories represented in discrete-type learning are "image-type" and "physical characteristic type." (Listed in Tables P, Q, and R in the Appendix.)

Several matters of interest are contained in Table 11. The number of subjects reporting discrete-type

TABLE 11

RESULTS OF ANALYSIS OF GROUP DIFFERENCES FOR REPORTING OF DISCRETE-TYPE (CONCRETIZATION) LEARNING

Discrete-type Learning	Control Group (1)	Schizo-affective Group (2)	Paranoid Schiz. Group (3)
Number of Instances Reported	47	60	54
Number of Reporting Subjects	15	13	15
Average Number per Reporting Subject	3.13	4.62	3.60
t_{1-2}	1.352		
t_{1-3}	.618		
t_{2-3}	1.085		

Numbers under t refer to numbered groups in upper line.

learning in the three groups obviously does not involve the same patterning as was found in distributions of reported use of inductive concepts for learning. All groups seem to share about equally in terms of numbers of subjects reporting a concretized type of learning.

The difference in means in Table 11 are not significant at either the 5% or 1% point. The difference between the control group and the schizoaffective group was significant at the 10% point, which has been regarded in this study as indicating a trend toward significance and the tentative rejection of the null hypothesis. The difference between the paranoid schizophrenic group and the schizoaffective group was significant at the 15% point.

This last difference could not be considered a trend toward significance. It takes its place, however, in an important constellation of results which are descriptive of the "abstract" and "concrete attitude." The concrete attitude was reported by Goldstein (20) as characteristic of the behavior of schizophrenics resembling organic brain-damaged cases. The qualitative results associated with the concrete attitude were those associated with the schizoaffective group. It is therefore concluded that the schizoaffective group resembled the organic brain-damaged type of schizophrenic. The major hypothesis that the paranoid schizophrenic would resemble the organic brain-damaged type of schizophrenic is invalidated.

<u>5. Summary of results: analysis of reported learning methods.</u>

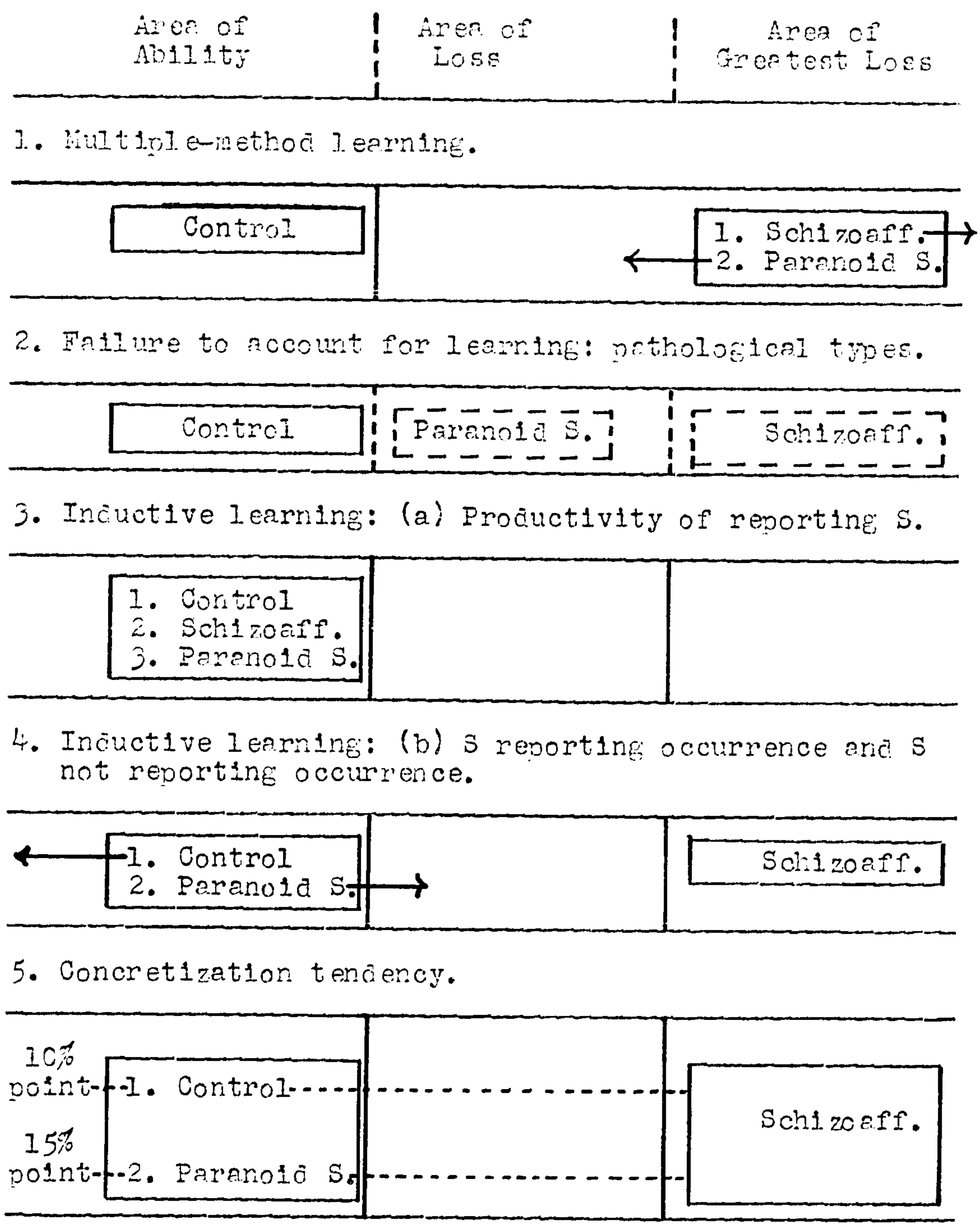
a) Learning methods reported by subjects.

(1) Learning methods reported by subjects were categorized into (1) spatial-type, (2) inductive-type, (3) discrete-type, and (4) factors relating to incomplete recall of learning.

b) Concept-formation.

(1) Inductive-type learning tended to be associated with a trial and error method. The subject gradually recognized differences in stimuli after initial awareness of similarity. Recognition of differences was aided by active search and making mistakes. Grouping of designs, based upon similarities and differences inherent in the designs, was considered a tendency toward formal inductive reasoning.

(2) Spatial-type learning was associated mostly with "whole" or "massed" learning methods. It seemed to involve formation of a hypothesis or deduction regarding the spatial



Arrows indicate direction of results; dotted lines indicate that no significance tests were made.

Fig. 5 Analysis of results obtained among groups for "Ability to Report Learning."

distribution of the whole field of stimuli. Spatial-type learning was considered a tendency toward formal deductive reasoning.

c) Concrete types.

(1) Two concrete types were found: (1) visual image associations; (2) physical description of the design.

d) Testing of experimental hypotheses, qualitative data.

(1) Reporting of multiple learning methods.

(a) All groups had many subjects reporting more than one method of learning. Differences between groups were matters of degree rather than kind.

(b) The control group was significantly characterized as having "ability" in terms of number of methods reported used during learning.

(c) Both clinical groups reported fewer methods used during learning than the control group. The experimental hypothesis, however, was invalidated for predicted differences between the schizoaffective and paranoid schizophrenic groups.

(2) Psychopathology associated with learning behavior.

(a) The schizoaffective group tended to reflect a greater degree of psychopathology during learning than did paranoid schizophrenic subjects. Such a trend would tend to invalidate the predictions of the experimental hypothesis insofar as they related to overt demonstrations of bizarre behavior during learning.

(3) Inductive-type learning: productivity.

(a) Subjects in the three groups who reported using inductive concepts during learning produced approximately the same average number of inductive concepts.

(b) The experimental hypothesis related to productivity to be expected from each group of reporting subjects was invalidated.

(4) Inductive-type learning: Reported occurrence and non-occurrence.

(a) The schizoaffective group contained significantly fewer subjects who were able to report use of inductive concepts in learning than the control group.

(b) The paranoid schizophrenic and control groups contained a similar number of subjects who reported the use of inductive concepts in learning.

(c) The experimental hypothesis pertaining to this area was invalidated.

(5) Discrete-type learning (concretization).

(a) All groups reported substantial numbers of discrete-type associations to designs.

(b) The experimental hypothesis

was invalidated. Only the schizoaffective group indicated a tendency to concretization of thinking.

Rate of Learning Measurements

Four measures were obtained by which the groups could be compared with respect to rate and process of learning.

1. Descriptive analysis of rate measurements. The question may be asked why several indices of rate of learning were used, instead of one, such as trials, or time. The pilot study had indicated the possibility that several of these rate measurements reflected different aspects of the subject's total effort. Some subjects were encountered who seemed extremely unsure of themselves and of their ability to learn this task. Initially, such subjects were control group persons. In learning, they seemed unable to free themselves of looking at the guidance board and to run the risk of making a mistake. Such subjects might occasionally show a large total e-g-m, and a large total time. Other subjects seemed to be rapid and somewhat frenzied "lookers." Their total time did not reflect the rapid checking back and forth which characterized their learning. Other subjects

seemed to depend upon a sort of "getting it eventually" attitude, which reflected itself in a large total for trials, but relatively small learning time.

In the pilot study, the subject worked consistently to the point where of his own volition he stopped looking at the guidance board, or requested E to leave it face down while he tried to place designs correctly. When working with paranoid schizophrenic subjects, E often found the patient at the 50th or 60th trial still trying to learn at the same rate as about the 20th trial. When E had kept the guidance board down and asked S to try to put the designs in correctly, S often required only two or three more trials in order to meet criteria for "learning" (two correct placements without looking). Some paranoid subjects, therefore were found who had what might be called <u>perseveration of effort</u>, behind which lay a good deal of unexpressed learning.

Since interest did not reside in the volitional elements of the psychosis primarily, but in expressible degree of learning, the method of keeping the board unexposed on each fourth trial was adopted. Such a method amounted to tuition. E told S how many designs were correctly placed. Control subjects seemed almost always to recognize immediately which designs had been placed incorrectly.

The method of 4th trial unexposed guidance board, then, was intended primarily to prevent a situation among clinical subjects where perseveration of effort concealed considerable learning. It represented an amount of tuition just short of complete guidance, which would have been telling S which designs he had been placing incorrectly. The experiment was designed, therefore, to reveal maximum degree of learning.

a) Exposure board time: Total of time spent in learning during trials when the guidance board was exposed represented time spent in not only looking at the board (studying it or just automatic glancing) but also in motor movements of placing or changing the designs.

b) E-g-m: Successful learning was defined for the subject as correct design placement without visual reference to the guidance board. A number of curves of e-g-m by trials were made for control subjects. Each three trials were averaged, and averaged points were connected. Each fourth trial was plotted for number of correct designs placed. A series of these curves is contained in the Appendix as Figure C through Figure H.

Several important considerations are attached to these curves. Those for control subject G.L. (female) are presented in Figure 6, and serve as an example of the tendencies expressed in most of the control group.

E-G-M

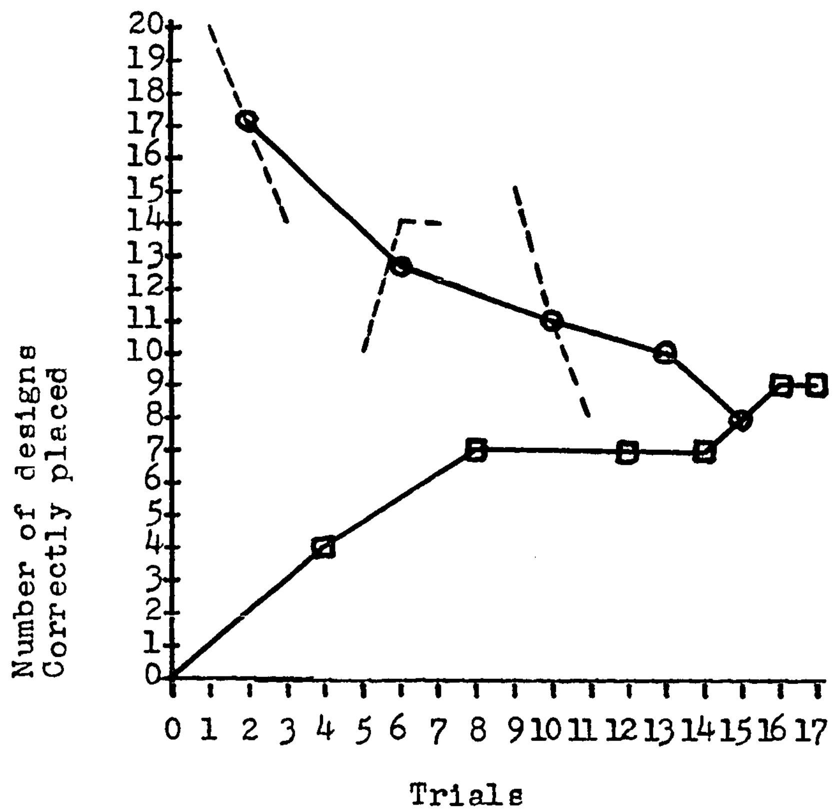


Fig. 6 Curves for e-g-m (expressed as averages of three exposed board trials) in upper line, and curve for total correct design placements on every fourth trial in lower line (control subject, female, G.L.).

These curves generally are reciprocals of each other. When the e-g-m curve drops, the number correct curve rises.

A tendency to a plateau in one is found in the other. The relative degree of rise, or speed of acquisition, measured by number correct curve, is paralleled by the degree of drop in the e-g-m curve.

Both of these curves are S shaped. the general tendency for most of the curves plotted for various control group subjects was for S shaped reciprocal curves. This tends to validate the Thurston hypothesis that learning is a process best described by an S shaped curve. The early negative acceleration of the e-g-m curve is matched by early positive acceleration in the number-correct curve. The acceleration is then reversed in kind for these two measurements. This may be translated into learning terms as follows:

Approximately the first third of the time spent in learning by the subject tended to result in acquisition of the greater amount of material to be learned. A plateau-like period followed, representing either consolidation of the previous learning, or a period of difficulty for acquiring the remainder of the material to be learned. The latter hypothesis seemed more likely in this case, since the number correct curve rises sharply from the plateau point to successful learning.

The hypothesis can be checked by graphical representation of the relationship between fixation of a design in memory and the trial at which this occurred.

Figure 7 indicates that subject G.L. learned to place correctly design 1 by the 12th trial, design 2 by the 4th trial, design 3 by the 16th trial, etc. It is interesting to note that on the 4th trial, the designs 2, 5, 8, and 9 were learned. On the 8th trial, the subject correctly placed designs 2, 3, 5, 6, 7, 8, and 9. These show up in Figure 7 as 7 correct placements. But by reference again to Figure 6, only designs 2, 5, 7, 8, and 9 had been <u>fixated</u> in learning. Correct placement, then, did not indicate learning, as measured in terms of successful retention. However, on the 12th trial, the subject correctly placed seven designs, all of

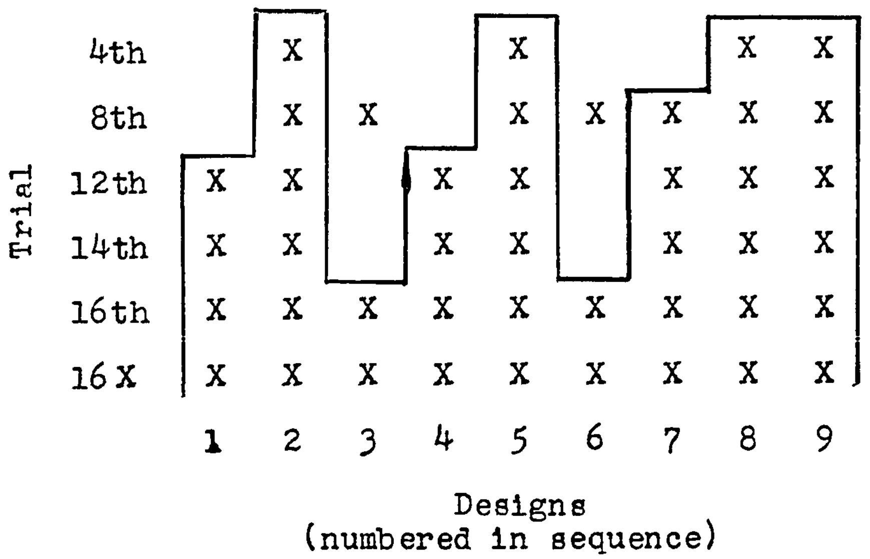


Fig. 7 Learning of designs, expressed by trial in which design was correctly placed, and from which point it was successively correctly placed ("X" represents correct design placement) (control subject, female, G.L.).

which were also fixated at this point in learning. The difficulty hypothesis, as accounting for the plateau, only partially explains it. The early portion of the plateau represents consolidation of some learning, but also expresses what were "chance" successes in placement of some designs. The latter part of the plateau represents the period of trying to incorporate the most difficult designs into whatever learning system the subject had used.

What was this system for this subject?

At the end of the 10th trial, she said (recorded by E): "It seems to be harder than at first. I know why it's hard. I'm trying to figure out a way of learning and I haven't." At the end of the test, when asked how she had learned, she gave the following account.

"The first one I learned is (number 2) the circle." She learned 5 and 9 next, calling 5 "the straight one" and 9 "the curled one." 1 and 4 "looked similar." They "went up and down." She had most trouble with 3, 6, and 7. She finally "figured out that (3) were steps and (6) was a ladder. The steps came before the ladder." 7 was learned by both an elimination idea and by the fact that it went in a corner.

The relationship between such a report of learning and the observations possible for checking the report indicated fair similitude. Generally speaking and discussed in greater detail elswhere, the designs which a control subject learned first tended to represent some vivid concrete visual association. Concept-type learning tended to occur, most likely, at the points where learning to differentiate between the designs represented a repeated difficulty.

The relationships, then, between e-g-m and learning seemed those of several stages.

The first seemed to be a stage of moderate to rapid drop in average number of e-g-m per three trials. Evidence indicated that during this period, S learned designs which aroused specific concrete associated images. Possibly groups of designs were forming into stable conceptually organized units.

The second stage represented a period of relatively little decrease in e-g-m, or one in which the decrease was spread out in time. During this period certain concepts and their equivalent designs were learned but other designs which held most difficulty for learning had not been successfully grouped and conceptualized.

The third, and final stage, represented

a sharp reduction (by extrapolation) in e-g-m. The most difficult designs were learned and the whole schema of learning now resulted in success.

More broadly phrased, the e-g-m reflected the degree to, and rate at, which the stimulus field became organized in terms of permanent and reliable motor responses.

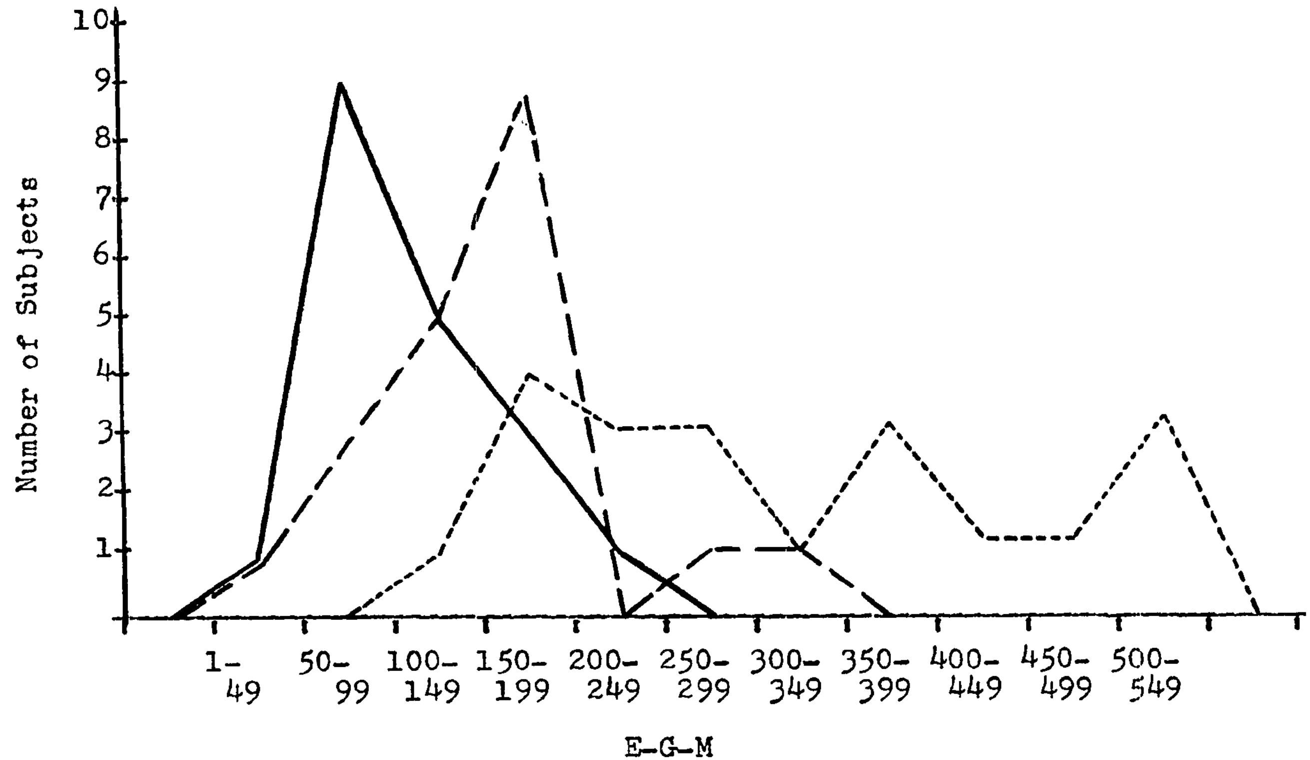
c) Total time: Total time, while included in Tables S, T, and U, in the Appendix, was not included in the statistical study of rate of learning measurements. The major reason for excluding this item was its tendency to reflect aspects of the learning process not systematically recorded by E. By this is meant, that many subjects spent endless seconds during an unexposed-board trial in debating whether they were remembering correctly or not. Others, who had spent considerable seconds during learning trials so that this effort was characteristic of them, would place design chips on a 4th trial quite rapidly and often without reflection. The experiment was not designed to either record or take account of such variables introduced into the total effort. No doubt they are important personality aspects of the individuals, but they could not be accounted for.

d) Total trials. Total trials were considered another aspect of the learning process not adequately covered by the exposure-time measurement or by e-g-m. Not all subjects used every three blocks of trials toward the end of their learning. Some volunteered to try placing the chips on other than 4th trials. In the case of L.G., a schizoaffective male subject, this amounted to lack of insight, since he kept trying to "guess" which designs he had incorrectly placed by asking that the board be kept down, and then turning to E for corroboration that at last he had put them all in correctly.

Total trials often reflected an attitude, of S toward the way to learn. Subjects were quite aware of the fact that E kept records, and often they were in competition with the unseen group they represented. They frequently asked how they were doing, and whether everybody else took as long to learn as they did. Most of the control subjects, and quite a few of the clinical subjects, indicated by such remarks that "spacing" of effort was part of their total goal. Particularly was this true of several subjects who used a "whole" method of learning, i.e., using a spatial (deductive) concept approach. Their objective seemed to be accomplishing the task in as few trials as they could. They often lost sight of the fact that each trial represented more time than if they were to space their effort in time. Such a case is that of L.S., in the female schizoaffective group.

2. Frequency distributions. Raw scores for e-g-m, total trials, and exposed-board learning time are listed for subjects by groups in Tables S, T, and U in the Appendix.

Frequency distributions of e-g-m, exposed-board learning time, and total trials for the three groups are listed in Tables V, W, and X in the Appendix. Frequency



Key:
Control Group:
Schizoaffective Group:
Paranoid Schizophrenic Group:

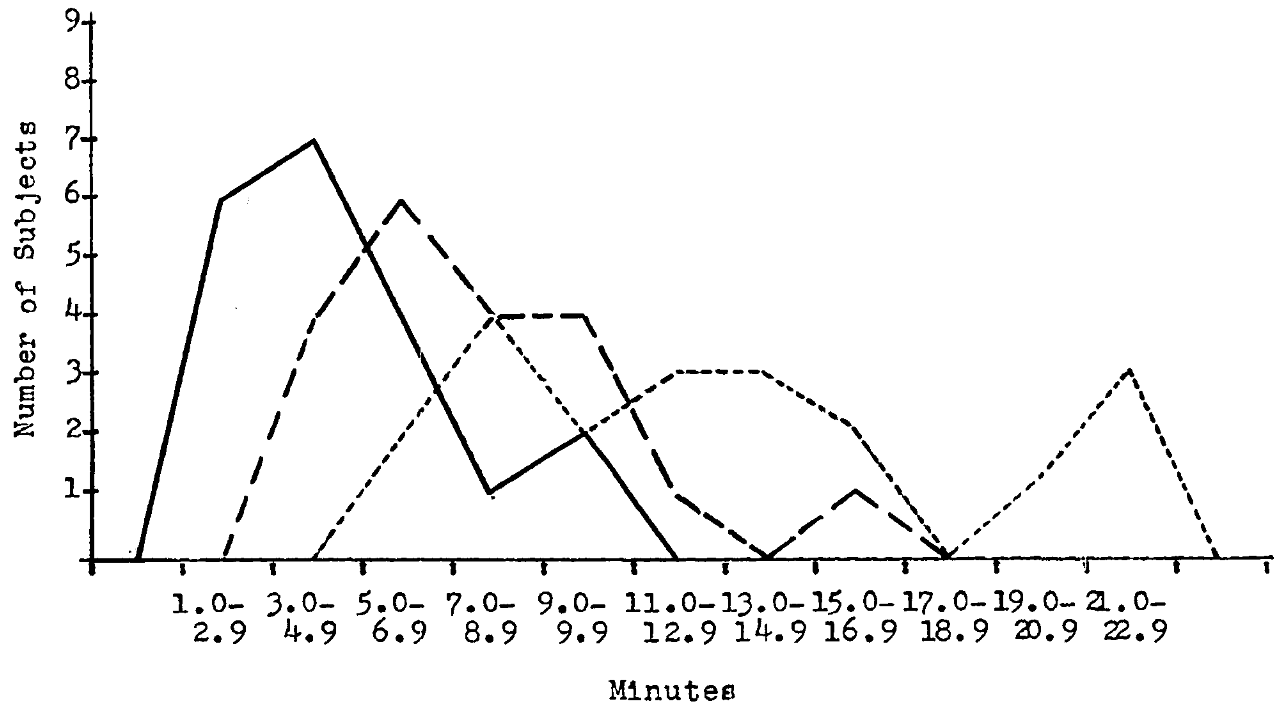
Fig. 8 Total eye-guidance-movements of subjects in control, schizoaffective, and paranoid schizophrenic groups.

polygons, based on somewhat contracted distributions, are listed in Figure 8.

In all three frequency distributions, a note is attached dealing with three cases in the paranoid schizophrenic group. These three cases had not learned to place all designs correctly by varying numbers of trials over fifty. E terminated S's effort in all three cases. From a somewhat practical viewpoint, it did not seem to matter a great deal whether these cases finally did learn by seventy or one hundred trials. They were considered non-learners, since each seemed no closer to completing the task than had been the case ten or twenty trials previous. This introduced a problem of non-determination to the variance estimate of the paranoid group.

The same type of problem, however, existed for both of the other groups, though not to the same degree. Three subjects in both the schizoaffective and control groups accounted for the major part of the skewed tendencies in the direction of increased trials, e-g-m, and learning time.

A cursory examination of all the frequency polygons indicates the somewhat unusual fact that the position of the schizoaffective and paranoid schizophrenic groups has been interchanged. The control



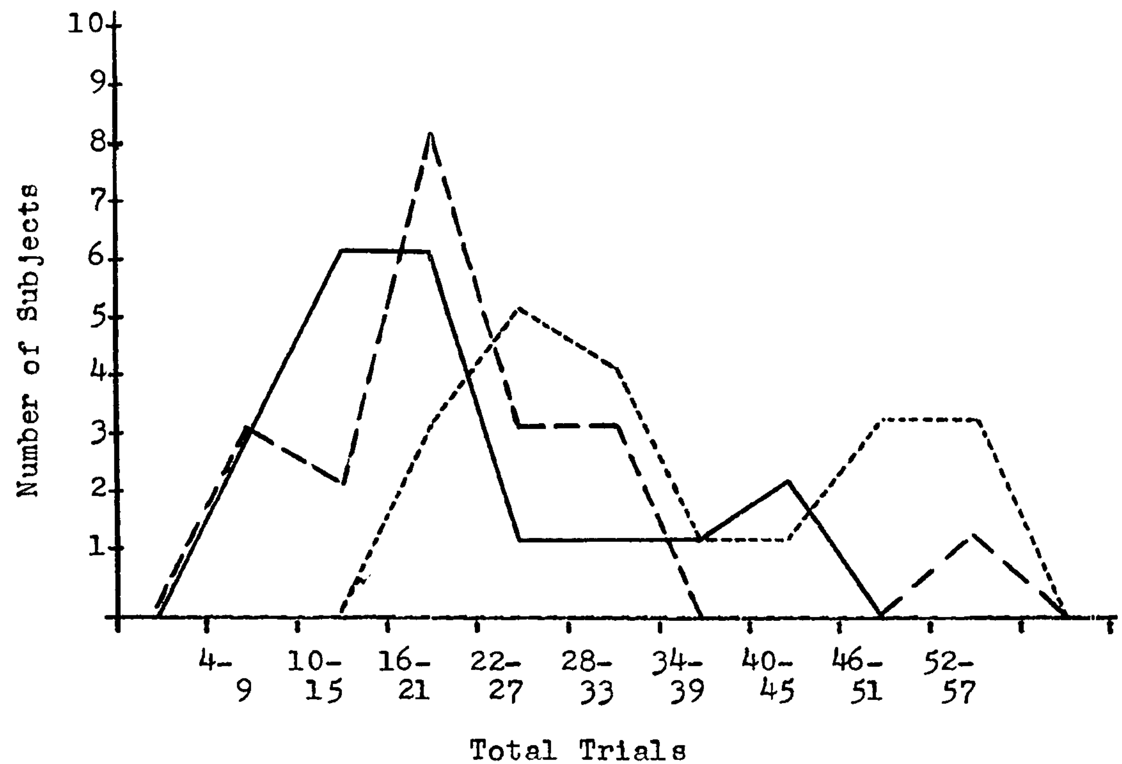
Key:

Control Group:————

Schizoaffective Group:— — — —

Paranoid Schizophrenic Group:--------

Fig. 9 Frequency polygons of distributions of total exposure-board learning time for control, schizoaffective, and paranoid schizophrenic group.



Key:

Control Group: ————

Schizoaffective Group: — — — —

Paranoid Schizophrenic Group: --------

Fig. 10 Frequency polygons of distributions of total learning trials for control, schizoaffective, and paranoid schizophrenic groups.

group overlaps in varying degrees with the schizoaffective group. Relatively little overlap of the paranoid schizophrenic group with the control group is found. In terms of direction of difference, the experimental hypotheses are substantiated.

On the other hand, though differences in distributions are in directions predicted, the overlap is considerable enough to immediately conclude that diagnoses of one condition from another would not be possible, if they were based on the quantitative findings alone.

The statistical hypotheses, based on the experimental hypotheses, have already been stated a number of times in the qualitative sections. Tables of pertinent data related to application of these statistical hypotheses are given in the following sections.

3. Statistical analysis.

a) E-g-m: Results from Table 12 indicate that the experimental hypotheses are validated for group differences in e-g-m.

The size of the standard deviation found for the paranoid schizophrenic group, when compared to the standard deviations of the other two groups raises the question

TABLE 12

STATISTICAL ANALYSIS OF GROUP DISTRIBUTIONS AND DIFFERENCES BETWEEN GROUPS FOR TOTAL EYE-GUIDANCE-MOVEMENTS DURING EXPOSURE-TRIAL LEARNING (ONE-TAILED TEST OF SIGNIFICANCE)

E-G-M	Control Group (1)	Schizo-affective Group (2)	Paranoid Schiz. Group (3)
Mean E-G-M	117.85	149.65	322.9
S.D.	56.095	69.75	148.75
t_{1-3}	5.374**		
t_{1-2}	6.43**		
t_{2-3}	4.407**		

Numbers under t refer to numbered groups in upper line.

of heterogenity of variance. This tends to cast doubt on the significance of the difference between the means, which would reflect heterogenity of variance rather than the difference due to experimental conditions. The F test for heterogeneity of variance between the control group and the paranoid schizophrenic group resulted in a significant probability. Edwards (11) suggested an approximation technique for reevaluating t when heterogenity of variance is present. This revision of t, which excludes the magnifying effect of heterogeneity of variance on t, resulted in t values between the groups still highly significant.

The results indicate that control group subjects required the fewest number of eye-guidance-movements for learning. Schizoaffective subjects required significantly more eye-guidance-movements, but not to the extent found required by paranoid schizophrenic subjects. The latter subjects required over twice as many eye-guidance-movements as the other two groups. All differences were found to be significant. This condition exists in spite of the fact that the average is probably not a stable indication of degree of effort required in learning for these groups, in view of the large standard deviation found. Future samples of this same kind could vary considerably from the presently estimated ranges of population values for the means.

b) Total exposure board learning time: Results in this area are the same as for e-g-m. (Table 13). Critical differences

TABLE 13

GROUP MEANS, STANDARD DEVIATIONS, AND RESULTS OF t TEST FOR SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS FOR EXPOSURE-BOARD LEARNING TIME (ONE-TAILED SIGNIFICANCE TEST)

Exposure Board Learning Time	Control Group (1)	Schizo-affective Group (2)	Paranoid Schiz. Group (3)
Mean Time	4.64	7.40	13.03
S.D.	2.344	2.846	5.048
t_{1-2}	2.482*		
t_{1-3}	5.747**		
t_{2-3}	4.233**		

Numbers under t refer to numbers after groups in upper line.

exist between the groups for exposed-board learning time. The degree of ease and difficulty in learning are significantly in the direction predicted by the experimental hypotheses. Such results could occur considerably less than once in a hundred times by chance alone, and are therefore regarded as highly significant. The average control subject spent less than about four and a half minutes in active learning of the guidance board; the schizoaffective average subject spent about seven and a half minutes in such learning; while the average paranoid schizophrenic subject spent thirteen minutes. The relationships here are just about 1-2-3 in terms of an arithmetical progression of loss.

c) Total trials required for learning. Table 14 presents means, standard deviations and tests of significance of differences between means for total trials required for learning. Part of the experimental hypothesis is invalidated. The schizoaffective group is not significantly separated from the control group, although the direction of difference

TABLE 14

MEANS, AND SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS FOR TOTAL LEARNING TRIALS OF THE CONTROL, SCHIZOAFFECTIVE, AND PARANOID SCHIZOPHRENIC GROUPS

Total Learning Trials	Control Group (1)	Schizo-affective Group (2)	Paranoid Schiz. Group (3)
Mean of Trials	19.05	20.75	35.30
t_{1-2}	.3593		
t_{1-3}	4.428**		
t_{2-3}	3.859**		

Numbers under t refer to numbered groups in upper line.

is as predicted. Both of these groups, however, are highly significantly separated from the paranoid schizophrenic group in degree of deficit.

The discussion of significance of number of trials in the previous pages suggested that many subjects, both control and clinical, viewed the goal of the task in part as a matter of spaced effort. The clinical group bearing this similarity to the controls was the schizoaffective group.

4. Summary of results: quantitative data.

a) Descriptive analysis of rate measurements.

(1) Exposure-board learning time not only represented time spent in learning from the guidance-board but included time spent in motor movements of placing design chips.

(2) E-g-m as a total quantity reflected the amount of effort expended in visual reference to the stimuli field during learning. E-g-m plotted against 4th trial number-correct, for control subjects, revealed an S-shaped curve. Number of correctly placed designs and e-g-m curves tended to be reciprocals of each other. Three stages of learning were suggested by analysis of the e-g-m curve. At any stage of learning, e-g-m tended to reflect the degree to and rate at which the stimulus field became organized in terms of more permanent and reliable motor responses.

(3) Total time was not included as a

rate of measurement of learning. It tended to reflect characteristics of the subject's performance not adequately recorded during this experiment.

(4) Total trials tended to reflect an attitude of the subject toward the whole learning task. Attitudes of subjects were often verbalized which expressed competitive feelings regarding the number of trials needed by the subject compared to what the subject thought others could do.

b) Frequency distributions for e-g-m, exposed-board learning time, and total trials indicated that the experimental hypotheses were verified for predicted direction of differences between the three groups. Results from rate of learning measurements tended to reverse the positions of the two clinical groups as they were found in the qualitative analysis. Little overlap of distributions ocurred between the control and paranoid schizophrenic groups.

c) E-g-m.

(1) Predictions of the experimental

hypotheses were validated. Highly significant differences were found between the three groups for average number of e-g-m required for learning in the directions predicted.

d) Exposed-board learning time.

(1) Predictions of the experimental hypotheses were validated. Highly significant differences were found between the three groups for average amount of time required to learn.

e) Total trials.

(1) The experimental hypotheses were invalidated for the predicted significance of difference between the means of control and schizoaffective groups. Both of these groups represented "ability" insofar as the paranoid schizophrenic group was concerned and, conversely, only the paranoid schizophrenic group indicated difficulty in learning. All differences, however, between groups were in the direction predicted.

Miscellaneous Results

1. Correlations between age and rate of learning: between I.Q. and rate of learning. At this point several other relationships involving the schizoaffective group are pertinent. Since the I.Q. range had covered approximately 30 points, the question arose as to whether any relationship existed between the I.Q. and the performance of subjects. Did rapid learners tend to be found in the bright normal range? Were slow learners associated with the low average intelligence range?

Also, in view of the critical differences found between age and type of schizophrenia, some correlation between learning ability and age might exist. Did slow learning tend to be associated with increasing age in the various groups?

Correlations between the various measures of learning rate and both I.Q. and age were obtained by using the Pearson Rank Order Correlation Coefficient (rho). Rho, instead of the Product-Moment Correlation Coefficient (r), was used because of the small samples and the extreme range of scores found for each measure of learning rate. Guildford's suggestions regarding use of rho were followed. To compensate for differences between rho and r, .4 was added to the t values.

Table 15 lists the obtained rho's and their

TABLE 15

TABULATION OF OBTAINED RANK ORDER CORRELATION COEFFICIENTS BETWEEN AGE AND RATE OF LEARNING CRITERIA, BETWEEN I.Q. AND RATE OF LEARNING CRITERIA, AND STANDARD ERRORS OF SIGNIFICANT CORRELATIONS

	Control Group		Schizo-affective Group		Paranoid Schiz. Group	
Age to E-G-M	.353	---	.174	---	.124	---
I.Q. to E-G-M	-.237	---	.702**	.131	.257	---
Age to Total Time	.305	---	.149	---	-.195	---
I.Q. to Total Time	-.045	---	.589**	.156	.131	---
Age to Total Trials	.409	---	.263	---	-.025	---
I.Q. to Total Trials	-.108	---	.461	---	.385	---

standard errors when the rho proved to be significant.

The test of significance of rho is two-tailed. The rho obtained for correlation between e-g-m and I.Q.

in the schizoaffective group could have been found less than once in a hundred similar samples by chance alone. The rho for I.Q. and total time in this same group is also significant at the 1% level of confidence, but is below the level suggested by Guilford as reliable for this statistic. All other correlations in Table 15 are low enough to support the null hypothesis that they represent chance fluctuations of random samples from the same populations. The following conclusions are drawn: (1) No systematic relationship exists between the age of a subject and learning ability, as measured by rate of learning on this test. Older subjects do not tend to require more effort to learn than younger subjects. (2) No systematic relationships exist between I.Q. and learning ability for subjects in the control and paranoid schizophrenic groups. In such groups, higher I.Q.'s are not associated with greater ability to learn or, stated differently, higher I.Q.'s are not associated with a performance requiring less effort for successful completion. (3) A highly significant relationship, however, does exist between I.Q. and learning ability, as measured by e-g-m, for the schizoaffective group. A highly significant but less reliable correlation exists between I.Q. and total learning time for schizoaffective subjects. In this group a systematic relationship does exist to some degree for rapid learners to have a higher I.Q. and slower learners to have lower I.Q.'s. The most reliable index of such a relationship was obtained for e-g-m (which previously had been discussed as a visual behavioral index of rate of learning). The more often a schizo-affective subject needed to look at the guidance board during learning, the lower his I.Q. tended to be or, conversely, the higher the I.Q., the fewer times he needed to look at the guidance board in order to complete the task.

These results strongly suggested that visualization processes in the schizoaffective group were significantly involved in the larger matter of type of intelligence represented by this group.

<u>2. Visual image type associations.</u> Tables Y, Z, and AA, listed in the Appendix, present a tabulation of all image-type associations made, regardless of whether they were associated with a concept-formation type or not. Such concrete images were distinguished from description of designs in terms of their physical characteristics. A previous analysis in the qualitative section established the fact that the schizoaffective group was significantly characterized as more concretized than the other two groups. The present analysis is intended to corroborate the fact that the schizoaffective

group was highly "image-minded" in terms of their tendency to concrete thinking.

The total number of visual image associations produced by the schizoaffective group is greater than the number produced by either of the other groups, (Tables Y, Z, and AA in the Appendix). The control group produced 32, the paranoid schizophrenic group produced 41, and the schizoaffective group produced 50. The number of subjects producing such associations in each group were roughly similar: 12 schizoaffective subjects produced 50 image associations; 14 paranoid schizophrenic subjects produced 41; 11 control subjects produced 32. The average number reported by a subject in each group is listed in Table 16.

As may be seen in Table 16, little difference in average number of visual image associations are found between the paranoid schizophrenic group and the control group. The number produced by the schizoaffective group is significantly greater than the number produced by the paranoid schizophrenic group. The difference between mean number produced by the control and schizoaffective groups is significant at about the 8% point. This is regarded as a trend in the direction of significance.

TABLE 16

MEAN NUMBERS OF VISUAL IMAGE ASSOCIATIONS AND TESTS OF SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS FOR VARIOUS GROUPS

	Control Group (1)	Schizo-affective Group (2)	Paranoid Schiz. Group (3)
Mean Number of Image-associations	2.91	4.17	2.93
t_{1-2}	1.526		
t_{1-3}	----		
t_{2-3}	1.729*		

Numbers under t refer to numbered groups in upper line.

3. Stimulus value of designs for eliciting concrete or concept-type thinking. Another analysis demonstrates not only the greater concretization of thinking in the schizoaffective group but also the tendency for this concretization to take the form of visual image associations.

a) Control group: A comparison was made for the control and schizoaffective groups of stimulus value of designs for eliciting concrete or concept-type thinking. As was indicated in the discussion of S-shaped curves for e-g-m and 4th trial number-correct, three general stages of learning were distinguished for the control group. The first stage of learning was characterized by somewhat rapid reduction in e-g-m during which time a majority of the designs were learned. It was surmised that designs which could be learned discretely were learned first. Designs which could be learned only by recourse to concept-formation tended to be learned last. This latter learning was reflected toward the end of the 2nd and in the third stage of the learning curve.

These stages were empirically verified. First, the number of designs correctly placed on trials when the guidance board was not exposed (usually 4th trials) were recorded by design for every such trial (as shown in Figure 7). A design was considered learned when no errors in placement occurred on successive efforts at placement for similar trials. Every design, for every subject, consequently, could be listed in terms of number of exposed-board trials needed before it was learned. Averages for all subjects in a group of trials needed for learning each design were obtained. Those for the control group are listed in Table 17.

Three groupings of averages were noted. Designs 1, 2, and 4 were learned in the fewest trials. Designs 3, 5, and 7 were learned next. Designs 6, 8, and 9 required the greatest number of trials to be learned.

In connection with the following discussion, the term "stimulus value" was used to indicate the relative degree to which a design was associated with few or many visual image associations, or in groupings of designs usually involved in a reported inductive-type concept-formation. For example, the stimulus value of design 4 in Table 17 for producing visual image associations in the control group was much greater than design 6. The stimulus value of a design for inclusion in a grouping of

TABLE 17

AVERAGE NUMBER OF TRIALS NEEDED BY SUBJECTS IN THE CONTROL GROUP TO LEARN EACH DESIGN AND NUMBER OF VISUAL IMAGE ASSOCIATIONS REPORTED

	Control Group	
	Average Trials To Learn	Number of Visual Images
Design 1	8.2	2
Design 2	6.1	6
Design 3	11.15	5
Design 4	9.45	7
Design 5	11.1	2
Design 6	13.45	1
Design 7	11.65	6
Design 8	13.85	1
Design 9	13.85	2

designs was obtained by crediting each design with a score of 1 for each reported inclusion in a grouping. A list of grouping of designs for the various subject groups is contained in Table BB listed in the Appendix.

A comparison was first made between average number of trials needed to learn each design and the number of visual image associations reported for each design (Table 17).*

Designs 1, 5, 6, 8, and 9 had fewest images associated with them. The average number of images reported for these five designs was 1.6; the average number of trials required to learn these designs was 12.09. On the other hand, designs 2, 3, 4, and 7 had most images associated with them. The average number of images reported for these designs was 6; the average number of trials required for learning was 9.59.

Arranged according to ease and

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*All image-type associations, both those found with spatial-type learning as well as those reported discretely learned were included. A sizeable number, however, of discrete associations of the "physical description" type were ommitted. Interest in this analysis centered mostly on the visual image tendency of the schizoaffective group.

difficulty in learning, the averages for both number of trials and number of visual image associations are listed in Table 18.

TABLE 18

AVERAGE NUMBER OF TRIALS FOR LEARNING AND AVERAGE NUMBER OF IMAGE ASSOCIATIONS FOR DESIGNS GROUPED BY EASE TO DIFFICULTY IN LEARNING (CONTROL GROUP)

	Control Group	
	Average Number Of Trials Needed To Learn	Average Number Of Image Associations
Designs 1, 2, 4	7.92	5
Designs 3, 5, 7	11.3	4.33
Designs 6, 8, 9	13.72	1.33

The relationships are somewhat similar to the previous analysis. The most easily learned designs are associated with the greatest incidence of reported visual image associations. The most difficult to learn designs (6, 8, and 9) had fewest reported visual image associations.

In Table 19, the same design groupings (ease to difficulty in learning) were coupled with stimulus values for inclusion

TABLE 19

AVERAGE NUMBER OF TRIALS FOR LEARNING AND AVERAGE NUMBER OF INCLUSIONS IN GROUPINGS OF DESIGNS ARRANGED IN EASY TO DIFFICULT LEARNING ORDER (CONTROL GROUP)

	Control Group	
	Average Number Of Trials Needed For Learning	Average Number Of Inclusions In Groupings
Designs 1, 2, 4	7.92	4
Designs 3, 5, 7	11.30	16
Designs 6, 8, 9	13.72	11

in design groupings (concept-type). The stimulus values were averaged for each three designs.

Designs which were most easily learned did not tend to be included to any marked degree in concept-formation types. Designs which were difficult to learn were associated with marked inclusion in inductive-type concept-formations.

Summary: Designs 1, 2, and 4 were learned most easily by control group subjects. Designs 6, 8, and 9 represented most difficulty in learning. Designs 2 and 4 were learned primarily in terms of concrete-type associations. Designs 1, 5, 6, 8, and 9 were learned primarily by inclusion in inductive-type concept-formations. Designs 3 and 7 were learned using multiple methods, i.e., both concrete-type learning and inductive-type learning are associated with these two designs. Generally, the designs most rapidly learned were associated with reported concrete-type associations.

Designs which were learned last tended to be associated with marked inclusion in inductive-type concept-formations.

b) Schizoaffective group contrasted with the control group. The more detailed analysis of learning presented for the control group was made, primarily, to establish empirical verification for interpretation of the learning curves. The schizoaffective group was compared to the control group only for incidence and distribution of visual image associations.

Averages of number of exposed-board trials needed by schizoaffective subjects to learn each design were obtained. Visual image associations reported for each design were obtained. These two groups of values are listed in Table 20.

Only one design, number 2, seemed to have been learned with any appreciable ease, as reflected in average number of trials required for learning. Design 1 seemed somewhat easier than the others. Seven designs, however, seemed to represent a more narrow range of variability in difficulty of learning than was found for the control group.

The number of images reported per design, moreover, do not break down into two groups - one group of designs associated with many images, the other group with few - as was found for the control group. The two designs, 1 and

TABLE 20

AVERAGE NUMBER OF TRIALS NEEDED TO LEARN EACH DESIGN AND NUMBER OF VISUAL IMAGES REPORTED PER DESIGN FOR SCHIZOAFFECTIVE GROUP

Schizoaffective Group		
	Average Number Of Trials Needed To Learn	Number of Visual Images Reported
Design 1	10.1	5
Design 2	5.4	6
Design 3	13.25	3
Design 4	12.25	10
Design 5	12.25	6
Design 6	14.45	2
Design 7	12.80	4
Design 8	14.25	7
Design 9	13.80	7

2, learned most easily do not have the greater number of visual image associations representing them. Whereas designs 8 and

9 were most difficult to learn and had among the least number of reported images (3 images) for the whole control group,

TABLE 21

COMPARISONS BETWEEN CONTROL AND SCHIZOAFFECTIVE GROUPS FOR AVERAGE NUMBER OF TRIALS NEEDED TO LEARN DESIGNS AND AVERAGE NUMBER OF VISUAL IMAGE ASSOCIATIONS TO DESIGNS, WHEN DESIGNS WERE GROUPED IN EASE TO DIFFICULTY SERIES

	Average Number Of Trials To Learn Designs		Average Number Of Visual Image Associations	
	Control Group	Schizo-affective Group	Control Group	Schizo-affective Group
Designs 1, 2, 4	7.92	9.25	5	7
Designs 3, 5, 7	11.30	12.73	4.33	4.3
Designs 6, 8, 9	13.72	14.17	1.33	5.3

designs 8 and 9 for the schizoaffective group have more visual image associations represented than for the most rapidly learned designs (1 and 2). The comparison between the control and schizoaffective groups, based on three groups of ease-to-difficulty designs found for the control group, is found in Table 21.

The tendency in the schizoaffective group was to report visual image associations for all designs regardless of the ease or difficulty in learning value of the designs.

Designs 3, 6, and 7 represented the fewest visual image associations for the schizoaffective group. Designs 1, 2, 4, 5, 8, and 9 represented the greater numbers of visual image associations.

4. Summary of miscellaneous results.

a) No significant correlation was found between age of subject and rate of learning in any of the subject groups.

b) No significant correlation was found between I.Q. and rate of learning for subjects in the control and paranoid schizophrenic groups.

c) A significant correlation was found between I.Q. and e-g-m for subjects in the schizoaffective group. A high I.Q. was associated with few e-g-m in the learning of the task; a low I.Q. with more numerous e-g-m in the learning of the task.

d) Investigation of visualization processes in the schizoaffective group.

(1) An examination of the degree to which visual image associations were reported among the three groups indicated a significantly higher number for the schizoaffective group. The control and paranoid schizophrenic groups had almost exactly the same average number per reporting subject. The average number reported by a schizoaffective subject was about 25% greater than the average number for subjects in the other two groups.

(2) Designs whose positions were learned in the fewest trials tended to have the highest stimulus value for producing concrete visual image associations, and the lowest stimulus value for inclusion in inductive-type groupings, insofar as control group learning was concerned. Learning of these designs was represented in the first stage distinguished in the reciprocal learning curves (page 136).

Designs whose positions were learned in an average number of trials tended to have the highest stimulus value for inclusion in inductive type groupings, and a medium stimulus value for producing concrete visual image associations. Learning of these designs was represented in both the first and early second stages of the reciprocal learning curves. Designs whose positions were learned in the greatest number of trials tended to have a high stimulus value for inclusion in inductive-type groupings, but a minimal stimulus value for producing concrete visual image associations. Learning of these designs was represented by the length of the plateau (second stage) and the third stage of the reciprocal learning curves.

(3) The stimulus value of six of the designs for producing concrete visual image associations in the schizo-affective subjects was high. No

tendency was found for designs whose placements required fewest trials to learn, to have the highest number of visual image associations. Two of the designs whose placement required most trials to be learned had a higher stimulus value for producing visual image associations than the designs whose placement required fewest trials for learning.

Summary of Results

1. Age, intelligence, and diagnostic agreement.

a) Paranoid schizophrenia represented a somewhat easier diagnostic problem than schizoaffective psychosis.

b) Agreement in diagnosis was more easily reached for female than male paranoid schizophrenics, whereas diagnostic agreement was more easily reached for male than female schizoaffective psychotics.

c) A characteristic of the schizoaffective group was a tendency for subjects to have an average age under 30 years. A characteristic of the paranoid schizophrenic group was that subjects had an average age of over 30 years.

d) The groups used in this experiment represented a homogeneous population with regard to I.Q. distributions.

2. Analysis of reported learning types.

a) Learning methods reported by subjects.

(1) Learning methods reported by subjects were categorized into (1) spatial-type, (2) inductive-type, (3) discrete-type, and (4) factors relating to incomplete recall of learning.

b) Concept-formation.

(1) Inductive-type learning tended to be associated with a trial and error method. The subject gradually recognized differences in stimuli after initial awareness of similarity. Recognition of differences was aided by active search and making mistakes. Grouping of designs, based upon similarities and differences inherent in the designs, was considered a tendency toward formal inductive reasoning.

(2) Spatial-type learning was associated mostly with "whole" or "massed" learning methods. It seemed to involve formation of a hypothesis or deduction regarding the spatial distribution of the whole field of stimuli. Spatial-type learning was considered a tendency toward formal deductive reasoning.

c) Concrete types.

(1) Two concrete types of responses were found: (1) visual image associations; (2) physical description of the design.

d) Testing of experimental hypotheses, qualitative data.

(1) Reporting of multiple learning methods.

(a) All groups had many subjects reporting more than one method of learning. Differences between groups were matters of degree rather than kind.

(b) The control group was significantly characterized as having "ability" in terms of number of methods reported used during learning.

(c) Both clinical groups reported fewer methods used during learning than the control group. The experimental hypothesis, however, was invalidated for predicted differences between the schizoaffective and paranoid schizophrenic groups.

(2) Psychopathology associated with learning behavior.

(a) The schizoaffective group tended to reflect a greater degree of psychopathology during learning than did paranoid schizophrenic subjects. Such a trend would tend to invalidate the predictions of the experimental hypotheses insofar as they related to overt demonstrations of bizarre behavior during learning.

(3) Inductive-type learning: productivity.

(a) Subjects in the three groups who reported using inductive concepts during learning produced approximately the same average number of inductive concepts.

(b) The experimental hypothesis related to productivity to be expected from each group of reporting subjects was invalidated.

(4) Inductive-type learning: reported occurrence and non-occurrence.

(a) The schizoaffective group contained significantly fewer subjects who were able to report use of inductive concepts in learning than the control group.

(b) The paranoid schizophrenic and control groups contained a similar number of subjects who reported the use of inductive concepts in learning.

(c) The experimental hypothesis pertaining to this area was invalidated.

(5) Discrete-type learning (concretization).

(a) All groups reported substantial numbers of discrete-type associations to designs.

(b) The experimental hypothesis was invalidated. Only the schizoaffective group indicated a tendency to concretization of thinking.

3. Testing of experimental hypotheses: quantitative data.

a) Descriptive analysis of rate measurements.

(1) Exposure-board learning time not only represented time spent in learning from the guidance-board but included time spent in motor movements of placing design chips.

(2) E-g-m as a total quantity reflected the amount of effort expended in visual reference to the stimuli field during learning. E-g-m plotted against 4th trial number-correct, for control

subjects, revealed an S-shaped curve. Number of correctly placed designs and e-g-m curves tended to be reciprocals of each other. Three stages of learning were suggested by analysis of the e-g-m curve. At any stage of learning, e-g-m tended to reflect the degree to and rate at which the stimulus field became organized in terms of more permanent and reliable motor responses.

(3) Total time was not included as a rate of measurement of learning. It tended to reflect characteristics of the subject's performance not adequately recorded during this experiment.

(4) Total trials tended to reflect an attitude of the subject toward the whole learning task. Attitudes of subjects were often verbalized which expressed competitive feelings regarding the number of trials needed by the subject compared to what the subject thought others could do.

b) Frequency distributions for e-g-m, exposed-board learning time, and total trials indicated that the experimental hypotheses were verified for predicted direction of differences between the three groups. Results from rate of learning measurements tended to reverse the positions of the two clinical groups as they were found in the qualitative analysis. Little overlap of distributions occurred between the control and paranoid schizophrenic groups.

c) E-g-m.

(1) Predictions of the experimental hypotheses were validated. Highly significant differences were found between the three groups for average number of e-g-m required for learning.

d) Exposed-board learning time.

(1) Predictions of the experimental hypotheses were validated. Highly significant differences were found between the three groups for average amount of time required to learn.

e) Total trials.

(1) The experimental hypotheses were invalidated for the predicted significance of difference between the means of control and schizo-affective groups. Both of these groups represented "ability" insofar as the paranoid schizophrenic group was concerned and, conversely, only the paranoid schizophrenic group indicated difficulty in learning. All differences, however, between groups were in the direction predicted.

4. Miscellaneous results.

a) No significant correlation was found between age of subject and rate of learning in any of the subject groups.

b) No significant correlation was found between I.Q. and rate of learning for subjects in the control and paranoid schizophrenic groups.

c) A significant correlation was found between I.Q. and e-g-m for subjects in the schizoaffective group. A high I.Q. was associated with few e-g-m in the learning of the task; a low I.Q. with more numerous e-g-m in the learning of the task.

d) Investigation of visualization processes in the schizoaffective group.

(1) An examination of the degree to which visual image associations were reported among the three groups indicated a significantly higher number for the schizoaffective group. The control and paranoid schizophrenic groups had almost exactly the same average number per reporting subject. The average number reported by a schizoaffective subject was about 25% greater than the average number for subjects in the other two groups.

(2) Designs whose positions were learned in the fewest trials tended to have the highest stimulus value for producing concrete visual image associations, and the lowest stimulus value for inclusion in inductive-type groupings insofar as control group learning was concerned. Learning of

these designs was represented in the first stage distinguished in the reciprocal learning curves (page136). Designs whose positions were learned in an average number of trials tended to have the highest stimulus value for inclusion in inductive type groupings, and a medium stimulus value for producing concrete visual image associations. Learning of these designs was represented in both the first and early second stages of the reciprocal learning curves. Designs whose positions were learned in the greatest number of trials tended to have a high stimulus value for inclusion in inductive-type groupings, but a minimal stimulus value for producing concrete visual image associations. Learning of these designs was represented by the length of the plateau (second stage) and the third stage of the reciprocal learning curves.

(3) The stimulus value of six of the designs for producing concrete visual image associations in the schizo-affective subjects was high. No tendency was found for designs whose placements required fewest trials to learn, to have the highest number of visual image associations. Two of the designs whose placement required most trials to be learned had a higher stimulus value for producing visual image associations than the designs whose placement required fewest trials for learning.

CHAPTER VI

INTERPRETATION

The major results of this experiment are the "crisscrossed" deficits which characterized the performances of the clinical groups. In order to focus attention upon the problems which were involved, each experimental group was described in terms of the experimental results. These descriptions were based on the averages of the performances found.

A large variability was associated with the behavior of the paranoid schizophrenic group for e-g-m needed in learning. The behavior variability of this group seen in a clinical setting also tended to be great as was discussed in the introductory sections. Further differentiation of the paranoid schizophrenic group into other groups with minimum variability of performance might indicate additional "types" (such as "confused," "overideational," etc.). This would lead, however, to the interesting speculation that psychosis is a matter of degree rather than kind. Emphasis in diagnosis upon degree of performance rather than kind of performance is advocated by proponents of the "sign" approach in clinical psychology. Rabin and Guertin's generally negative conclusions (35) regarding this approach have already been reviewed. Most clinicians attempt to use a combination of qualitative and quantitative "signs."

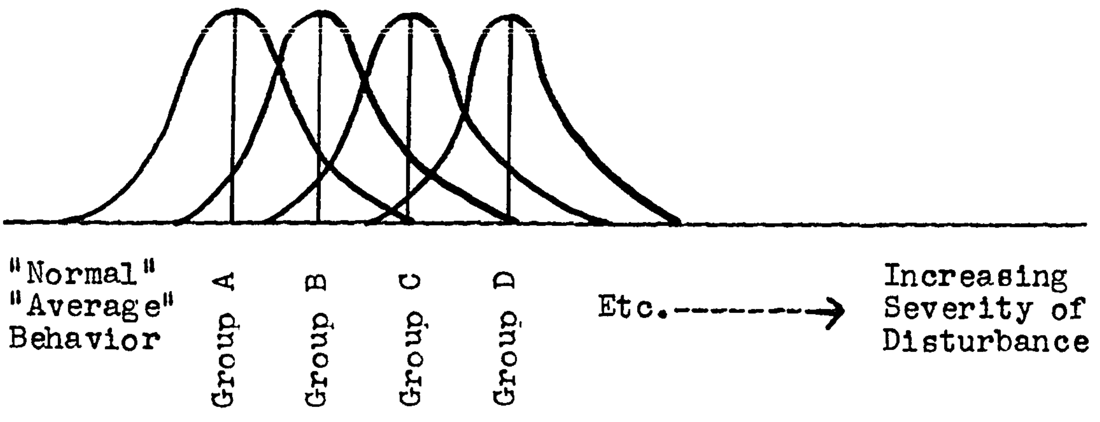

Fig. 11 Diagrammatic representation of relationship between "normal" behavior and "abnormal" behavior.

Figure 11 describes this latter method in diagram form. In terms of this experiment and its quantitative results, Group A could be the control group and Group B could be the schizoaffective group. Group C and D would represent the paranoid schizophrenic group. Adding to this the qualitative tendencies, and translating them into ratings of ability and deficit, Group A again could be the control group, Group B, C, and part of D could be the paranoid schizophrenic group depending upon which qualitative measure was being referred to, while Group D could generally represent the schizoaffective group.

Most clinical psychological diagnostic examinations are based upon this approach. The result of obtaining many different samples of an individual's behavior is a series of presumed trait measurements. These are also presumed to vary about a population average. A few measurements tend to stand out significantly in terms of deviation from the norm, while others vary less but in the direction, usually, of the few outstanding measurements or qualities. An attempt is then made to relate the quality and degree of trait clusters characterized by the outstanding few tendencies, to a known clinical syndrome such as "hysteria," or "schizophrenia," etc.

Something of this kind of thinking is represented in the effort to describe the three groups used in this experiment in terms of their composite results. This is dealt with in greater detail in a later section. The danger lies in the exclusion of results of many groups not tested on this instrument as yet. Therefore, the descriptions are not presented primarily as diagnostic criteria. They are primarily descriptive points of reference for analysis of the theoretical problems with which this paper is concerned.

Control Group

The general tendency of this group was to learn first those designs which could be concretely associated with either suggested visual images or with some other concrete association. Designs whose placements required most effort to learn tended to be grouped by means of inductive-type concepts. A little less than half of the control subjects used a partial or complete deductive-type learning method. Difficulty in learning the placement of a design was associated with a high degree of inter-design and intra-design similarity "built-into" the problem. When confronted with a high degree of stimulus homogeneity, the control group learned in large degree by use of generalizing and abstracting processes, the results of which were inductive and deductive concepts. The results of these generalizing and abstracting behaviors reflected a constellation of resourcefulness characterized in this experiment as "ability." Such ability consisted of: (1) multiple-learning methods; (2) superiority in terms of number of instances of inductive and deductive types of generalizing and abstracting processes; (3) absence of bizarre explanations of learning; (4) a greater degree of concept-type than concrete-type learning; (5) most rapid learning as measured by all indices for rate of learning.

Schizoaffective Group

The schizoaffective group, excluding several subjects over 40 years in age, had an average age under 30 years. They were also the only group showing a significant correlation between I.Q. and any rate of learning measure.

The significant aspects of their general learning behavior were: (1) fewest subjects reporting use of inductive-type concept-formation; (2) greatest degree of concretization of thinking; (3) moderate to no deficit in rate of learning.

The schizoaffective group, not the paranoid schizophrenic group, represented concretization of thinking. They reported a greater number of concrete-type associations both in conjunction with and not in conjunction with concept-formations. They also had 25% more visual image associations than either of the other two groups. The few (6) cases reporting use of inductive-type concepts could form, proportionately, enough instances of this so that no critical difference was found when they were compared to the control group. But the group as a whole had significantly fewer subjects who reported use of inductive-type concepts. The schizoaffectives also had the greater number of instances of bizarre behavior associated with learning behavior. The designs which were difficult to learn were reported learned by visual image associations to a much greater degree by this group than by any other group.

The relative paucity of concept-formation learning in this group was not, however, associated with the slowest rates of learning. The group did not even differ significantly from the control group as regards spacing of effort in learning (total trials). They required significantly greater effort in time, and in number of eye guidance movements for such accomplishment. However, there was only a moderate deficit, as indicated by greater time and number of e-g-m.

Paranoid Schizophrenic Group

The paranoid schizophrenic group was characterized significantly as being on the average over 30 years of age.

This group did not differ significantly from the control group in the two important areas of qualitative results, namely, in number of subjects reporting use of inductive concepts in learning and in number of concretized responses reported. These results invalidated the major experimental hypothesis based on a pilot study. The paranoid schizophrenic group did not show a loss of the abstract attitude in the area of ability to report learning.

They showed consistently greatest deficit, however, for rate of learning. At no point in the frequency distributions did this group have a representative who learned more rapidly than a control or schizoaffective subject.

The significant aspects of their general learning behavior were: (1) fewer subjects able to report inductive-type learning; (2) no significant concretization of thinking; (3) consistently highest rate of learning.

When the clinical groups are characterized in terms of their general tendencies, a different syndrome of behavior was associated with each clinical group. The schizoaffective required only moderate to little more effort than a non-psychotic, in terms of time and spacing of effort, for learning a task where hand and eye coordination was required and where verbalization was at a minimum. When the schizoaffective had to tell how he did something or describe his conscious experiences, he was likely to report little and report this as a concrete event rather than in general terms. The paranoid schizophrenic, on the other hand, was relatively glib in generalizing about an experience. The performance reported about, however, was likely to have been one requiring great effort, often to the point of interminable effort.

This is what has been referred to as the "criss-crossed" effect. If the concrete thinking reported by the schizoaffective had been coupled with the slow learning of the paranoid schizophrenic, the results would have been comparable to those of organic brain-damaged subjects.

On the other hand, if the degree of reporting ability found in paranoid schizophrenia had been coupled with the learning rates of the schizoaffective group, little difference would have been found between the control group and this hypothetical composite group.

In terms of deficit found, the schizoaffective group could be said to demonstrate a kind of "generalizing" aphasia for that portion of the experiment concerned with recall of learning methods. The paranoid schizophrenic group could be said to demonstrate a type of constructive apraxia for that portion of the experiment concerned with performance of the task. These terms are used more descriptively here than in the strict sense of their neurological meaning.

Age, Intelligence and Motivation

1. Age. The division of the clinical group into two age groups was an unexpected finding. No previous studies of schizoaffective psychotics could be found. No basis existed for assuming an age range characteristic of the group. The finding that the group tended to average

under 30 years of age (when the 3 cases over 40 years old were dropped) must be accepted tentatively. Before this could be accepted as a confirmed data trend, studies of age at time of first admission should be made of a larger sample. These findings could then be compared with a proportionately sized group of paranoid schizophrenics. The term "proportionately" is used because the paranoid schizophrenic population is believed to be considerably larger than the schizoaffective population.

An assumption can be made that a larger group would support the present findings regarding age differences. The skewed nature of the distributions found was attributed to the cut-off points adopted (age 25 to 40). It was presumed, in view of the directions of skewness, that the paranoid schizophrenic group extended well into the forties, the schizoaffective group down toward the teens.

Strecker and Ebaugh (43) reported that age of greatest incidence for paranoid schizophrenic reactions was 35 to 40 years. Present findings agree with those reported.

Mayer-Gross (29) claimed that three quarters of all cases of schizophrenia started between 15 and 25 years of age. From this point of view, the schizoaffective population might represent a sample of early schizophrenia.

The possibility exists, however, that schizo-affectives and early schizophrenics might belong to the same population, in view of several studies reported by Bellak (2) dealing with early and pre-schizophrenic clinical signs. The emphasis of the findings centered on mood fluctuations, anxiety, withdrawal, acting-out tendencies, and "scattering" of delusions rather than the more tightly organized psychopathology often characteristic of the paranoid schizophrenic.

There is just as much reason, however, not to emphasize the resemblance too strongly. One gathers from surveying the recent history of trends in interpretation of psychopathology that a current trend can be mistaken for established fact. The problem of the relationship of schizophrenia to age groups and to the manic-depressive syndrome has not yet been settled. Reflecting current opinion, Bellak (2) said, "The general tendency among psychiatrists is to consider doubtful cases in advanced age as cases of manic-depressive disorder, while cases in the teens or early twenties are more frequently considered dementia praecox. . . . ."

A more conclusive study regarding the relationship between early schizophrenia and schizoaffective psychosis would be a study of a large group of early schizophrenics rated for various symptom formations. Factor analysis of the trait constellations would tend to determine the constellations of symptoms characteristic of the group.

2. Intelligence. The choice of an intelligence range between low average and up to superior intelligence derived from the generally accepted fact that paranoid and catatonic schizophrenics tend to have higher test intelligence than other schizophrenic types (43). A survey of the range of I.Q. for schizoaffective psychotics had indicated a similarity to the range of the paranoid schizophrenic group.*

The primary purpose of the range set for I.Q. was to control to some degree the spread of ability in the three groups. It was realized that psychosis had some effect on overall intelligence efficiency. An assumption implicit in almost all clinical investigations is that the average nonpsychotic subject does not show the degree of scatter associated with performance of psychotic subjects. The I.Q. in the latter group is often the result of a compromise average between high weighted scores for certain tests and low weighted scores for others. The pre-psychotic ability level may have been systematically higher, then, in the clinical groups than in the control group. This problem

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*It is also possible that schizoaffective psychotics were often classified as catatonic schizophrenia in the other studies reported.

would not tend to be a significant one unless the clinical group performed better on experimental test materials than did the control group. Otherwise, one can assume that the deficit of the clinical groups on the experimental material was, perhaps, even more significant. If a reliable method existed for equating groups such as these for level of ability, one could determine the degree of deficit found with greater certainty.

The finding of a significant and relatively high correlation between Wechsler-Bellevue Full Scale I.Q. and e-g-m for the schizoaffective group was also unexpected.

This finding was associated with a significantly greater production of reported visual imagine associations in the same group. Observations and suggestions made by Bills (3)on relationship of muscle and sensory systems to abstract thinking are extremely interesting in connection with these findings.

> . . . . It is possible that movements of convergence or localizing movements are meaning carriers in the absence of sub-vocal speech. Some persons report their thinking as principally verbal while others report considerable visual imagery. Perhaps the latter use eye movements as meaning carriers. Few studies have been reported in which a systematic study of eye movement in thinking was made. . .

The correlation found indicated that schizoaffective subjects with low average I.Q. tended to use many e-g-m during learning. A tendency existed for a rise in I.Q. to the superior range to be associated with decreasing numbers of e-g-m needed for learning. The significant correlation between I.Q. and time for learning indicated that total effort was involved. It is more significant that the I.Q. correlation with e-g-m was the highest found.

The problem raised was whether the schizoaffective group could be identified with "visualizers." Such a group would be characterized as reporting their thinking primarily in terms of visual images. It could also be assumed, theoretically at least, that emphasis would be found throughout their behavior on various aspects of visual processes, such as the high correlation between I.Q. and visual referring behavior during learning. The examination made of production of visual images, as reported by subjects in the various groups, indicated that the greatest number was produced by the schizoaffective group.

The proportion of all concrete associations made to designs by the schizoaffective group that were of the visual image type was 63.3%. The proportion of all concrete associations made to designs by the paranoid schizophrenic group that were visual image associations was 72.4%. These proportions indicated that concretization tendencies in both clinical groups tended to be predominantly of the visual image type. But the percentages indicate that, while the schizoaffectives did produce significantly greater number of visual image associations, the percentage relationship to other types of concrete associations was lower than that of the paranoid schizophrenic group. One would have expected, from visualizers, a high percentage of visual image associations in a given learning situation; but one would have also expected that other groups in the same situation would have produced significantly lower percentages of visual image associations. The conclusion seems to be that the schizoaffective subjects tended to produce more concrete associations, rather than a higher percentage of concrete associations which belonged to one sensory-modality.

This matter of sensory type is summarized by Bills (3).

> It has been pointed out that one of the important forms of recall is the memory image. The study of images in psychology has undergone a decline in recent years, partly because of the practical difficulties inherent in a type of experiment which is exclusively subjective, partly because of the failure to formulate significant problems, but chiefly because of the doubt which has been cast on the reality or importance of the phenomena by certain recent psychologists. . . .

Part of the doubt cast on the wisdom of further study of visual images was the failure to establish a typology based on sensory-modality of imagery. Bills (3) said:

> Among other things, the work of Galton raised the question of imagery types. Theoretically every person is capable of having images from particular modalities, such as vision or

> kinaesthesis. Proceeding on this assumption, psychologists classified persons in accordance with their predominant type of imagery, into visualizers, audiles, tactiles, etc. Further investigation proved that the great majority of persons do not belong to any one type, but rather fall into a mixed type, possessing all kinds of imagery, to about equal degree.

It would be unwarranted, it is concluded, to assume from the results of this experiment that schizo-affectives were "visualizers." As is discussed in greater detail in another section, they probably learned as much as did the control group by using abstraction and generalization processes. They tended to <u>report verbally</u> in terms of visual image associations to a greater degree than did other groups. What is suggested here, and developed at length elsewhere, is that the better part of what occurred in reporting learning process was subject to inhibition at the motor speech or motor language level. This also has been referred to as a "generalizing" aphasia. The greater number of concrete associations are interpreted as representing a degree of compensation for such inhibitory effects, rather than any native tendency for thinking primarily in terms of visual images.

The high correlation between I.Q. and e-g-m is interpreted similarly. The explanation made at this point is that the other groups had recourse to motor-expressive possibilities in both language <u>and</u> visual imagery areas, only one of which proved to be available to the schizo-affective group. For this group, the visual modality tended to replace (substitute for) verbal resources not available because of long-standing inhibitions in the verbal area. There would be no correlation expected between I.Q. and e-g-m for groups who have the ability to respond relatively as well by language formulations as by imagery formulations. Something of this reasoning is associated with expected findings for normal subjects on the two different scales of the Wechsler-Bellevue Intelligence Test. Large differences between the Performance Scale and the Verbal Scale are not expected. When such large differences are found, they are associated with either an educational or environmental situation, or with psychopathology. The ability might well be called "visual motor" in this regard, since the total performance involved other motor-expressive systems than the visual.

Motivation for the Learning Task

Did the paranoid schizophrenic group characteristically not try to learn? Was their performance (long learning time, large number of total trials, and excessive visual references to the stimulus field) a reflection of a low degree of "cooperation" with the examiner and the task? Such an explanation of behavior of schizophrenics during test situations has been made by other investigators, who have developed theories based on the "social withdrawal" of schizophrenics to account for their generally found poorer performance. Loss of interest in "objects," or "achievements," or human relationships generally, are said to be expressed as disinterest, negativism, or other forms of refusal to exert effortful behavior in test situations.

The problem of social withdrawal may be separated into two aspects: (1) is the behavior posited by proponents of this theory a deliberate, conscious effort of the patient? (2) is the behavior found an indication of the patient's own dim realization of his distance presently from reality and a reflection, therefore, of an effort to return to reality coupled with an inability to do so?

The first theory of withdrawal would lead to a belief that the patient at the time of testing said, as though to himself, or even aloud, "I will not do this; I have no interest in the matter." Such uncooperative behavior in the form of negativism, suspiciousness, verbal aggressive behavior, etc., can often be elicited from some paranoid schizophrenics. Were these the attitudes expressed by the patients used in this experiment?

Or did the patients cooperate, but with expressions of awareness that this was a task on which they would not do well?

All paranoid schizophrenic patients were cooperative in the sense of being willing to take the test, although many immediately started to explain that they would do poorly. Some patients did project boredom at places. The examiner would be credited with boredom because the patient was taking such a long time in learning. But these same patients, at a later point, would refer to a cold, or weak eyes, or poor schooling, or numerous other excuses with which to account for their inability to consummate the task. An excellent example of the general attitudes of the paranoid schizophrenic patients during testing, and reflecting an aspect of the total interpretation of the learning behavior made in this study, is the record of paranoid schizophrenic male subject A.F.

The number preceding the quoted verbatim statements of the subject refers to the trial, at the end of which the comment was made.

1. "I was in doubt about that one (#2). There's more space between there" (points to the board).
3. "I got a little bit excited."
4. After getting only one placement correct on this downboard trial, and being told this, he said, "I really didn't study."
6. "I've got kind of a cold all this week."
16. After being told that he had placed four correctly, he said, "I never was no count to memorize. I can prove that."
24. After placing all the designs correctly and being told this, he said with evident surprise, "Did I do that well?"
30. This was the second effort to place all designs correctly. He was told he had placed only six correctly. He said, "I'm

falling down again. Especially as ignorant as I am." Then he added, "Before you leave, I'd like to show you some quotations I've written if you don't mind." (Notice the effort at compensation in the direction of verbal behavior).

31. "I've probably made some mispelling on those, in my writing."

38. "I'll try to remember."
At the 47th trial, he finally placed all designs correctly for the second time in a row.

This patient reported that he had learned by associating 3 letters of the alphabet to parts of designs, by other concrete associations, and by a partial inductive-type concept (#4, #8, and #9 "went by the crooked"). He then showed E a poem which he had written. This is reproduced to show the emphasis on language expression in the presence of deficit for visual-motor effortful behavior.

Exile

1. We ar living in the tributation
2. All of the creation of every nation.
3. We all worrie about taxaction.
   Because of exertation.
4. You may think its funnie
5. But it is A wennie
6. Some may be full of hature
   because of human nature
7. Some blaims another, 2 blame
   none other, excep each other.
8. I have a brother who loves another.
9. There is funeral sometimes,
   because of a ruinal.
10. If I go to a hotel I will take a pail.
    If I go to jail who will go my bail.
    Tribulation is because of taxaition.

It is a lot of realation. In very nation. Because of creation.

These comments, which were taken verbatim by the experimental assistant during the course of learning, resemble those obtained and quoted by Goldstein and Scheerer (19), Hanfmann and Kasanin (22), and others. Most of the time, these remarks were excuses of all kinds. If there were a general attitude of uncooperativeness, this was not picked up by E nor was it revealed by an examination of the statements made by subjects during learning. These paranoid schizophrenics were trying, usually, very hard to learn. But, in contrast to the schizoaffective subject, there was an air of detachment, or distance, from the task and from E. They often did not seem to be in the intimate moment to moment contact with the task which generally described the behavior of the schizoaffective and control group subjects. They seemed to realize that they were defective in some way in this area, and seemed prepared to defend themselves for a poor showing. Seigel, Sackler, et al (42) in an examination of schizophrenics following histamine therapy, wrote of the patient's behavior:

> The emotional functioning of biochemically improved schizophrenic patients often reveals, after retesting, tentative groping toward affective contact - sometimes timid, often precarious. However, these efforts do make an inroad into the withdrawal and strong sense of detachment and isolation. Affective liability and regressive outbursts may also

> be reduced and trends toward a mature constraint in social adaptation emerge. <u>The schizophrenic's anxiety is a typical one. He apparently recognizes with singular in-sight, the malignancy of the deteriorative process within. His test productions often show with amazing clarity how deeply he suffers from a diffuse awareness of impending catastrophe.</u> *

The theory that withdrawal processes are the deliberate attitude of the subject based on uncooperativeness may be rejected. The poor showing made on the performance section of the experiment by the paranoid schizophrenic must be explained on a different basis than attitudes of negatism, suspiciousness, uncooperativeness, etc. The poor showing of the paranoid schizophrenic group in the performance area, however, is not related to lack of effort produced by social attitudes which would have resulted simply in not <u>trying</u> to learn. The paranoid schizophrenic <u>could</u> not learn as easily as the schizoaffective. The cause of the difficulty was not resident in the relationship between the experimenter and the subject. In this case, the experimenter can be interpreted as standing for the social world and relationships to it. The cause of the difficulty lay in the task. The cause of the difficulty resided in inter-psychological areas, rather than inter-social areas.

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* Underlining of remarks made by this author.

This does not refer to any proposal regarding "ultimate" causes at this point. It is simply comparing the behavioral signs as they were obtained, to the explanations and predicted behaviors made by the "social withdrawal" theorists.

Another reason for rejecting the social withdrawal theory in the case of the paranoid schizophrenic group, is that in the area of social communication (the report of learning made by S to E after the task was finished), the paranoid schizophrenic group reflected greater facility in more subjects than the schizoaffective group. The schizoaffective group would have to be regarded as not having suspiciousness, negativism, uncooperativeness, etc., since they could learn almost or as well as the control group could. Suppose that this were granted. The schizoaffective group could not be properly regarded as schizophrenic, then. To support this logic, the following quotation is made from a long statement of Hunt (25) in which an explanation of social withdrawal in terms of extinction of social facilitation resources is advanced.

> Seen from this standpoint, the slowness and the excessive variability of the reaction-times of the schizophrenics and their failure to maintain a set to react might be taken to indicate partial extinction of their responses to social stimuli. . . . According to this interpretation, more complete uncooperativeness would represent a more complete extinction

> of social responses in these patients. Apathy would represent a more generalized extinction or weakening of the interests learned in the course of social interaction.

But in every other manner, as discussed in the formulation of the two types in the introductory sections, the schizoaffective group was properly regarded as being a type of schizophrenia. Most authorities rejected the notion that the schizoaffectives belonged in the manic-depressive syndrome. Clearly, it may be seen that when the qualitative behavior of a schizophrenic such as the paranoid type and the quantitative behavior of another type such as the schizoaffective are placed side by side, a number of superficially attractive theories regarding schizophrenia do not seem to represent all schizophrenia and do not adequately account for either of the types included in this study insofar as their behavior during this learning situation is concerned.

Some theories of schizophrenia state that continual frustration results in the substitution of an inappropriate response for the appropriate response which is blocked (inhibited). Some version of this formulation appears in most analytical systems and most of the psychobiological interpretations. From this point on, however, each system goes its own way. The analytical school tries to interpret <u>what</u> it is the organism wants, what satisfies these wants, what frustrations occur, and what results from frustration. Its important contribution, it seems to this author, lies in the concept of a dynamic goal-seeking organism. In addition, this is a dynamic, goal-seeking organism at every stage of its existence. The wants of the organism during its formative years seem to be generally characteristic for certain stages of development in our culture; the deprivations also seem generally characteristic in terms of our culture. The theory may be criticized for "animism," for "reification of concepts," and for numerous other reasons such as identification of the concept "sex" as synonmous with all other biological drives. The theory still offers a more complete account of the development of personality and character than seems offered by a behaviorist theory today. Cameron may be taken as an example of this latter school.

Cameron (8), who represents the psycho-biological viewpoint of Adolf Meyer and who represents Hunt's viewpoint at greater length, rejects both the organic and the analytic interpretations of psychopathology. The "structuralist" who is concerned with the mechanics of the organism as an anatomico-physiological unit leaves out of his interpretations of psychopathological behavior the "environmental, social, and personal" aspects. The analytic interpretation posits a separate "psyche" and generally creates a solipsistic system which "encourages introspective techniques and mentalistic interpretations."

Also rejected by Cameron (8) are the efforts of the psychiatric world in general to bring forth any satisfactory nomenclature. "all current attempts at classification of functional personality disorders are unsatisfactory; this is true for the neuroses as well as the psychoses." He describes the admixture of pathology in clinical cases and tends to conclude that the diagnostic criteria "are not based upon final and convincing scientific evidence." But few have ever claimed that they were based upon such a final formulation, or that anyone in the field had solved human behavior problems to the point where casual explanations satisfactorily accounted for all human behavior.

Cameron's viewpoint at times seems to resemble that of Allport's in its emphasis upon the uniqueness of every case and the possibility of understanding human behavior only in its concrete singular representations. Schizophrenia "presents us with a development, new and unique for a given individual's life history. . . . ." (8).

He advanced a theory to account for functional disorders based upon "defective development of role-taking skills in the individual." "For this view the <u>functional</u>

psychoses are major disorders in which the direct effects of structural, physiological, and biochemical pathology are minimal or absent, while personal and social factors are maximal." This viewpoint, as representative of a social behaviorism involving analysis of interaction between individual, and between individual and culture in terms of demands of the culture, may be extremely important; but it fails to account for the experimental results obtained in this study. Either schizophrenia must be regarded as just a term (based upon history and now a relic), or it must be regarded as structurally organized in some way (even though the structure is complex and poorly understood). Cameron's viewpoint inclines toward the former interpretation of schizophrenia. The systematic variations found in these experimental results cannot be interpreted in terms of a theory which lies outside of the second viewpoint regarding schizophrenia. This experiment had an operational frame of reference within theories of schizophrenia positing systematic relationships between somatic and psychic oomponents.

Cameron analyzed the behavior of schizophrenics "in situations requiring verbal and manipulatory solutions. . ." for problems similar to the present experimental task. From his results came the viewpoints quoted and referred to in the introductory sections. These viewpoints were intended to dismiss the validity of concepts of "abstract" and "concrete" behavior evolved by Goldstein. Cameron's own results were summarized by him (8) as follows: (1) the talk of the schizophrenic is characterized as "asyndetic," "metonymic," and "interpenetrative;" problem-solving behavior is described as "overinclusive," "noncorrespondence," "transformation," and "generalization." This behavioral categorization is another effort to describe more accurately schizophrenic behavior, but to what is this behavior related? It seems to hang in "objectively" thin air instead of "subjectively" thin air. A "pragmatic" approach such as Cameron's must be considered as "unique" as it considers its subject matter. A behavioral interpretation of withdrawal and motivation as unique events cannot be dealt with systematically.

Organic Dysfunction

1. Resume. Another question that may be asked is whether the results for the clinical groups suggested a relationship to organically brain-injured persons. An organic group was not included in the experiment; but the experimental hypotheses were formulated from a number of facts known about the behavior of brain-damaged persons, reported in studies reviewed.

Such subjects cannot plan ahead, are likely not to be able to carry several thoughts in a loosely held "hypothesis," are not likely to recognize mistakes, look to the examiner for continual reassurance and guidance (catastrophic behavior), do not generalize or abstract but regard each aspect of the stimulus situation as having equal value and equal right to attention no matter how irrelevant such aspects may be. Goldstein summarized these behaviors by the concept of "concrete attitude."

Test results from which Goldstein's formulation was derived, were not results which furnished primary quantitative data yielding rate of process measures. Quantitative measures were considered a necessary correlative to any qualitative analysis. When the problem was reviewed in terms of concept-formation as an aspect of a learning situation, practically no clinical studies were found which indicated the direction for predicting behavior.

Therefore an assumption was made that the speed of learning in organic brain-damaged subjects is decreased because of injury to processes of abstraction and generalization. Concretization of thinking reflects this same injury but from the descriptive viewpoint. Schizophrenics resembling organic brain-damaged cases, then, were predicted to show decreased speed of learning and concretization of thinking. If a schizophrenic showed concretization of thinking but learned quickly, considerable doubt would be cast on the hypothesis that such a subject resembled an organic brain-damaged case.

This hypothesis was based on results of work of Hebb, Goldstein, Bender, etc., and the theoretical background provided by Jackson, Lashley, Head, Goldstein, and others reviewed in more detail in the introductory sections.

The key word in the whole formulation, however, was "resembles." Functional duplicates, however, can be found for almost any type of organic damage that can be anatomically or physiologically demonstrated. Morgan (30) said of this:

> Stage fright may make a person just as speechless as he sometimes is after certain brain lesions. In some of the postepileptic states we see people unable to understand written or spoken language, just as though they had severe lesions of the brain. In hysteria and neurotic disorders we sometimes see cases of inability to recall names of familiar persons or objects - the same kind of inability that occurs in some brain injuries. It is, in fact, possibly by suggestion and hypnosis to duplicate most of the syndromes of impairment that occur in brain damage. . . .

Of what value, then, are results which lead diagnostic thinking in the direction of brain-injury, but which stop short on the word "resembles" in concluding that such a case was brain-injury? The unfortunate state of affairs reflected here is simply that the causes, areas, and processes involved in many brain cases often cannot be detected by clinical means. What of schizophrenia? Schizophrenia, for example, has as many adherents in the field postulating "organicity" as it has in the field postulating "functional" disorder. Bellak (2), after a lengthy trip through 39 etiological explanations for schizophrenia, concluded:

> The etiological factors of the deficit reaction known as schizophrenic reaction type or schizophrenic syndrome may range from a hypothetically completely psychogenic nature to a hypothetically completely organic nature. . . . . . As relatively completely psychogenic, one would consider a case in which early childhood setting is consistent with the dynamic conceptualization of a traumatic character formation particularly in the psychoanalytic sense; where character manifestations can be dynamically understood as forms of maladjustment; where the onset of the disease is manifestly associated with psychological trauma and where many manifestations can be understood, interpreted, predicted, and controlled on the basis of psychological operations.
>
> . . . .
>
> One might wish to consider as of predominantly organic causation of an essentially schizophrenic type those cases of mental diseases where, with our modern means of diagnosis, we can establish an organic etiology of the mental picture, such as demyelinization, atropy, or liver pathology, that otherwise would be definitely diagnosed as dementia praecox. We would conceptualize such a case as the schizophrenic type as due to destruction or dysfunction of brain

> tissue by various means and corresponding to an organ defect. However, even in such cases we feel, as many investigators do, that the psychotic manifestation of this organic deficit is definitely determined by the previous (psychologically caused) personality type. . . . . .

Psychological examinations and other inquiries such as experimental studies have as their objective the eventual task of separating the elements of personality distorted by organic pathology from elements of personality distorted by conflict in the personality. But a stand must be taken at some point -- although these points will shift continually in the search for this knowledge and the slow acquisition of this knowledge -- regarding what is expected in one case and what is expected in another.

It had been found that both schizophrenics and brain-damaged cases tended to do poorly on novel performance-type tasks. A host of investigators following the lead of Goldstein had predicted that on such tasks, both schizophrenics (some at least) and organics would reflect a concretized attitude and performance. A pilot study using the concept-formation test described in this experiment had indicated that paranoid schizophrenics could not form concepts which organized non-verbal stimuli in spatial relationships. This suggested that such individuals bore a resemblance to the schizophrenic type reported by Goldstein (20), a type also unable to form concepts on a different but related performance task. Such types were additionally assumed to be explainable in etiological terms more fully from an organic viewpoint than from a functional viewpoint. Such a stand must be taken, or the net result is equivocation. Cameron (8) said of this matter, "Although the hypothesis that in schizophrenia one drops from a conceptual or abstract to a perceptual or concrete mode of thinking need not necessarily imply the intervention of cerebral histopathology, in actuality the two assumptions usually go together."

The schizoaffective type was included in the study for comparative reasons primarily. Preliminary thinking degree of loss of ability raised the question of whether subjects in this group would show any decrease of ability at all. Schizophrenia, it was decided, represented some deficit reaction as a total social adjustment pattern; schizoaffectives would tend to reflect some deficit in ability to learn, but this degree of loss was assumed to be less than that exhibited by the paranoid group, from whom a remarkable resemblance to the organic brain-damaged type was expected.

The experimental hypotheses, however, were not validated in terms of experimental results for the clinical groups. The following sections and chapters attempt to relate the findings to formulations reviewed in the introductory sections.

Abstract and Concrete Behavior: Reevaluation

The question might be asked, whether there were two experiments conducted. The subject was not instructed that he would be quizzed about his learning methods after the successful completion of learning. The first experiment involved: (1) ability to comprehend instructions, (2) ability to apply effort and to learn, (3) ability to complete the task. No verbalization was necessary during this phase of the experiment. Several subjects were found who actually said not a word during the whole course of learning. The second experiment involved the ability to put into words the recollection of what occurred as a conscious experience during the learning.

When the experiment is divided into two separate phases, each may be clearly seen to relate to an area of difficulty for the clinical groups. The major deficit for the paranoid schizophrenic group occurred during phase I; the major deficit for the schizoaffective group occurred during phase II. Connected with phase I is the problem of the paranoid schizophrenic who has severe loss for visual-motor learning, but no major loss for verbalized recall of learning in concept-formation terms. Connected with phase II is the problem of the schizoaffective who has mild to no loss for visual-motor learning but severe loss for verbalized recall of learning in concept-formation terms.

Verbal Recall of Learning

Most reviews of concept-formation studies, which state that concept-formation may occur without the subject being able to define verbally the process, are based on experiments of Hull. For example, Bills (3) said, "When the general concept emerges it may not be explicit, nor capable of precise definition. Hull has shown that capacity for verbal definition is not an essential requirement for making correct responses to generalized concepts."

There is also a tendency to identify processes of abstraction, and often generalization, with concept-formation. A similar conclusion was reached by Bills (3) regarding ability of the subject to define verbally processes involving abstraction. "Presumably this (reacting to similarity in experience) requires a certain amount of abstraction from the whole, though it is not necessary for the process of abstraction to be conscious or deliberate." Such statements reflect the conclusions of Hull and others who have identified the processes of abstraction with concept-formation.

The point of view taken in this section is that processes of abstraction and generalization were not conscious events recalled by the subjects. The subject verbalized (or failed to verbalize) what could be recalled after the learning, whether one minute after the learning or half an hour later. Meanings — words, images, feeling states, etc., — can be recalled but not processes. Abstraction and generalization are considered processes, not meanings. The subject remembers what was abstracted, not the abstracting.

It may be that the formal structure of logic and language helps to create a cause and effect relationship which is often assumed to represent psychological processes rather than the result of centuries of logical attitudes toward communication. After writing down a series of relationships on paper, one can also write a conclusion which represents a logical relationship among the highly similar items on the paper. Between the premise and the conclusion are intervening steps by which another person can trace the "logic." This entire experience, however, reflects the adoption of a "logical attitude," not the demonstration of psychological processes which have a "logical" order inherently similar to the relationships put down on paper (which are often confused by over-ideational character-types).

> Paranoid schizophrenic male subject D.G. said, "I noticed the similarity between 2 and 7. 2 had a ring. Both were on an angle. I took that into consideration, too."

A process or series of processes may be inferred which involved for the subject a certain complex of attentive states of varying degrees. There were attitudes of acceptance or rejection toward motor movements as part of a total set toward the task (making mistakes, learning from mistakes, noticing similarity, etc.). When asked how he learned, he replied, for example, as in the quoted remarks. At this point he remembered some parts of the flux of events and verbalized these as "similarity" (a word denoting a process), a "ring" (visual image recalled by a process), an "angle" (a general word denoting a class of relationships involving physical elements of an object). He related this to the examiner, however, in terms of a language sequence which implied a good deal more than it made explicit. "I took that into consideration" could mean that the subject was aware of abstracting. But it could mean that the process, stimulated by the similarity of stimuli and by a continuous reaction between vision, hand movement, verbal symbols, etc., ended at some point in a verbal meaning or visual meaning entering consciousness (having been successfully found in the hierarchy arrangements of verbal and visual symbols held in memory).*

The point made here is that recall of learning involved: (1) the motor-expressive behavior of "reporting" and (2) recall of conscious events during learning. But processes involved in learning were not recalled.

The difficulty experienced by schizoaffectives was associated with (1) and (2) as a behavioral unit, not with processes involved in learning (abstracting and generalizing processes). This can be demonstrated by a comparison between the control group and the schizoaffective group based on one of the tables in the Results chapter.

A comparison between design units learned in fewest trials and design units learned in most trials for the control and schizoaffective groups has been listed in Table 21 . The design groupings in the table were arranged on the basis of an analysis of the average number of trials required by the control group subjects to learn each design. Three groupings were found. The first grouping was found to be associated with the greatest degree of reported learning by concrete images. The last three, the hardest to learn, were rarely reported learned in terms of visual image associations but were reported learned in

* Based on the discussion of Rapaport in the introductory section regarding development of the organism and learning.

great degree by inclusion in concept-formation groupings.

The average number of trials the schizoaffective group required for learning each design was derived. The designs were grouped in exactly the same way as for the control subjects. The same order of differences in ease and difficulty of learning were found although the magnitude differed. It may also be mentioned here again, that the schizoaffective group had only six subjects reporting concept-formation while the control group had fourteen.

The results suggest that the order of difficulty for learning the designs was the same for both groups. The schizoaffective subjects at a level below conscious experience reacted to the same "realities" as the control subjects and demonstrated this in terms of the results in the table mentioned. The difference between the control group and the schizoaffective group was that the former reported the difficulties of the problem generally in terms of concept-formation while the schizoaffective reported these same difficulties in terms of concretizations. The former learning method is what Goldstein and others have called the "abstract" attitude while the latter has been called the "concrete" attitude. The former learning method was supposed to involve processes of abstraction and generalization, while the latter were supposed to represent disintegration of ability to abstract and generalize. Furthermore, as was discussed in the introductory sections, these attitudes represented a non-continuous order of events. Both could coexist, but both were not on the same continuum of processes.

Continuous Relationship Between "Abstract" and "Concrete" Attitude

Many schizoaffective and paranoid schizophrenic subjects were found (as was reported elsewhere) who reported learning halfway between concretization and concept-formation.

> Paranoid schizophrenic male subject A.R. said that designs #3 and #7 "were giving me trouble." He learned #3 because it "had four downward vertical strokes" and #7 because it "had six more or less vertical strokes."

This report is certainly somewhere near what was required for concept-formation, but still included the concrete experience of counting tiny lines and remembering the numbers in each part counted. The words for the abstract attitude in this case would have been "more" and "less" referring to number of marks. But this is what the subject did, although he did not report in these terms. He knew that there were more strokes in one and less in the other. The general concept to which all the terms belong is "number." The subject, however, reported in terms of what has been referred to as "physical description," a concrete type of learning.

In other words, "concrete" and "abstract" apply only to the meaning (symbol), not to the processes involved by which the meaning became conscious (reportable item). Concretization does not apply to the hypothesized "abstracting" and "generalizing" processes; it applies only to the reported end of such processes.

How could such processes be concretized? Even if they were reduced in quantity, they would still be abstracting and generalizing processes. If they were reduced to a completely inoperative state they would cease to exist; but they would not then be concretized.

Some disintegrative process exists, but seems to concern motor-expressive behavior areas i.e., the reported meaning (which include bodily attitudes as well). One might speak, as did Bychowski (7), of a kind of "agnosia" of thinking, if one meant thereby that the upper levels (the general concepts) in the hierarchy of concepts, were not being reported by the schizoaffective group. This returns the discussion to a critique found in the introductory section and pertinent at this point (page 38).

> While abstract and concrete attitudes were considered generalized capacity levels, both referred to the response portion of a receptor-central process-response trichotomy. Goldstein specifically said: "In order to avoid misunderstanding, we have to emphasize that the process of disintegration in the

> direction of concrete behavior does not prevent the arousal of ideas and thoughts. What the deterioration actually affects and modifies is the way of manipulating and operating them."
>
> According to such a viewpoint, there is no "central aphasia," but a degree of apraxia. This same difficulty, of distinguishing between the response as an observable behavioral element and response as an inference concerning internal processes is encountered in Vinacke's paper on concept formation.

Goldstein's definitions (20) of concrete and abstract attitudes were quoted. The definition of the concrete attitude, or a description of it, is requoted.

> The concrete attitude is realistic. In this attitude we are given over and bound to the immediate experience of the given thing or situation in its uniqueness. Our thinking and acting are directed by the immediate claims made by one particular aspect of the object or situation in the environment.

It is concluded that Goldstein's first formulation (20) applies to these experimental results and that the second involves overgeneralization insofar as these results are concerned. "What the deterioration actually affects and modifies is the way of manipulating and operating them." This locates the defective integration in the motor-expressive areas of the total learning behavior. This applies to both deficits in the clinical groups.

But the implications of such a conclusion do not apply to the whole personality. If response processes are different from central processes, "abstract" and "concrete" thinking do not exist. All "thinking" is generalizing, abstracting, correlating processes. There is no abstract thinking any more than there is concrete thinking. There are abstract and concrete "thoughts." Thinking involved in a learning problem is related to processes designated as abstraction and generalization. These cannot be concretized; they can be put out of commission, probably, in other kinds of pathology. But they were not inoperative in the two clinical groups studied.

The fact that the whole personality is not "concretized" (that ability in one area exists beside deficit in another area) tends to cast doubt on the more usual organic interpretation of the findings. As is shown in the next section, these constellations of ability and deficit bear a marked resemblance to lesser disorders described as character or neurotic types.

Learning Behavior In Relation To Character Type

The search for population "types" has spotted the history of philosophy, psychology, and medicine from Hippocrates to Fenichel. Some few years ago, an effort was made to trace behavioral difficulty to inadequate intelligence, reflecting an assumption that the various qualitative descriptions of ranges in I.Q. had associated with them predetermined tendencies to delinquency or psychopathology. Associated with this effort was the assumption of the invariability of the I.Q., or the invariability of what the I.Q. represented (mental age in relationship to chronological age). In the clinical setting, patients were described as having a mental age of eight years. The impression left was that this patient acted like an eight year old because the I.Q. of this patient was similar to that of an average eight year old.

Even as recently as 1947, Hunt (25) went out of his way to point out that "The fact that manic-depressive patients in these studies have approximately a normal average mental age refutes Duncan's (1936) argument that mental deficiency is an important etiological factor in this disorder."

A more recent trend is to regard the various estimates of intellectual functioning as representative of the integrated total personality (or representative of the lack of integration in the total personality).

This concept of personality has been formulated as a clinical viewpoint by several writers. Schafer's statement (38) seems representative.

> Clinical psychological testing starts with the proposition that a person's distinctive style of thinking is indicative of ingrained features of his character make-up.

> Character is here understood as the person's enduring modes of bringing into harmony internal demands and the press of external events; in other words it refers to relatively constant adjustment-efforts in the face of problem situations. The modes of achieving this harmony are understood to consist essentially of reliance on particular mechanisms of defense and a selective responsiveness to stimulation associated with these defenses. The defenses emphasized may be repression, denial, projection, intellualization, or any of the others described in the psychoanalytic literature. The selective responsiveness to stimulation is the attempt to guarantee that life situations will be so perceived or organized as to preclude the entrance into consciousness of especially disturbing material.

One of the most extensive presentations of what is meant by "character" in current clinical usage is presented by Fenichel (12). He pointed out that the older clinical viewpoint toward, for example, hysteria was to regard the ego as a defense source "holding back" a neurotic conflict which at times would break through. Then the patient would become an hysteric. Such a viewpoint is inconsistent and unreal when confronted by facts of human behavior. "In modern neuroses, however, it is not a question of dealing with a hitherto uniform personality that is merely disturbed by some immediate event but, rather, with one that is patently torn or malformed, or at any rate so involved in illness that there is no borderline between "personality" and "symptom." He believed that the older viewpoint may have properly regarded neuroses as personality disturbances, but that indecisive humans of today who inherit cultural conflict from birth have developed "egos restricted by defensive measures." In other words, everyone has some neurotic defenses by virtue of the society lived in, and consequently tend to have character illness instead of something as superficial as a personality disorder.

Reaction formations which supress original instinctive attitudes and phobic defenses in the hysterical subject, for example, tend to become characterological. "Patterns of this kind are rigid, definitive, once-and-for-all formations." (12) The egos may have varying degrees of freedom. "In extreme cases the rigidity is a total one; in less extreme cases a relative elasticity may be preserved." (12)

Fenichel (12) said, "Character, as the habitual mode of bringing into harmony the tasks presented by internal demands and by the external world, is necessarily a function of the constant, organized, and integrating part of the personality which is ego; indeed, ego was defined as that part of the organism that handles the communications between the instinctual demands and the external world."

At another point he said (12), "Accordingly character disturbances are limitations or pathological forms of treating the external world, internal drives, and demands of the superego, or disturbances of the ways in which these various tasks are combined."

Of particular interest in the analytic theory are interpretations of the function of the "intellect" in the total service of the ego. Inhibition, as a mechanism, is one such reference (12).

> In addition to physical inhibitions, there are mental ones. Quite a percentage of so-called feeblemindedness turns out to be pseudo debility, conditioned by inhibition. . . . . Every intellect begins to show weakness when affective motives are working against it. . .

The analytic viewpoint (12) has related inhibition of thinking and speech with repression of interest in sexual matters.

> Studies have been made of a number of specific disturbances of intelligence, such as the failure of children in certain subjects at school, or their inability or unwillingness to study certain things. The analytic study of such cases corroborates what has been said about inhibitions in general. The particular subject, or something associated with the first introduction in this subject, or the personality of the teacher and his way of teaching, or an accidental feature that eventually had nothing to do with the subject proper, like a particular number in mathematics or a particular letter in reading or writing, proved to be associated with fundamental conflicts around infantile sexuality. . . .
>
> Closely connected with the inhibition of thinking are the inhibitions of speech,

> ranging from hysterical mutism and stuttering to insecurity in the manner of expression or in choice of words. Occasionally speech difficulties appear only in certain situations or in the presence of certain persons, situations or persons promoting the mobilization of old unconscious conflicts. Since thinking is intimately connected with speech, the conditions producing speech difficulties are quite similar to those producing inhibition of thinking.

Somewhat to be contrasted to inhibitions exercised over language formulations and speech mechanisims are inhibitions of "emotions and will" (12).

> Mental inhibitions are not limited to the sphere of intellect. There are also inhibitions in the spheres of emotion and will. Like psychogenically stupid persons, there are also persons who are psychogenically cold and affectless or indecisive and weak. Because their emotions are connected with instinctual conflicts, such persons inhibit their emotional life to avoid the conflicts; or they displace unconscious conflicts and therefore feel contradictory about any utterance of their will. They may overcompensate for emotional immaturity by an intense development of their intellectual life. There is also a real repression of the affective life, a sort of shutting out of all direct and warm relationships with persons and things, a general frigidity, so to speak. . . . . .

The hysterical character-type usually is associated with inhibition exercised over language and speech, whereas the compulsive and compulsive-obsessive character types are usually associated with inhibitions over emotion and will. The relationships of these character types to the two clinical group characterizations are obviously close. It would be impossible, and not to be expected, that a perfect correspondence would occur. Syndromes, character types, general tendencies, and averages all have a similar meaning in the clinical investigation.

There are extremely close relationships between a neurosis and a character neurosis. Two terms are used because the acceptance of dynamic-formulated character types is not universally accepted. The formulations, however, have often been accepted at one level and have been considerably abused at another. Parts of the thinking involved in the dynamic approach are often used descriptively rather than with the dynamic interpretation involved in their original form. Additionally, the descriptive formulations have fitted into clinical psychology. They are especially prominent as devices for the cross-sectional diagnostic approach of Schafer.

Diagnostic criteria associated with the obsessive-compulsive neurotic character-disorder are given by Schafer (38) as:

> The chief characteristics to be sought out are pedantic intellectualizing (perfectionism and ostentation, circumlocutory, circumstantial display of erudition), rationalizing and doubting

> (rumination, excessive qualification, overcautiousness), and rigidity (inability to be casual when casualness is appropriate, inability to permit full-bodied emotional experiences to develop).

These characteristics are found in various degrees in different quantitative and qualitative areas of the various tests discussed. This group is described as generally having a verbal scale level higher than the Performance level.

The hysterical neurotic character-disorder is described by Schafer (38) as follows:

> The chief personality characteristics to be sought out are emotional lability, impulsiveness, childish naivete in general and conspicuous sexual naivete, a tendency toward histronics, minimization of active and independent ideation as a means of coping with problems, a basic dependence on conventional precepts as guides to behavior, egocentricity and blocking of thought processes when confronted with "traumatic" (usually sexual but often aggressive) material in the tests.

This description is often summarized in clinical language by reference to an "acting-out" personality. This subject displays emotional behavior; the obsessive-compulsive type verbalizes his emotional reaction. Again, the relationship to the formulations of paranoid schizophrenia and schizoaffective psychoses are marked. The hysteric, additionally, usually has a verbal scale level below the Performance Scale level. The repressive mode of adjustment characteristically "is such as to render very unlikely the achievement of an over-all excellent Verbal level." (38)

The effect of psychosis upon these two types does not always result in a clear cut difference being found on conventional I.Q. tests. Reasons for this were discussed in the introductory chapters. Often enough, however, as was pointed out in the discussion of differences in diagnostic emphasis between clinical psychologist and psychiatrist, the pro-dromal character make-up emerged. The association of the hysterical character type with the schizoaffective psychotic, and the obsessive-compulsive character type with the paranoid schizophrenic, occurred often enough to constitue one of the bases for this investigation.

The results found generally substantiate the larger picture presented from investigations in a different area. The relative failure of the schizoaffective in the verbal motor-expressive area would be interpreted as related to pre-psychotic characteristic inhibition of ideational and speech components of experience. The relative failure of the paranoid schizophrenic in the visual-motor expressive area would be interpreted as related to pre-psychotic characteristic inhibition of emotion and will (the latter understood as meaning inability to react to emotionally toned situations by immediate motor-expressive behavior other than verbal).

Summary

The experimental hypotheses were invalidated by the results found. Paranoid schizophrenic subjects did not resemble the organic brain-damaged cases. The results formed a different pattern of ability in one area and deficit in ability in another area for each of the clinical groups. The areas involved were considered motor-expressive in function, not central processes (abstracting and generalizing functions). The schizoaffective subject demonstrated a type of "generalizing" aphasia; the paranoid schizophrenic subject demonstrated a type of constructional apraxia. These terms applied descriptively and only with reference to average tendencies. The results were not considered diagnostic for individual cases. Various theories pertinent to the type of schizophrenia investigated and the results found were reviewed. The theory that type of schizophrenia was related to the differential effect of age on human abilities was considered not applicable until further investigation clarified points mentioned. Theories of "social withdrawal" were considered inadequate to explain results obtained. Organic theories based on similarity of schizophrenics to organic brain-damaged cases, where the common defect affected functioning of the total personality, were invalidated. At a descriptive

level, a similarity was found between the results and a restricted theory applied only to motor-expressive functions. The psychoanalytic theory of selective inhibition of motor-expressive functions as ego defense mechanisms, resulting in character types, was found to relate closely to the experimental results. Behavioral similarities were noted between analytic descriptions of hysteric neurotic character disorders and experimental results of the schizoaffective group, between analytic description of compulsive neurotic character disorder and experimental results of the paranoid schizophrenic group. It was considered possible that the concept of "inhibition" might eventually prove to be a common explanation for the interpretation of schizophrenia as a functional disorder and the interpretation of schizophrenia as an organic reaction type.

CHAPTER VII

CONCLUSIONS, LIMITATIONS OF DATA, AND SUGGESTIONS FOR FURTHER RESEARCH

1. The results of this study indicate that rate of performance and learning methods reported for this task are correlated with disturbances of thinking and of affective expression.

2. The absence of disturbances of thinking and of affective expression is correlated with ability to report conceptual learning and rapid rates of learning (control group subjects).

3. The type of schizophrenia characterized by disturbances in thinking and by inhibited affective expression is correlated with ability to report conceptual learning and with extremely slow rates of learning (paranoid schizophrenic subjects).

4. The type of schizophrenia characterized by disturbances in thinking and by heightened affective expression is correlated with inability to report conceptual learning and with rapid rates of learning (schizoaffective subjects).

5. The hypothesis, that paranoid schizophrenic subjects manifest a deficit in ability to report concepts

which organize non-verbal stimuli in spatial patterns, is invalidated.

Limitations of Data

The conclusions of this experiment are limited in the following ways: (1) they apply to averaged tendencies and are not considered diagnostic in individual cases; (2) they do not apply to age ranges and I.Q. ranges different from those employed in this study; (3) they apply only to paranoid and schizoaffective types of schizophrenia and do not invalidate a hypothesis that other schizophrenic types might resemble organic brain-damaged cases.

Suggestions for Further Research

The average age found for each schizophrenic type was related to other reports of age in relation to schizophrenic types. The discussion of the tendency to an average younger age of the schizoaffective group suggested that an additional experiment could be conducted to determine whether or not schizoaffective psychotics represented a random sample of the early schizophrenic population: "A more conclusive study regarding the relationship between early schizophrenia and schizo-affective psychosis would be one made on a large group of early schizophrenics rated for various symptom formations. Factor analysis of the traits and behaviors rated would tend to determine the constellations of symptoms characteristic of the group" (page 198). The schizoaffective syndrome could then be compared to these findings and conclusions could be drawn concerning the similarity.

Another study which should be made is the analysis of learning involving concept-formation of subjects classified as hysteric and obsessive-compulsive neurotic character types. It remains to be seen whether the same type of results found to be characteristic of schizoaffective psychotic subjects are found to be characteristic of hysteric neurotic character subjects. A similar correlation would be sought between results of paranoid schizophrenic subjects and results of obsessive-compulsive character disorder subjects. Positive results in such directions would not only tend to confirm the theory of continuity between neurosis and psychosis, but would emphasize the continuity of characterological makeup and its contribution to the type of psychosis likely to occur.

The following hypotheses are proposed as general rules to be tested by further experimentation:

(1) Heightened affective expression, accompanied by any disturbance in thinking, is correlated with

inability to report conceptual learning.

(2) Inhibited affective expression, accompanied by any disturbance in thinking, is correlated with slow rates of learning.

APPENDIX

TABLE A

AGES, I.Q.'S, AND OTHER DATA OF SUBJECTS IN THE CONTROL GROUP

Subject	Age	I.Q.	Education (No. of years)	Major Occupation	Comments
			Control Group Males		
ERL	24	96	7	Farmer	Army:Cpl.
DE	24	104	12	Farmer	Army:Sgt.
RAT	25	105	11	Machinist	Army:Pvt.
RB	26	93	?		Army:Pvt.
DC	27	104	11	Mechanic	Army:Sgt.
KD	28	120	13	Army	
WC	29	95	9	Loom Operator	Army:Pvt.
JH	33	115	?		Army:Pvt.
JHu	35	117	10	Crane Operator	Army:Cpl.
RG	38	109	12	Salesman	
			Control Group Females		
PN	26	93	12	Hosp. Attn't.	WAC:Pvt.
GL	27	110	16	Housewife	
DLW	29	114	12	Personnel Clerk	WAC:Pfc.
LE	30	108	12	Beautician	WAC:Sgt.
EH	31	106	12	Clerk	WAC:Sgt.
VG	33	111	12	Housewife	
MH	34	110	12	Hosp. Attn't.	WAC:Sgt.
MRH	35	110	8	Hosp. Attn't.	WAC:Sgt.
SK	36	116	12	Dental Technician	WAC:Sgt.
MB	40	96	12	Store Manager	

TABLE B

AGES, I.Q.'S, AND VARIOUS DIAGNOSES OF SUBJECTS IN THE SCHIZOAFFECTIVE GROUP

Subject	Age	I.Q.	Psycholog. Diagnosis	Psychiatric Diagnosis	Staff Diagnosis
			Schizoaffective Males		
LM	20	110	Latent Schiz.	Simple Schiz.	Schizoaff.
JIK	21	92	Schizoaff.	Schizoaff.	Hebe. Schiz.
ED	23	95	Schizoaff.	Schizoaff.	Schizoaff.
FL	23	119	Schizoaff.	Schizoaff.	Schizoaff.
NB	27	102	Schizoaff.	Schizoaff.	Schizoaff.
HB	29	112	Schizoaff.	Schizoaff.	Schizoaff.
JG	35	94	---	---	Schizoaff.
RH	42	116	Schizoaff.	Schizoaff.	Undiag. Psychosis
RW	43	98	---	---	Schizoaff.
LG	45	103	---	Schizoaff.	---
			Schizoaffective Females		
KLS	19	96	Inconclusive	Deferred	Schizoaff.
MLS	20	115	---	Schizoaff.	Schizoaff.
MAF	24	98	Schizoaff.	Schizoaff.	Schizoaff.
MMS	25	107	Schizoaff.	Paranoid S.	Manic-Depress.
RB	25	121	Schizoaff.	Schizoaff.	Schizoaff.
LS	27	118	---	Schizoaff.	---
MG	30	98	Paranoid S.	Paranoid S.	Schizoaff.
CLG	31	97	Schizoaff.	Schizoaff.	Paranoid S.
AS	35	105	Schizoaff.	Schizoaff.	Paranoid S.
HTK	43	107	Depressive	Schizoaff.	Schizoaff.

TABLE C

AGES, I.Q.'S AND VARIOUS DIAGNOSES OF SUBJECTS IN THE PARANOID SCHIZOPHRENIC GROUP

Sub-ject	Age	I.Q.	Psycholog. Diagnosis	Psychiatric Diagnosis	Staff Diagnosis
			Paranoid Schizophrenic Males		
HK	28	112	Paranoid S.	Deferred	Undiag.Psy.
LS	31	98	---	Paranoid S.	---
AF	33	92	Paranoid S.	Paranoid S.	Paranoid S.
DG	33	114	Paranoid Cond'n.	Paranoid S.	Paranoid S.
ES	36	105	Schizoaff.	Paranoid S.	Paranoid S.
AR	36	120	Inconclusive	Paranoid S.	Paranoid S.
GF	37	101	Paranoid S.	Paranoid S.	Paranoid S.
JR	37	105	Paranoid Cond'n.	Undiag. Psychosis	Paranoid S.
FD	41	99	Paranoid S.	Alcoh'c.Psychosis	Paranoid S.
JR	42	105	Paranoid S.	Paranoid S.	Paranoid S.
			Paranoid Schizophrenic Females		
CB	23	108	---	Catatonic S.	Paranoid S.
LM	24	97	Paranoid S.	Paranoid S.	Paranoid S.
ES	27	92	Schizoaff.	Paranoid S.	Paranoid S.
CF	28	105	Paranoid S.	Paranoid S.	Paranoid S.
LS	31	98	Schizoaff.	Paranoid S.	Paranoid S.
CS	34	90	Paranoid S.	Paranoid S.	Paranoid S.
RM	34	116	Paranoid S.	Paranoid S.	Paranoid S.
DB	35	98	Schizoaff.	Paranoid S.	Paranoid S.
AC	37	99	Paranoid S.	Paranoid S.	Paranoid S.
LB	40	95	Paranoid S.	Paranoid S.	Paranoid S.

TABLE D

FREQUENCY DISTRIBUTION OF SUBJECTS BY AGE IN CONTROL, SCHIZOAFFECTIVE, AND PARANOID SCHIZOPHRENIC GROUPS

Age	Control Group	Schizoaff. Group	Paranoid Schiz. Group
19 - 20		2	
21 - 22		2	
23 - 24	2	3	2
25 - 26	3	2	
27 - 28	3	2	3
29 - 30	3	2	
31 - 32	1	1	2
33 - 34	3		4
35 - 36	3	2	3
37 - 38	1		3
39 - 40	1		1
41 - 42		1	1
43 - 44		2	1
45 - 46		1	
Σ	20	20	20

TABLE E

FREQUENCY DISTRIBUTION OF SUBJECTS BY I.Q. (FULL-SCALE WECHSLER-BELLEVUE) IN CONTROL, SCHIZOAFFECTIVE, AND PARANOID SCHIZOPHRENIC GROUPS

I.Q.	Control Group	Schizoaff. Group	Paranoid Schiz. Group
88 - 90			1
91 - 93	2	1	2
94 - 96	3	3	1
97 - 99		4	6
100 - 102		1	1
103 - 105	3	2	4
106 - 108	3	2	1
109 - 111	4	1	
112 - 114	1	1	2
115 - 117	3	3	1
118 - 120	1	1	1
121 - 123		1	
Σ	20	20	20

TABLE F

METHOD OF LEARNING REPORTED BY SUBJECTS

Control Group: Males

1. Subject E.L.: He remembered the "first three first" (horizontal row). He tried to learn this row. Then he tried to learn #5 and #9. #5 he distinguished by the "little curve on top;" #4 by "large black marks." #6 and #8 were hardest; they were confusing because they "looked alike." When he tried to remember the others, he forgot about these two.

2. Subject D.E.: "By the way they're shaped. Just pictured it in my mind - the whole thing. When I saw the shape of it I knew pretty well what block it went in." By "shape" he meant the following:

#2: "screw in a tap"
#3: "elbow"
#4: "old fox horn"
#5: "piece of wire"
#7: "hat"
#8: "top part as S"

He distinguished #9 from #5 as #5 being number 9 upside-down. #9 was also broader and heavier than #5.

He "pictured" the whole board in terms of "middle," "top," and "bottom." He learned #2 and #3 together; the "elbow" pointed directly to the "screw" and "you knew it went to the right."

3. Subject R.A.T.:

#2: "circle"

#3: "angle" curved in opposite direction of angle of corner of the board.

#9: "looked like hash-marks - like a sleeve and hash-marks."

#7: "hat"

Otherwise, he just remembered where they went on the board. "Just get the one's I knew were right and guess at the rest."

4. Subject R.B.: This subject, on the first trial, laid out the cards by rows, selectively choosing the chips. This took 52", his longest time per trial. From

TABLE F Continued

then on, he placed the chips in randomized order given to him. He learned, he said, by "starting with rows." After he "knew some," this wasn't necessary. He paid attention to the size and shape of the lines.

#1: this had about nine little marks on the top part of the design.

#3: the side part of the design had four little lines.

#9: had six little lines on the bottom.

#5 and #9 "looked so much alike."#9 lines "are thicker than #5."

#2: "by horseshoe top on there."

#1 and #4: "not like the others, so made it easier."

#3, #6, and #7: #6 "had lines going across." #7 reminds me of "a camera when you look at it."

5. Subject D.C.: He learned the top row first, the 2nd row next, and then the third row (horizontal). He also had locations for different designs in terms of outstanding characteristics.

#3: "made a corner"

#5 and #9: #5 "sitting more in the center." #9 "more to the left."

#4: "by the form itself. Turns toward the right from the center."

6. Subject K.D.: He started with the top row, learning #2 first, then #1 and #3. Then he learned the two bottom row corners (#7 and #9).

#5 and #9: were similar. #9 "curved to the right and number five to the left."

He did not learn #8. (This is a remainder concept.) It was the only one left.

He confused #3 and #4. #4 "had a curve like a hook."

#7: a "hat;" also "in the corner."

#3 and #6: were confused. #6 "was straight up and down." #3 "lines had a hook."

7. Subject W.C.: "When I put them in, I studied them." He studied the smaller element of each design, as a selective element, letting "the big ones go." Questioned about this, he said, "If I learn the way the small ones run, the big ones come easy." He seemed further to divide the designs into smaller and larger ones.

#3: "small part runs straight out."

TABLE F <u>Continued</u>

#6: "small part runs" diagonally. The other part "runs vertically."

#9: "runs clockwise"

#1: "runs up"

#5: "runs clockwise"

#4 and #8: "are big ones"

#2 and #4: "easiest." One had a circle and the other a hook mark.

#9 and #8: "hardest" because of big curvilinear elements.

<u>8. Subject J.H.</u>: "Put them in, studying them, placing them." He thought they looked like "just objects, drawings on the paper, that's all."

#4, #2, and #1: easiest. "They stand out from the rest of them. Have a different detail."

#8 and #9: were most difficult. "Resemble each other in a little way."

#6: "was easy. Had a contrast through the middle of it. Two sections of straight line."

<u>9. Subject J. Hu.</u>: On the first trial, he started selectively to place chips by horizontal rows. He "memorized ones that were outstanding." He also tried to "put them in according to that order" (by rows).

#4 and #2: "outstanding." One was a "spiral" and the other a "circle."

#9 and #5: #9 was "thick, thin, then thick again." #5 was "almost straight."

#3: "horizontal and vertical"

#6: "all horizontal lines"

#7: "on oblique"

He had difficulty with #5 and #9, and #3 and #7. The former he "had to differentiate between them a couple of times." The latter, he "couldn't remember which corner right away."

<u>10. Subject R.G.</u>:

#4: "horse's head"

#2: "flower"

#1: he remembered outstandingness of pattern.

#5 and #9: tried to remember by way of "curves."

#3 and #7: learned together. #7 "on slant;" #3 "right angle."

#6: remainder; "last one left."

TABLE F Continued

Control Group: Females

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1. Subject P.N.: "I was really determined to do it without watching the board in front of me," she said. She said she learned because they were "all different designs."

#5 and #9: "similar" - #9 has "heavier lines and more lines."

#2: "little round thing in one at center top."

#1, #4, and #7: "similar in little lines." #1 had "thin lines at top," #4 had "heavier lines in center," and #7 "had heavier lines and longer."

#8, #9, and #5: "go together. Have heavier lines and longer."

2. Subject G.L.: At the end of the third trial, this subject said: "It seems to be harder than at first. I know why it's so hard. I'm trying to figure out a way of learning and I haven't." By trial 10, she had evidently discovered a "method," but the obvious behavioral elements were studying the learning board for ten or fifteen seconds occasionally, placing a chip without looking, then checking to see if she were correct.

"First one I learned is (#2) - circle."

#5 and #9 next: the former "straight one;" the latter "curled one."

#1 and #4: "looked similar. Went up and down."

#3, #6, and #7: "had most trouble. Finally figured out (#3) were steps, (#6) was ladder. Steps came before ladder." #7 seemed to be a process of elimination by means of learning the other two associated together.

3. Subject D.L.W.:

#1: "Figured this as 1."
#2: "This had two objects so I used this as 2."
#3: "This ┘ I used as bottom part of figure 3."
#4: "Used as 4. This was hardest, I think. Confused with #3."
#5: "This I just knew went in the middle."
#6: "This had six lines down at the bottom."
#7: "This is a camera."
#8: "This had two lines."
#9: "Reminded me of a cat's tail."

TABLE F Continued

4. Subject L.E.:

#2: "Remembered it well. Had a circle."

#1: Confused her. Reminded her of #9, but she had learned where nine went.

#3 and #7: "similar." Former one went up, and latter went slanting.

#4: "Only one with (curve."

#5 and #9: Latter "is cut deeper in" circular element than former.

#8: "Two segments. Double rows. Only one like it."

5. Subject E.M.H.: Learned #2 and #4 "first. Struck my eye. Made more of a picture." Former was like a "vase and circle." Latter like a "cane."

#1: Upper element like "ripples of water." Lower like "fence."

#3: "Tree, grass growing around it."

She realized, she said, that #5 and #9 had similar designs, also #3 and #7. When she put in #8, she could correctly place #5 and #9. But she was vague about these.

6. Subject V.G.:

#4 and #2: "were easy." Latter was like a "circle, fence with flower." Former was like a "horse."

#3: "tree"

The others did not remind her of anything. She said that she had most difficulty with #5 and #9, learning finally that #9 had more marks and curved to the right, while #5 curved to the left.

7. Subject M.H.:

#4: "Indian"

#3: "a corner." In line with it were #6 and #9, a "little alike."

Middle line (#2, #5, and #8) had "rounds, little curvy lines."

#4: "looked like an Indian," so others were "just left." (#1 and #7)

This was overall vertical row learning.

8. Subject M.R.H.: "Just by looking, remembering shapes."

#5 and #9: "Looked pretty much alike." They were differentiated by different curves.

Otherwise, this subject could not account for her learning.

TABLE F Continued

9. Subject S.K.:

This subject thought that #5 and #9, and #3 and #7 "looked alike." #5 "went left," #9 "went right."

#3: had on the bottom, while #7 had on top.

#1 and #6: looked alike, but #1 had on top, while #6 had on bottom.

#2 and #4 she could not explain, except for the "circle" of #2. When she placed #5, she "just remembered" that #8 went underneath.

10. Subject M.B.: "The shape of them." She classed "them as different things as I went along."

#2: "wreath"
#1: "tree"
#3: "hinge"
#4: "animal"
#5: "worm"
#6: "as two objects because they are apart."
#7: "pin"
#8 and #9: "as two separate objects shaped differently."

Schizoaffective Group: Males

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1. Subject L.M.: He said that he memorized the center one first. Then he tried to learn the upper line of certain designs with "different variation" of size. His description was a little confusing. More specifically, he gave the following:

#3: "left angle"
#6: "right triangle"
#5 and #9: Latter "was thicker surface."
#8: "Two longer lines than" #1.
#7: "A T for that corner."
#4: "One left, easy to put."
#2: "circular. Only one with an oval in it."

2. Subject E.D.: On the first trial, this subject laid all the chips on the table, duplicating the horizontal rows of the learning board, but upside-down. In other words, the lower row was at the top, then the middle row, then the top row. After doing this, he placed the chips in, taking the top row first and placing it in the

TABLE F Continued

bottom row of his learning board, etc. His only explanation for learning was "row 'em out." (This patient had been wildly manically excited when he entered the hospital a few days previously, and filled with paranoid grandiosity and persecution).

3. Subject N.B.: "I don't know myself." "Just shapes of them. Knowing where they're at." By this he meant in detail:

#5: "Thin. I knew it went in the middle."

#1, #4, and #7: These were learned together. #1 had a "mark in the middle," #4 had one "on bottom," and #7 "on side."

#3 and #6: These were learned together. #3 had a "little mark on the left hand side," #6 "little mark on the bottom."

4. Subject H.B.: He seemed to use differences between the designs. "One a little different from another." "Different shapes." "I just say, remember where they were sitting." "I'd just say, this design here, this design there, and this design there."

5. Subject J.G.: The large number of trials resulted from the subject's insistence that he try with the board down before he had learned the chip positions. When told he had made mistakes, he would guess which they were, and, guessing wrongly, would correct himself. He claimed to learn #2 first, then #3, then #7.

#7: "L shape upside-down."

#3: "pointed left"

#5 and #8: Claimed these confused him. #8 had "two verbal lines."

#9: "Similar to the boomerang on the right corner."

#1: "similar to a worm"

#4: "fingerprint"

#6: No significance; only one like it.

#2: "zero with a dash"

6. Subject R.H.: No particular method the subject claimed. "I just tried to picture the board. When I picked up a chip, I tried to picture the board in relation to the object. I just tried to picture that board in my mind."

7. Subject R.W.: This subject did not know how he learned.

TABLE F Continued

8. Subject L.G.: "First three I had about right. Began with #2, made me lucky. I used a little system that made things easy for me. (#3, #4, #5) used this in two ways. Part of a circle. Used half-circle as a guide, but you didn't use it everywhere. See, you're drawing something (meaning out on the board). A figure in pencil-dash form. Rest just came from using it so much."

9. Subject J.K.: "Tried to get general idea." "Tried to understand what they are and associate them with things I knew." "Some gave me certain ideas of objects. I gave them names."

#1: "water-faucet"
#2: "hazy - a hole"
#3: "don't know - no name - rectangular - a corner."
#4: "an elephant's trunk"
#5: "a paint-brush"
#6: "no name"
#7: "sombrero hat"
#8: "S with a little thing by it"
#9: "snake"

"Each time a few more. As they came to my hand I felt they belonged there" (a certain place).

10. Subject F.L.:

"I was associating" (#2, #5, #8)

#2: "Most different, in center spot." He picked #5 and #8 as underneath and "contrast and different."

#3, #6, and #7: "Get screwed up on." He mentioned he made a mistake on these. "When you make a mistake, you got to watch out for the mistake."

#5 and #9: "lot of people get mixed up. Me, I'm different. I see where they're there to trick somebody." The former was actually learned because it went to the right, the latter to the left.

Schizoaffective Group: Females

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1. Subject K.L.S.: She learned the first row, she said, then added a few until they were all learned.

#2: "circle"

TABLE F Continued

#4: "this was not an exact copy," so she knew this one because it differed from the one on the learning board.

She confused #3 and #7. The former she called an "L backward;" the latter, "little messed up on one side and bottom."

#8, #9, and #5: were the "longest ones." But #5 had "thinner lines."

"I really don't know. I just did it so many times."

2. Subject M.L.S.: "I just looked at the shapes of them. I realized that this belonged here and that there just from doing them over and over again." By "shapes" she meant "the way they're formed." And by this she meant:

#1: "looks like a little can with something underneath it."

#2: "wreath and violin underneath"

#5: "exclamation mark"

#8: "S with 1 underneath it"

#9: "question mark"

#4: "pipe"

#3, #6, and #7: "I don't know what these look like. I just remembered the shapes of them."

3. Subject M.A.F.: This subject said that she tried to learn by horizontal rows. "I learned it by looking at the first cards and the board up there.

#1: "I thought to myself how many lines there were in the first one. I pictured how they swing. I pictured to myself how many straight short lines and they are coming straight down. Then how many lines in the V shape, except the V shape is upside-down."

#2: "The lines were all in a circle form and under the circle several little straight lines. Main thing was the circle."

#3: "Several short straight lines coming straight down and on the left were several straight lines."

#4: "Pictured like the shape of a question mark. The question mark is backwards."

#5: "Like a question mark, too."

#6: (she thought of "steps")

#7: "Several short straight lines forming steps but some steps went off to the left."

#8: "Several short straight lines forming steps but going in opposite direction of a question mark –

TABLE F Continued

laying on a side."

#9: "Pictured it as my hand would lie down. My hand would lie down in that direction so I would know. Also a question mark."

(Note use of kinesthetic aid)

4. Subject R.B.: "I tried to get some similarities between them. Or something outstandingly different."

"Easiest one was #2. It had a circle and straight line. Knew the one under it was a tail or hammer" (#5).

#4: "neck of a horse"

#1: This was one of the last learned. She said that she learned it as a "1."

She tried to learn the two corners (#3 and #7). #3 was a matter of a right angle and directional aim of lines.

#5 and #9: Confused on these. Latter had a different sort of twist.

#9 and #1: These were hardest, she thought.

5. Subject L.S.: This subject held the cards in her hand, and without looking away once, studied the board for three minutes. Then she laid the cards out and duplicated their position on the learning board. Then she put in the top row, middle row, and finally the bottom row. On the second trial, she laid out only the chips she had not as yet learned.

"By association." "One thing, I've learned braille." She learned "across the rows, left to right, three times. Later on it didn't make any difference. Each one reminded me of something."

#2: "circle." Also, she connected this with the mark for the shorthand sound of "s."

#3: "Three perpendicular lines and also the third chip."

#1: "Sort of just memorized. Only one that has nine lines. Nine is my lucky number."

#9: "Nine has three lines. Three is my lucky number. I don't like that, on the bottom.

#4: "Roman helmet, like on my blouse (pointing).

#8: "A little sea-lion. I bought a little stuffed sea-lion at the aquarium in New York. Sea-lions live at the bottom of the sea (this for bottom position of #8)."

#7: "First diagonal I came to in braille was E. This is definitely diagonal."

TABLE F Continued

6. Subject M.G.: "Forcing my concentration. Blotting out everything else I was doing."

"It was artistic way."

#4: "horse's head"

#1: "Navy man - Army man - Lieutenant's rank."

#3: "Right hand corner of my mind."

#9: "I just marked it in my mind as down here."

#8: "Crossways"

#2: "Jack-o-lantern." "Like we made in kindergarten when I was a child."

7. Subject L.V.G.: She said that she learned by horizontal rows. She did not "call" them anything. In a general way, she implied that by "shapes" she meant directional differences, such as #9 going to the right, #5 to the left. She did not think there was much similarity between any except #3, #6, and #7.

8. Subject H.K.: Hardest were #5 and #9. She said that she tried to memorize each end of lines 1, 2, and 3. This is, then, learning the last vertical row as a means of associating the horizontal elements.

#9: "tail"

#4: "indian with feathers"

#2: "wreath with a fence"

#3, #7, and #6: She saw the similarity between these, then made the following distinctions. #3 "these were horizontal and this across." #6 "had heaviest lines and longest on top." #7 "had sort of like a little box there."

#5, #8, and #9: "Two went up and down, and one went straight across."

9. Subject A.S.: This subject used a combination of discrete images plus a sort of linear connectedness. First she said, "I just watched the marks on cards and places where they ought to be at."

#2: "has circle"

#3: "like an L backwards"

#4: "like a pump"

#5: "marked larger and smaller at bottom"

#6: "A little difficult for me to get where it belonged.

#7: The top element was small, the diagonal element was long.

#8: "looks like an S"

TABLE F <u>Continued</u>

#9: "Just different design. Doesn't look like anything."

She formed one linear relationship including #1, #2, #5, and #7. The other included #4, #8, and #9.

<u>10. Subject M.M.S</u>: "By comparing."

#5 and #9: "Looked alike. I learned these first."

#3 and #7: "looked alike"

#4: "thumb-print" (This was learned with #5 and #9.)

#5: "hammer"

#9: "something like a fingerprint but not complete"

Generally, she compared #5 and #9, #3 and #7, #1 and #4, and #8 and #2. She found them alike at first, and then she tried to see how they were different.

Paranoid Schizophrenic Group: Males

<u>1. Subject H.K.</u>: "By different lines."

#3: "right angle"

#6: lines to oblique and vertical

#2: "brush and sign"

#1 and #8: former is below and latter is above.

#5 and #9: latter "to right" and former "to left."

#1 and #4: #4 "hooked over" other lines.

#3 and #7: "straight left angle and other off to side."

<u>2. Subject L.S.</u>: He said that he concentrated on the center row. He remembered #5 "like a tail" and associated the first vertical row to this.

#8: "bridge"

#9: "curve"

#6: "gap"

#2: "wheel"

The hardest were #7, #5, and #9. #5 curved to the right, #9 to the left.

TABLE F <u>Continued</u>

3. Subject A.F.: "By trying to remember each marking."
#3: "an L"
#2: "an O"
#1: "an I"
#5: "a question mark"
#7: "a T sideways"
#4, #8, and #9: "I couldn't figure out in what shape they were."

4. Subject D.G.: "First I had to keep relaxed, avoid tension." "Show patience." "By not trying to pick too many at a time." "By association, not only of design but by location."

#7: This was learned first. "Seemed to be smaller than the rest."

#5 and #8: These were learned next. Long narrow designs. #8 had "the double print."

For a while, he said that he was picking out the chips in order, establishing their location. He gradually formed a "picture print in my mind."

#3 and #6: "by angles"

#5 and #9: He made a mistake between these two and the next time he remembered his mistake and learned from it.

#2 and #7: He noted a similarity between these.

#3 and #2: both had a "ring;" "both on an angle, too. I took that into consideration."

5. Subject E.S.: "Copying the board."
#2, #5, and #4: "easiest to remember"
#2: "circle"

"Easier designs to remember, that's all I know."

#6, #7, #3, #8, and #9: these were difficult.

6. Subject A.R.: "I should have caught on sooner," he said after finishing.

He saw #3 and #7 as similar at first, then distinguished them as follows: #3: "had four downward vertical strokes;" #7: "had six more or less downward vertical strokes."

#9: "exclamation mark"
#5: "question mark"
#2: "horseshoe"
#4: "reverse question mark"
#1: "in left-hand upper corner" He identified this with #1 space.

TABLE F Continued

#8: "lower center"
#6: He identified the others and "left this one to last."

7. Subject G.F.: "Just memorized."
#4: "horse's head"
#7: "miller"
#5: "being in the center"
#3: "on the corner"
#6: "in the center"

8. Subject J.R.: This subject made some mistakes, which he said made him get the "outline vision" in his mind, by which he meant the shape. But this made him notice these designs in detail and forced him to note dissimilarities.

He said that he learned the four corner ones and the center one first. He used shape and direction.
#3: "reversed L"
#6: "angle"
#9: "exclamation mark"
#7: "hat"
#4: "tail"
#1: "Chinese character mark"

On the twelfth trial, he placed the top row first, then the first vertical row, bottom row, and then middle row. He said that he distinguished left from right side of the board. The right side was a "straight up and down" side; the left had "some similarity" among the "objects."

9. Subject F.D.: "Pictured them in my mind." He also said that he learned the middle vertical row together "at one time."
#1: "stairs"
#4: "hair"
#7: "dashes"
#2: "bowling set"
#5: "smaller of the two" (#5 and #9)
#8: "snake"
#3: "stairs, different" from #1.
#6: "only one left, so I didn't bother to picture that one."
#9: "larger" than #5.

TABLE F <u>Continued</u>

<u>10. Subject J.R.</u>: This subject refused to talk. He had been reported not to have conversed for over a month, but he was quite cooperative, and seemed to enjoy his "game" of gesturing and making elaborate movements, such as praying while learning.

He indicated by pointing that he learned #9, #5, and #1 together. He showed that #5 went up and to the left, while #9 went down and to the right. #2 was a circle, #7 the size of the bottom part. It is obvious that he had concept-formation involved in his learning.

Paranoid Schizophrenic Group: Females

<u>1. Subject C.B.</u>: "By the figures. By the design." "In order." "Memorizing, I guess it was."

<u>2. Subject L.M.</u>: "By concentration. I did not use my brain at all. Eyesight. I'm of royal blood. I don't have any brain. I'm partenious. I'm of royal blood. Our brains aren't average. I'm telling you this because of differences of people on the test."

<u>3. Subject E.W.</u>:

#1: "Lines straight ↓ and crooked underneath."

#2: "crown"

#3: "small lines at side." Also, she counted that there were four marks.

#4: "Arch coming over and lines underneath arch."

#5: "Long coming down and short underneath."

#5 and #9: "Lines longer on this (#9) than this."

#6: "heavy and longer on top"

#7: "four lines at side; more in center than ones on #3"

#8: "long lines this way and straight underneath"

Concept formation involved in two places.

<u>4. Subject C.F.</u>: "Way the marks go, I guess."

#3, #6, and #7: "mostly straight"

#5, #8, and #9: "mostly curved"

#1, #2, and #4: "different shapes"

TABLE F Continued

#3, #6, and #7 were "like angles, shaped different."

#5, #8, and #9 were "different shapes." #5 "went in one direction," #9 "went another."

#4: "like a chicken head"

5. Subject L.S.: "I'm just getting sick and tired of playing with them."

#5: "question mark in the middle"
#2: "circle"
#8: "looked like it went uphill"
#4: "indian"
#3: "looked like a railroad track"

6. Subject C.S.: "Associated them with initials."

#1: "T"
#2: "O"
#7: "J"
#5 and #8: "S's in different shapes"
#9: "with mark going this way ↖ "
#4: "J upside-down"
#6: "a six mark design"

7. Subject R.M.:

#2: "Easiest. An association like a planet up above."

#5 and #9: "Curvature." The former had "a little curvature but going the other way (from #9). The pattern is related but opposite."

#3, #6, and #7 were associated together. They all had "large number of strokes." #3 had the "position of the strokes to the left." #6 had them "below." #7 had them "to left."

#4: "semicircle, same idea of learning as #2. Comet in the sky."

#1: "geometrical figure. Angle intercepted by straight lines."

8. Subject D.B.:

#4 and #8: "look like giraffes to me."
#5 and #9: "Similar but in opposite directions."
"Nothing else."

9. Subject G.C.: "Figure out which way different designs were."

#1: "It went here (pointed) and had a curve underneath."

TABLE F Continued

#4: "This goes over here (meaning that one element curved over the other)."

She said that she learned #1, #4, and #7 first, implying she learned by rows. She learned the similar straight elements in these three as belonging in this row.

#5: "When I looked at it, I knew this (#5) was the reverse of this (#9)."

She knew #5 and #9 were similar, but #9 was thicker than #5.

I sort of guessed at (#3, #6, and #8), but this (#8) has a different design."

#3: "This would be out on the left, but they're similar, see?"

"They're a pattern, or design."

10. Subject L.B.: She memorized #1 and #2 first she said. Then she tried #5, #8, and #9. "They were somewhat similar." Then #4, then #7 and #6. She tried "to get together" #3 and #6.

#1: "not another one similar to it."

#2: "resembled an O"

#8, #9, and #5: #8 had "two parts further apart."

#5 and #9: Former curved one way, latter another.

#6 and #7: Former "stood up a little;" latter was a "cockeyed-caty-corner."

TABLE G

TABULATION OF CONCEPT TYPES AND DISCRETE ASSOCIATIONS REPORTED BY CONTROL GROUP SUBJECTS

Control Group																							
	Male											Female											
Concept Formation Types	EL	DE	RAT	RB	DC	KD	WC	JH	JHu	RG	Total	PN	GL	DLW	LE	EMH	VG	MH	MRH	SK	MB	Total	Total
Deductive Type (Spatial and Numerical)	X	X		X	X	X			X		6			X				X				2	8
Inductive Type	X	X	X	X	X	X	X	X	X	X	10	X	X		X	X	X	X	X	X		8	18
Discrete (Associated with Deductive)		X		X	X	X			X		5			X				X				2	7
Discrete (Not associated with Concepts)	X		X			X	X	X	X	X	7	X	X	X	X	X	X			X	X	8	15
Total	3	3	2	3	3	4	2	2	4	2	28	2	2	3	2	2	2	3	1	2	1	20	48

TABLE H

TABULATION OF CONCEPT TYPES AND DISCRETE ASSOCIATIONS IN SCHIZOAFFECTIVE GROUP

Schizoaffective Group

	Male											Female											
Concept Formation Types	LM	ED	NB	HB	JG	RH	RW	LG	JK	FL	Total	KLS	MLS	MAF	RB	LS	MG	LVG	HK	AS	MMS	Total	Total
Deductive Type (Spatial and Numerical)		X									1			X		X		X	X			4	5
Inductive Type	X		X							X	3	X	X		X			X	X	X	X	7	10
Discrete (Associated with Deductive)											0			X		X			X			3	3
Discrete (Not associated with Concepts)	X		X		X			X	X	X	6	X	X		X		X		X	X	X	7	13
Total	2	1	2	0	1	0	0	1	1	2	10	2	2	2	2	2	1	2	4	2	2	21	31

TABLE I

TABULATION OF CONCEPT TYPES AND DISCRETE ASSOCIATIONS IN PARANOID SCHIZOPHRENIC GROUP

	Paranoid Schizophrenic Group																					
	Male											Female										
Concept Formation Types	HK	LS	AF	DG	ES	AR	GF	JR	FD	JR	Total	CB	LM	EW	CF	LS	CS	RM	DB	GC	LB	Total	Total
Deductive Type (Spatial and Numerical)		X						X	X		3									X		1	4
Inductive Type	X	X	X	X		X		X	X	X	8			X	X		X	X	X	X	X	7	15
Discrete (Associated with Deductive)		X						X	X		3											0	3
Discrete (Not associated with Concepts)	X	X	X	X	X	X	X			X	8			X	X	X	X	X	X		X	7	15
Total	2	4	2	2	1	2	1	3	3	2	22	0	0	2	2	1	2	2	2	2	2	15	37

TABLE J

TABULATION OF FACTORS INVOLVED IN FAILURES TO ACCOUNT FOR LEARNING IN CONTROL GROUP SUBJECTS

Control Group																							
	Males											Females											
	EL	DE	RAT	RB	DC	KD	WC	JH	JHu	RG	Total	PN	GL	DLW	LE	EMH	VG	MH	MRH	SK	MB	Total	Total
Partial Recall	X	X			X			X			4				X				X			2	6
Vague Explanation											0					X			X			2	2
Similarity Confusion	X										1				X							1	2
Guessing		X									1											0	1
No Recall											0											0	0
Personal-ization											0											0	0
Illogical Explanation											0											0	0
Total	2	2			1			1			6				2	1			2			5	11

TABLE K

TABULATION OF FACTORS INVOLVED IN FAILURES TO ACCOUNT FOR LEARNING IN THE SCHIZOAFFECTIVE GROUP

	Schizoaffective Group																					
	Males											Females										
	LM	ED	NB	HB	JG	RH	RW	LG	JK	FL	Total	KLS	MLS	MAF	RB	LS	MG	LVG	HK	AS	MMS	Total	Total
Partial Recall			X					X			2						X	X				2	4
Vague Explanation		X		X		X					3							X				1	4
Similarity Confusion											0		X									1	1
Guessing											0											0	0
No Recall				X		X	X				3											0	3
Personalization										X	1					X	X					2	3
Illogical Explanation								X			1											0	1
Total		1	1	2		2	1	2		1	10		1			1	2	2				6	16

TABLE L

TABULATION OF FACTORS INVOLVED IN FAILURES TO ACCOUNT FOR LEARNING IN PARANOID SCHIZOPHRENIC GROUP

Paranoid Schizophrenic Group																							
	Males											Females											
	HK	LS	AF	DG	ES	AR	GF	JR	FD	JR	Total	CB	LM	EW	CF	LS	CS	RM	DB	GC	LB	Total	Total
Partial Recall					X		X	X		X	4					X			X	X		3	7
Vague Explanation											0											0	0
Similarity Confusion			X		X						2											0	2
Guessing											0									X		1	1
No Recall											0	X	X									2	2
Personal-ization										X	1											0	1
Illogical Explanation											0		X									1	1
Total			1		2		1	1		2	7	1	2			1			1	2		7	14

TABLE M

CATEGORIZATION AND INCIDENCE OF OCCURRENCE OF REPORTS BY SUBJECTS IN CONTROL GROUP OF INDUCTIVE-TYPE LEARNING

Control Group																						
	Males											Females										
Difference Reported	EL	DE	RAT	RB	DC	KD	WC	JH	JHu	RG	Total	PN	GL	DLW	LE	EMH	VG	MH	MRH	SK	MB	Total	Total
Curvilinearity											0				/				/			2	2
Angularity			/						/	/	3				/							1	4
Size		/		/					/		3	/										1	4
Direction		/				/	/			/	4						/			/		2	6
Number of Lines in Element				/							1	/					/					2	3
Position of Part					/						1	/								2		3	4
Angle vs. Curve						/					1		/									1	2
Reversal		/									1											0	1
Total	0	3	1	2	1	2	1	0	2	2	14	3	1	0	2	0	2	0	1	3	0	12	26

TABLE N

CATEGORIZATION AND INCIDENCE OF OCCURRENCE OF REPORTS BY SUBJECTS IN THE SCHIZOAFFECTIVE GROUP OF INDUCTIVE-TYPE LEARNING

	Schizoaffective Group																					
	Males											Females										
Difference Reported	LM	ED	NB	HB	JG	RH	RW	LG	JK	FL	Total	KLS	MLS	MAF	RB	LS	MG	LVG	HK	AS	MMS	Total	Total
Curvi-linearity											0				/							1	1
Angularity	/										1				/							1	2
Size	2										2											0	2
Direction										/	1							/	/			2	3
Number of Lines in Element											0											0	0
Position of Part			2								2											0	2
Angle vs. Curve											0											0	0
Reversal											0											0	0
Total	3		2							/	6				2			/	/			4	10

TABLE O

CATEGORIZATION AND INCIDENCE OF OCCURRENCE OF REPORTS BY SUBJECTS IN THE PARANOID SCHIZOPHRENIC GROUP OF INDUCTIVE-TYPE LEARNING

	Paranoid Schizophrenic Group																					
	Males											Females										
Difference Reported	HK	LS	AF	ES	AR	GF	JR	FD	JR	DG	Total	CB	LH	EW	CF	LS	CS	RM	DB	GC	LB	Total	Total
Curvi-linearity											0											0	0
Angularity	/									/	2				/							1	3
Size								/			1			/						/	/	3	4
Direction	/	/							/		3				/			/	/			3	6
Number of Lines in Element					/					/	2			/								1	3
Position of Part											0							/		/	/	3	3
Angle vs. Curve											0											0	0
Reversal											0											0	0
Total	2	1			1			1	1	2	8			2	2			2	1	2	2	11	19

TABLE P

TABULATION OF DISCRETE TYPE ASSOCIATIONS AS TENDENCY TO CONCRETIZATION IN CONTROL GROUP

	Control Group																					
	Male											Female										
Discrete Type Associations	EL	DE	RAT	RB	DC	KD	WC	JH	JHu	RG	Total	PN	GL	DLW	LE	EMH	VG	MH	MRH	SK	MB	Total	Total
Discrete Type (Associated with Inductive Type)									1		1		2			1						3	4
Discrete Type (Not associated with a Concept)	2		3			1	2	4	4	3	19	1	1	3	3	3	3			1	9	24	43
Total	2		3			1	2	4	5	3	20	1	3	3	3	4	3			1	9	27	47

TABLE Q

TABULATION OF DISCRETE TYPE ASSOCIATIONS AS
TENDENCY TO CONCRETIZATION IN
PARANOID SCHIZOPHRENIC
GROUP

Paranoid Schizophrenic Group

	Male											Female											
Discrete Type Associations	HK	LS	AF	DG	ES	AR	GF	JR	FD	JR	Total	CB	LM	EW	CF	LS	CS	RM	DB	GC	LB	Total	Total
Discrete Type (Associated with Inductive Type)	1	2		2							5											0	5
Discrete Type (Not associated with a Concept)	1	1	5		1	7	5			1	21			5	1	5	8	3	2		4	28	49
Total	2	3	5	2	1	7	5			1	26			5	1	5	8	3	2		4	28	54

TABLE R

TABULATION OF DISCRETE TYPE ASSOCIATIONS AS TENDENCY TO CONCRETIZATION IN SCHIZOAFFECTIVE GROUP

Schizoaffective Group

	Male											Female											
Discrete Type Associations	LM	ED	NB	HB	JG	RH	RW	LG	JK	FL	Total	KLS	MLS	MAF	RB	LS	MG	LVG	HK	AS	MMS	Total	Total
Discrete Type (Associated with Inductive Type)											0	2							6	6	3	17	17
Discrete Type (Not associated with a Concept)	3		1		8			1	9	1	23	2	6		4		6		2			20	43
Total	3		1		8			1	9	1	23	4	6		4		6		8	6	3	37	60

TABLE S

E-G-M, EXPOSURE BOARD LEARNING TIME (IN MINUTES), TOTAL LEARNING TRIALS, AND TOTAL LEARNING TIME (IN MINUTES) OF CONTROL GROUP MALES AND FEMALES

Non-Psychotic (Control) Group					
Male					
Sub-jects		Total E-G-M	Exposure B. Learn-ing Time	Total Learning Trials	Total Learning Time (in ')
1.	ERL	92	5.1	17	7.2
2.	DE	89	3.6	14	6.0
3.	RAT	64	2.1	9	3.2
4.	RB	81	4.1	13	6.1
5.	DC	192	6.8	25	10.4
6.	KD	84	2.9	13	4.5
7.	WC	36	1.7	8	2.9
8.	JH	210	7.9	40	13.3
9.	JHu	76	3.4	13	4.7
10.	RG	108	4.7	19	8.3
Female					
1.	PN	67	2.3	9	3.2
2.	GL	141	6.3	17	10.4
3.	DLW	111	3.3	17	5.0
4.	LE	80	2.4	16	4.1
5.	EH	248	9.8	34	17.2
6.	VG	117	4.9	18	8.3
7.	MH	89	2.7	13	4.1
8.	MRH	191	6.5	29	10.8
9.	SK	105	3.0	13	4.9
10.	MB	176	9.3	44	13.9

TABLE T

E-G-M, EXPOSURE BOARD LEARNING TIME (IN MINUTES), TOTAL LEARNING TRIALS, AND TOTAL LEARNING TIME (IN MINUTES) OF SCHIZOAFFECTIVE MALES AND FEMALES

Subjects	Total E-G-M	Exposure B. Learning Time	Total Learning Trials	Total Learning Time (in ')
Schizoaffective Group				
Male				
1. LH	173	6.7	26	12.5
2. JK	191	8.9	17	12.8
3. ED	187	9.6	17	14.2
4. FL	54	4.6	7	6.0
5. NB	112	5.2	22	9.6
6. HB	109	5.7	17	9.2
7. JG	153	9.1	29	13.9
8. RH	67	3.5	14	6.1
9. RW	305	15.6	55	21.5
10. LG	287	11.1	33	19.1
Female				
1. KS	191	8.1	30	12.3
2. MS	161	5.1	21	8.4
3. MAF	178	9.6	9	14.6
4. MMS	101	4.1	13	6.3
5. RB	148	7.5	17	9.6
6. LS	7	7.3	5	8.6
7. MFG	139	4.3	21	6.1
8. CLG	189	9.7	22	17.5
9. HK	152	6.5	21	11.1
10. AS	89	5.8	19	8.9

TABLE U

E-G-M, EXPOSURE BOARD LEARNING TIME (IN MINUTES), TOTAL LEARNING TRIALS, AND TOTAL LEARNING TIME (IN MINUTES) OF PARANOID SCHIZOPHRENIC MALES AND FEMALES

Subjects	Total E-G-M	Exposure B. Learning Time	Total Learning Trials	Total Learning Time (in ')
Paranoid Schizophrenic Group				
Male				
1. HK	200	7.6	27	11.8
2. LS	136	7.3	17	9.9
3. AF	380	14.4	47	22.8
4. DG	191	8.0	21	12.0
5. ES*	603	21.4	56	32.5
6. AR	167	7.7	25	12.1
7. GF*	603	21.4	56	32.5
8. JR	153	6.1	23	9.8
9. FD	239	11.9	25	17.2
10. JR	269	20.3	26	26.8
Female				
1. CB	306	15.0	33	19.1
2. LM	364	14.0	49	21.3
3. EW	283	12.7	33	18.2
4. CF	168	6.8	21	9.4
5. LS	285	11.4	49	18.1
6. CS	368	10.9	42	15.6
7. RM	475	16.7	36	23.4
8. DB*	603	21.4	56	32.5
9. AC	430	14.7	31	23.0
10. LB	235	10.9	33	15.5

*These subjects could not complete learning in this average amount of effort (three subject's scores averaged for entry value).

TABLE V

FREQUENCY DISTRIBUTIONS OF TOTAL TRIALS REQUIRED FOR LEARNING FOR THE CONTROL, SCHIZOAFFECTIVE, AND PARANOID SCHIZOPHRENIC GROUPS

Total Trial Scores	Control Group	Schizo-affective Group	Paranoid Schiz. Group
1 - 3			
4 - 6		1	
7 - 9	3	2	
10 - 12			
13 - 15	6	2	
16 - 18	5	5	1
19 - 21	1	3	2
22 - 24		2	1
25 - 27	1	1	4
28 - 30	1	2	
31 - 33		1	4
34 - 36	1		1
37 - 39			
40 - 42	1		1
43 - 45	1		
46 - 48			1
49 - 51			2
52 - 54			
55 - 57		1	3*
Σ	20	20	20

*Represents averaged trials for three non-learners up to where they were stopped.

TABLE W

FREQUENCY DISTRIBUTIONS OF EXPOSED BOARD LEARNING TIME FOR THE CONTROL, SCHIZOAFFECTIVE, AND PARANOID SCHIZOPHRENIC GROUPS

Exposed Board Time (minutes)	Control Group	Schizo-affective Group	Paranoid Schiz. Group
1.0 - 1.9	1		
2.0 - 2.9	5		
3.0 - 3.9	4	1	
4.0 - 4.9	3	3	
5.0 - 5.9	1	4	
6.0 - 6.9	3	2	2
7.0 - 7.9	1	2	3
8.0 - 8.9		2	1
9.0 - 9.9	2	4	
10.0 - 10.9			2
11.0 - 11.9		1	2
12.0 - 12.9			1
13.0 - 13.9			
14.0 - 14.9			3
15.0 - 15.9		1	1
16.0 - 16.9			1
17.0 - 17.9			
18.0 - 18.9			
19.0 - 19.9			
20.0 - 20.9			1
21.0 - 21.9			3*
Σ	20	20	20

*Represents averaged time for three non-learners up to where they were stopped.

TABLE X

FREQUENCY DISTRIBUTIONS OF E-G-M FOR THE CONTROL, SCHIZOAFFECTIVE, AND PARANOID SCHIZOPHRENIC GROUPS

E-G-M Scores	Control Group	Schizo-affective Group	Paranoid Schiz. Group
1 - 24		1	
25 - 49	1		
50 - 74	3	2	
75 - 99	6	1	
100 - 124	4	3	
125 - 149	1	2	1
150 - 174		4	3
175 - 199	3	5	1
200 - 224	1		1
225 - 249	1		2
250 - 274			1
275 - 299		1	2
300 - 324		1	1
325 - 349			
350 - 374			2
375 - 399			1
400 - 424			
425 - 449			1
450 - 474			
475 - 499			1
500 - 524			
Over 525			3*
Σ	20	20	20

*Represents averaged E-G-M for three non-learners up to point where they were stopped.

TABLE Y

CONCRETE VISUAL-IMAGE ASSOCIATIONS PRODUCED BY CONTROL GROUP SUBJECTS

Design 1.	Design 2.	Design 3.
1. "ripples in water" and "fence" 2. "tree"	1. "vase" and "circle" 2. "fence with flower" 3. "wreath" 4. "screw in a tap" 5. "horseshoe top" 6. "flower"	1. "steps" 2. "tree, grass growing around it" 3. "tree" 4. "hinge" 5. "elbow"
Design 4.	**Design 5.**	**Design 6.**
1. "cane" 2. "horse" 3. "indian" 4. "animal" 5. "old fox horn" 6. "hash-marks" 7. "horse's head"	1. "worm" 2. "piece of wire"	1. "ladder"
Design 7.	**Design 8.**	**Design 9.**
1. "camera" 2. "pin" 3. "hat" 4. "hat" 5. "camera" 6. "hat"	1. "S"	1. "cat's tail" 2. "5 upside-down"

TABLE Z

CONCRETE VISUAL-IMAGE ASSOCIATIONS PRODUCED BY THE SCHIZOAFFECTIVE GROUP SUBJECTS

Design 1.	Design 2.	Design 3.
1. "looks like a little can with something underneath it"	1. "wreath and violin underneath"	1. "L backward"
2. "a 1"	2. "jack-o-lantern"	2. "right hand corner of my mind"
3. "Navy man--Army man, Lieutenant's rank"	3. "wreath with a fence"	3. "like an L backward"
4. "water-faucet"	4. "only one with an oval in it"	
5. "similar to worm."	5. "hazy...a hole"	
	6. "zero with a dash"	

Design 4.	Design 5.	Design 6.
1. "pipe"	1. "exclamation mark"	1. "steps"
2. "question mark backwards"	2. "question mark"	2. "an old shack on the farm, roof like that"
3. "thumb-print"	3. "hammer"	
4. "neck of a horse"	4. "tail or hammer"	
5. "Roman helmet, like on my blouse"	5. "a paint brush"	
6. horse's head"	6. "question mark"	
7. "indian with feathers"		
8. "like a pump"		
9. "an elephant's trunk"		
10."fingerprint"		

TABLE Z Continued

Design 7.	Design 8.	Design 9.
1. "some steps going off to the left"	1. "S with 1 underneath it"	1. "question mark"
2. "a T for that corner"	2. "forming steps"	2. "question mark"
3. "sombrero"	3. "a little sea-lion"	3. "incomplete finger-print"
4. "L shaped upside-down"	4. "crossways"	4. "like my hand lying on the table"
	5. "S"	5. "tail"
	6. "S with little thing by it"	6. "snake"
	7. "two verbal lines"	7. "similar to boomerang on right corner"

TABLE AA

CONCRETE VISUAL-IMAGE ASSOCIATIONS PRODUCED BY THE PARANOID SCHIZOPHRENIC SUBJECTS

Design 1.	Design 2.	Design 3.
1. "a T" 2. "an I" 3. "Chinese character mark" 4. "stairs"	1. "crown" 2. "an O" 3. "a planet up in the sky" 4. "resembled an O" 5. "wheel" 6. "an O" 7. " a horse-shoe" 8. "bowling set" 9. "circle" 10. "brush and sign"	1. "looks like a rail-road track" 2. "an L" 3. "reversed L" 4. "stairs"
Design 4.	**Design 5.**	**Design 6.**
1. "arch coming over" 2. "chicken head" 3. "indian" 4. "a J" 5. "comet in the sky" 6. "giraffe" 7. "reverse question mark" 8. "horse's neck" 9. "tail" 10. "hair"	1. "question mark" 2. "an S" 3. "question mark" 4. "question mark"	
Design 7.	**Design 8.**	**Design 9.**
1. "a T sideways" 2. "miller" 3. "hat" 4. "snake"	1. "an S" 2. "giraffe" 3. "bridge"	1. "exclamation mark" 2. "exclamation mark"

TABLE BB

NUMBER OF GROUPINGS OF DESIGNS AND REPORTED INSTANCES OF EACH GROUPING FOR VARIOUS SUBJECT GROUPS

	Control Group		Schizoaffective Group		Paranoid Schiz. Group	
	Grouping of Designs	Number of Instances	Grouping of Designs	Number of Instances	Grouping of Designs	Number of Instances
	8, 9, 5	1	4, 8, 9	1	1, 4	1
	1, 4, 7	1	1, 2, 5, 7	1	6, 7	1
	3, 6, 7	2	5, 9	4	5, 9	9
	5, 9	15	1, 8	1	7, 3	3
	6, 8	1	3, 6, 7	4	3, 6, 7	2
	2, 3	1	3, 6	2	5, 8, 9	2
	3, edge of board	1	5, 8	1	5, 8	2
	1, 3, 9	1	1, 4, 7	1	4, 2	1
	3, 4	1	5, 8, 9	2	4, 8	1
	3, 6	1	3, 7	3	1, 4, 7	2
	4, 8	1	1, 4	1	3, 6	2
	9, 8	1	8, 2	1	4, 8, 9	1
	3, 6, 9, 1, 5	1				
	3, 7	4				
	1, 9	1				
	1, 4	1				
	3, 6, 9	1				
	2, 5, 8	1				
	1, 6	1				
Total	19	37	12	22	12	27

TABLE CC

NUMBER OF TIMES A DESIGN WAS REPORTED IN A GROUPING FOR THE VARIOUS SUBJECT GROUPS

Incidence of a Design Being Reported In a Grouping			
Designs	Control Group	Schizo-affective Group	Paranoid Schiz. Group
Design 1	6	4	3
Design 2	2	2	1
Design 3	13	9	7
Design 4	4	3	6
Design 5	18	8	13
Design 6	7	7	5
Design 7	7	8	8
Design 8	5	6	6
Design 9	21	7	12

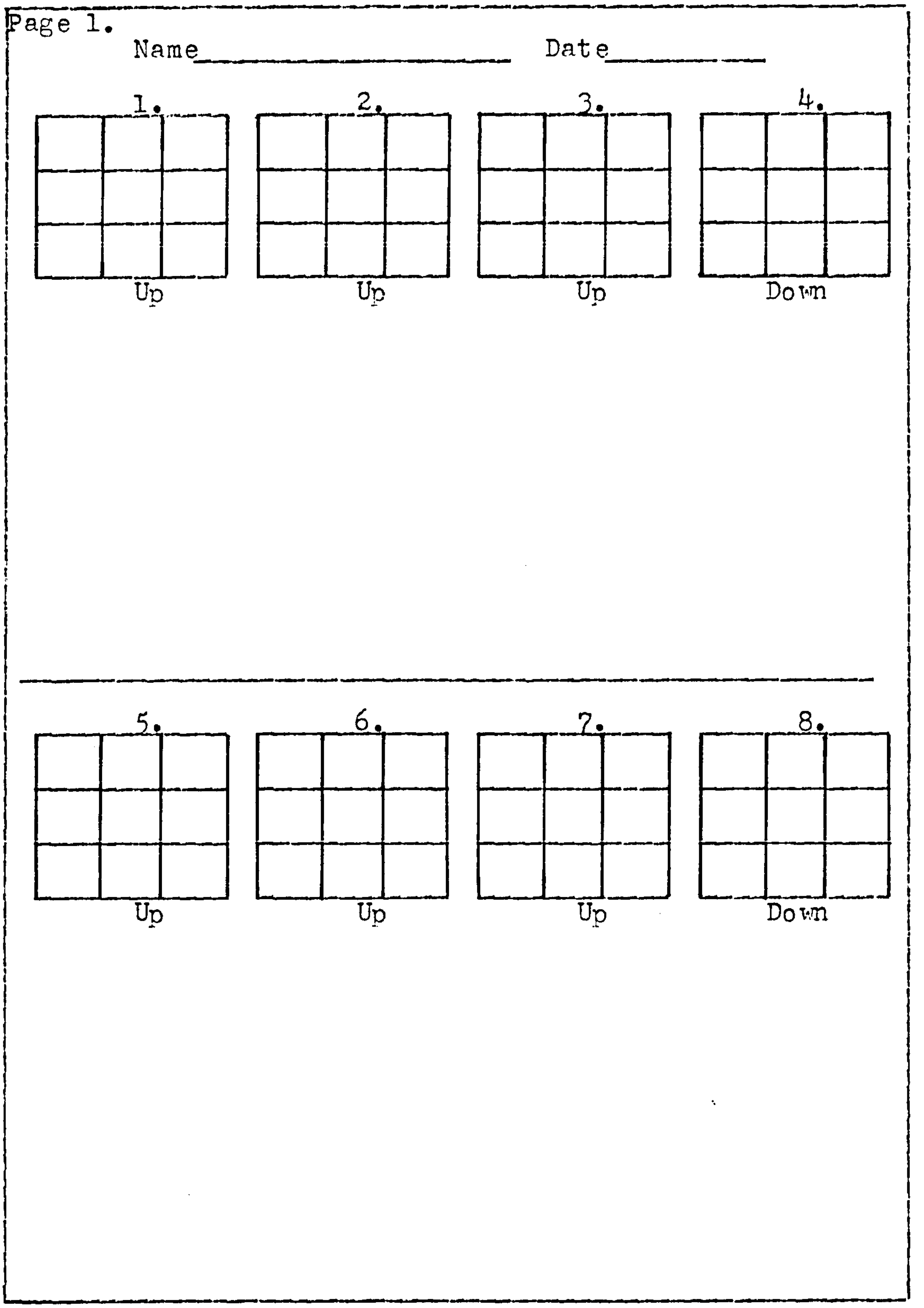

Fig. A Facsimile of the Recording Sheets used by the Experimenter's assistant.

Name____________________ Date__________

Trial	#E-C-M	#Seconds	Trial	#E-C-M	#Seconds
1			40		
2			41		
3			42		
4			43		
5			44		
6			45		
7			46		
8			47		
9			48		
10			49		
11			50		
12			51		
13			52		
14			53		
15			54		
16			55		
17					
18					
19			Inquiry		
20					
21					
22					
23					
24					
25					
26					
27					
28					
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33					
34					
35					
36					
37					
38					
39					

Fig. B Facsimile of the Recording Sheets used by the Experimenter.

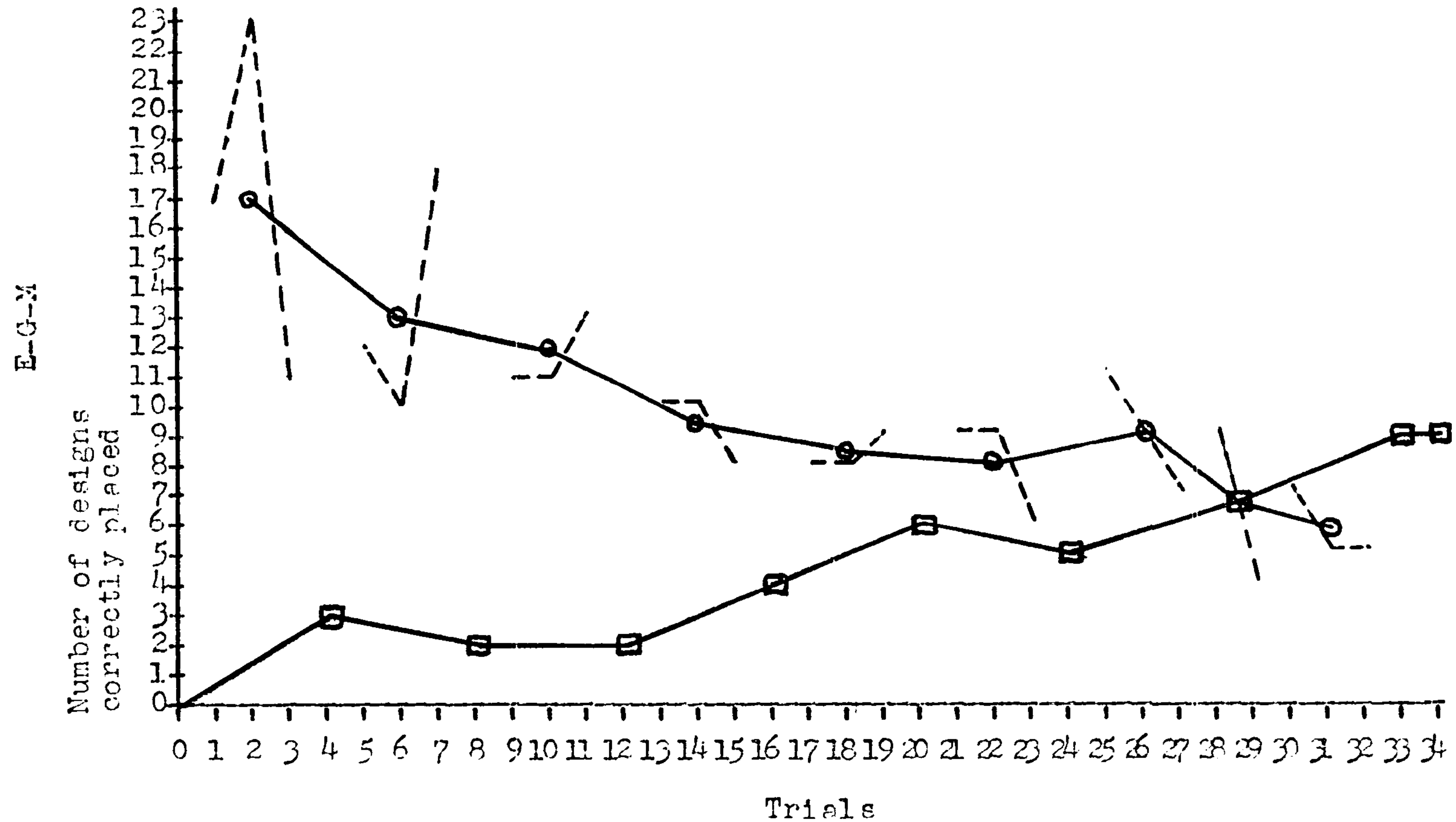

Fig. C Reciprocal S-type curves for correctly placed designs on non-exposed trials and E-G-M averaged for exposed trials (control subject, female, S.E.H.).

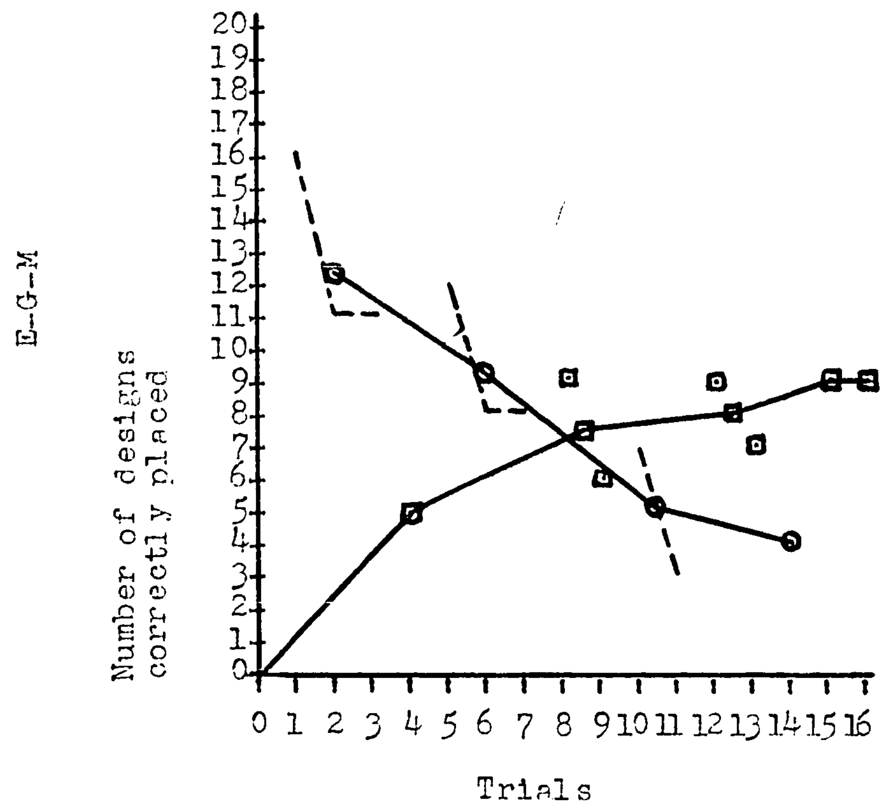

Fig. D Reciprocal S-type curves for correctly placed designs on non-exposed trials and E-G-M averaged for exposed trials (control subject, female, L.E.).

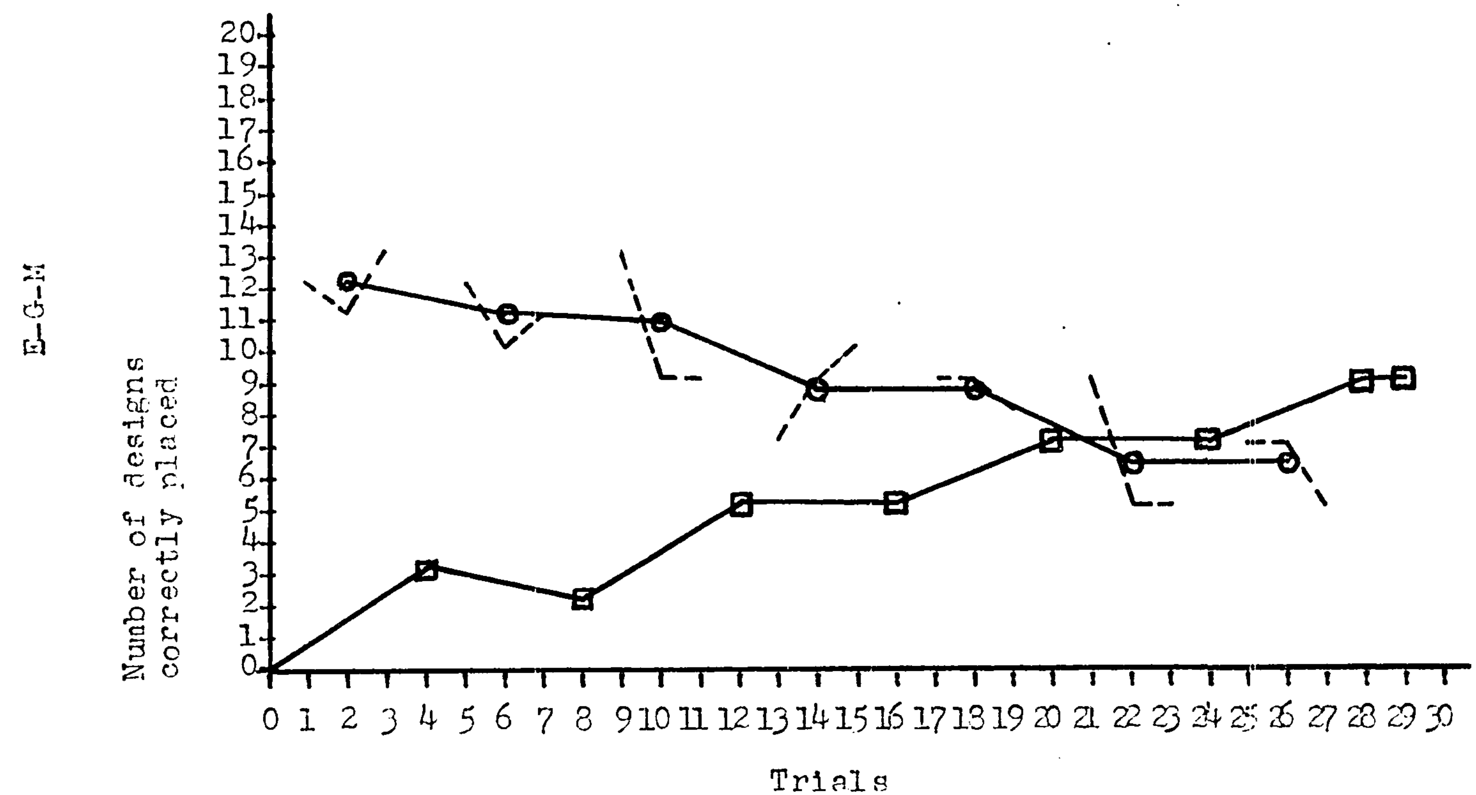

Fig. E Reciprocal S-type curves for correctly placed designs on non-exposed trials and E-G-M averaged for exposed trials (control subject, female, M.H.).

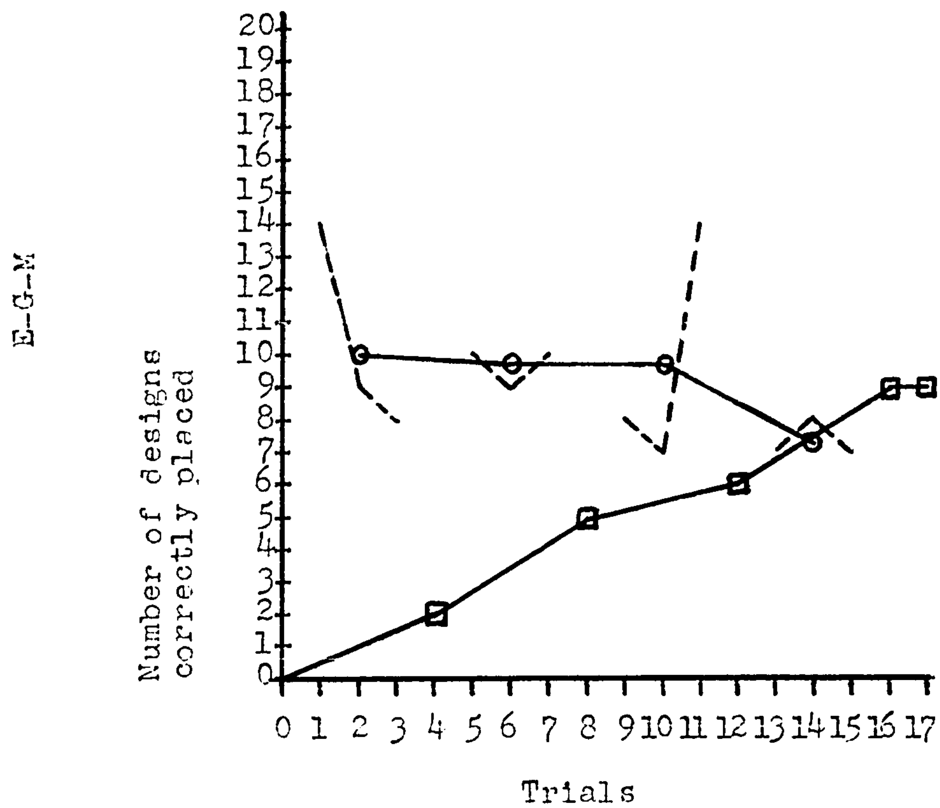

Fig. F Reciprocal S-type curves for correctly placed designs on non-exposed trials and E-G-M averaged for exposed trials (control subject, female, D.L.W).

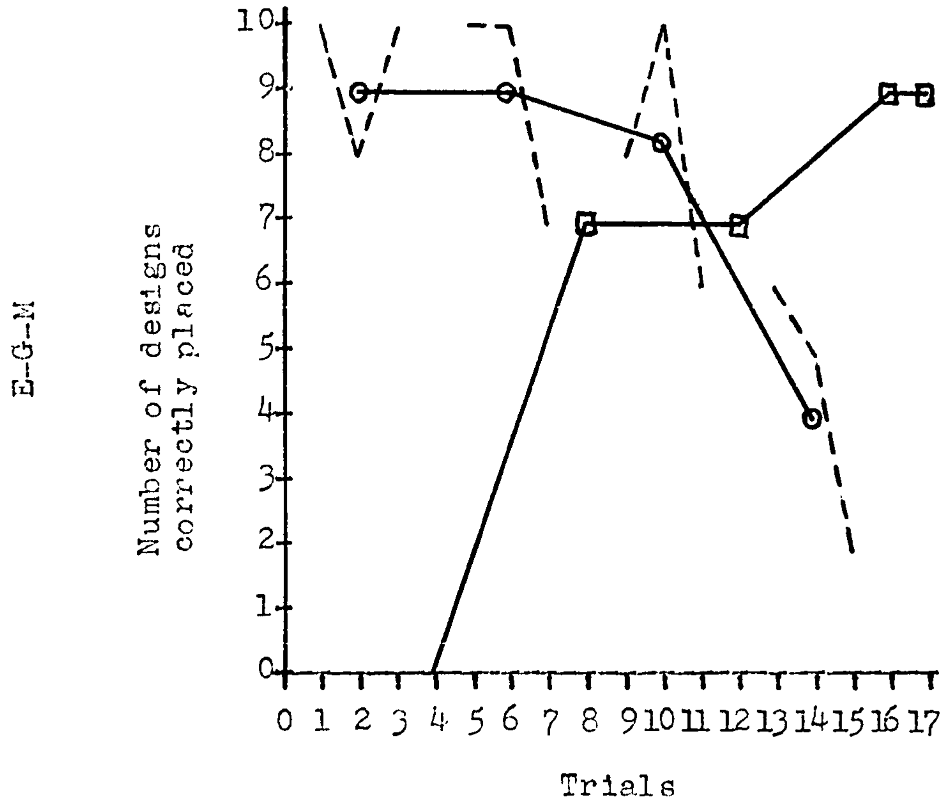

Fig. G Reciprocal S-type curves for correctly placed designs on non-exposed trials and E-G-M averaged for exposed trials (control subject, male, E.L.).

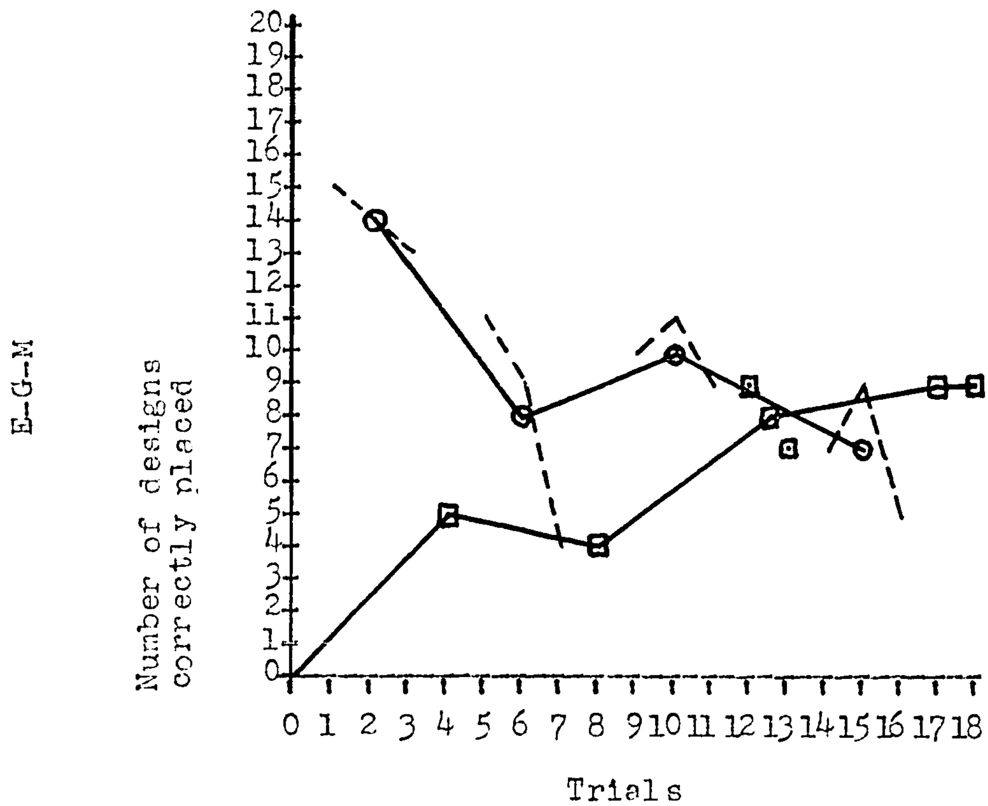

Fig. H Reciprocal S-type curves for correctly placed designs on non-exposed trials and E-G-M averaged for exposed trials (control subject, female, V.G.).

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