The Diagnostic Efficiency of a Modified Mosaic Test in the Schizophrenias

by

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ABSTRACT

The treatment of schizophrenia as a homogeneous nosological entity, although currently prevalent, has little justification historically or experimentally. As its foundations, the scientific analysis of psychopathological behaviour demands an accurate and objective taxonomic system, and, therefore, failure to identify the sub-types of schizophrenia is methodologically invalid. In order to demonstrate the efficiency of a psychometric device in differentiating the schizophrenias, a modification of the Lowenfeld Mosaic Test was administered to a population of hospitalized schizophrenics grouped by sex, chronicity and diagnosis.

The modifications of the standard instrument included: introduction of circular and mixed angular-circular shapes to the existing angular stones; incorporation of an ego-involving test set; and addition of an objective scoring system based on operational definitions. In order to investigate the relationships between this technique and other measures of cognitive and orectic functioning, the modified mosaic test was included in a battery of eight tests and behaviour rating scales. In addition, a form-association test was developed to investigate the relationship among geometric form and affective aspects of personality. Studies of scoring and retest consistency were also undertaken.

A majority of the scoring categories showed significant differences between the acute and chronic groups, and between the paranoids and nonparanoids. No sex differences were found, and the differentiation between catatonics and hebephrenic-simples was less precise. Age, length of hospitalization and pharmacological therapy appeared to have minimal influence on test performance. Consistency of scoring was high, and retest reliability was satisfactory for the analysis of group tendencies.

Categories appeared to relate to level of intellectual functioning and/or affective expression. Impairment of cognitive processes was explained tentatively on the basis of diminution of attention to the external environment, and the orectic manifestations were interpreted in terms of hypotheses involving an extrapunitive - intropunitive bifurcation.

It was concluded that the scoring categories utilized have considerable diagnostic validity, and that the modified mosaic test is highly efficient in differentiating the schizophrenias.

"Every man is in certain respects
a. like all other men,
b. like some other men,
c. like no other man."

Clyde Kluckhohn and
Henry A. Murray

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I. INTRODUCTION

A. The Purpose

The purpose of this investigation is to develop a simple test which will yield a sample of objectively scored variables, and to relate these variables to the nosological categories of the schizophrenias in the hope of providing stable diagnostic "signs" which are both valid clinically and meaningful psychologically. Specifically the study evaluates the ability of scoring categories, derived from a visual-motor, mosaic technique, to differentiate to a statistically significant extent between the types of schizophrenia. The relationship between this technique and other tests and rating scales administered to the same population is also examined.

Although the exigencies of the clinical situation have resulted in many tests which purport to measure various dimensions of personality, few have demonstrated consistent ability in differentiating between the nosological categories of psychiatric diagnosis independent of the clinical experience and sagacity of the examiner. Failure in this diagnostic function has led many to cast doubt not only upon the methods employed but also upon the whole concept of taxonomy in psychiatry. Many studies reveal a cavalier dismissal of psychiatric diagnosis as: artificial and unsuitable; unreliable and of no value; and a preoccupation with labels rather than persons and processes. Although Bleuler (6) has argued that most schizophrenic cases continue to show,

throughout the disorder, the symptomatology of the subgroup to which the case belongs, contemporary psychiatrists such as Noyes (128) have commented: "...efforts to classify schizophrenic patients into specific categories have been relatively fruitless, and the present tendency is not to attempt the division." (p.246) However, inadequacy in methods used and in the nosological categories themselves is not justification for abandonment of diagnosis, nor is there any consistent, empirical evidence to support such rejection. In a recent review of studies which question the reliability of the traditional descriptive classification Foulds (43) reported: continual misunderstanding of the function of taxonomy; serious contamination of psychopathology in cases used; and considerable variability in the methods of appraisal. In contrast to such studies Seeman (153) found that medical students were able to achieve a moderate degree of success in arriving at independent agreement with their professor regarding the diagnoses of six classical cases selected for class demonstration. Schmidt and Fonda (152), investigating the reliability of schizophrenic diagnosis between pairs of psychiatrists using the official psychiatric nomenclature, report reliability coefficients between +.73 and +.95, depending upon the range of discrimination required. The same authors report that in the differentiation of patients into the categories: organic, psychotic and characterological, approximately four-fifths of such classifications by one

psychiatrist were independently confirmed by another. Orgel(129) using a rating scale based on behavioural criteria, found a correlation between judges of +.95 in diagnosing paranoid and hebephrenic schizophrenia. Foulds (42) reported that agreement between pairs of psychiatrists making specific, independent diagnoses was in the region of 4 on a scale ranging from 0 to 6; 4.5 between a psychologist interpreting and administering tests and the criterion of final diagnosis; and 3.8 when the psychologist interpreted the tests without contact with the patient. These scores were significantly higher than the baseline scores of diagnoses formed only on knowledge of the type of patient admitted to particular wards, age and sex. Foulds concluded that the reliability of psychiatric and the validity of psychological diagnoses are not as poor as current opinion supposes.

Diagnostic classification is necessary if there is to be order in observation with an attendant increase in meaningfulness. Just as in biological taxonomy, the labelling of psychiatric phenomena indicates their inclusion in a class of similar phenomena. In clinical practice this is essentially a labour-saving device for it is possible to infer on the basis of class membership the possession of certain common class characteristics without the necessity of further experience. Inter-individual comparisons serve to shorten and sharpen an intra-individual analysis. Arieti (3) states that in the investigation of schizophrenia both formal and dynamic analyses

are required: the formal emphasizes the class characteristics which patients share, the common psychological mechanisms which they adopt; the dynamic seeks the specific elements in any case. He concludes: "Every schizophrenic, like every man, is both similar to and different from other patients and men." (p.5) Diagnosis is far from a preoccupation with labels. It implies not only some notion of aetiology and nature but also the possibility of prediction of future course, anticipation of later symptomatology and prognosis with the possibility of its control.

Clinical utility is only one consideration. Wittenborn (177), Zubin (71) and others have argued that coherent, cohesive and meaningful theory construction and critical experimentation in abnormal psychology require that the psychopathological subject-matter be identified, described and classified accurately and objectively. Current rejection of the types of schizophrenia and the concomitant postulation that schizophrenia is a homogeneous disease entity has resulted in contradictory and generally confused clinical and experimental findings, and has led to perplexing theoretical speculation. Mayer-Gross (110) has argued that "the unpredictable state of the schizophrenic is not suited for the behaviouristic, psychometrical and statistical methods of present-day psychology; hence it is at present neglected." (p.48).

At our present state of understanding of psychopathological

ical phenomena, it would be rash to argue that either our methodology or the nosological categories used are satisfactory. However, this study is based on the argument that psychiatric diagnosis is a necessary and clinically useful procedure. As Munroe (124) has stated:

> "The achievements of Kraepelin and those psychiatrists whose concern is mainly with diagnostic classification should not be minimized. However faulty, the current psychiatric classifications do offer a sense of pattern in the confused welter of mental disease which contributes importantly to the understanding of the individual case. A good diagnostic label, properly applied, is an aid to the therapist in anticipating many of the reaction patterns of the patient, present and future, beyond the limited sample of patients he has himself encountered.....It is recognized that observation of recurrent systems of events may be very useful in practice even when their intrinsic dynamics are not understood..... Any tendency to rest content with such systems and to apply them indiscriminately is deplorable - but it is equally mistaken to ignore the assistance they can offer." (p.297)

Possibly the failure to construct an efficient test to serve this important function of psychiatric diagnosis is not due to the unreliability and invalidity of the criterion against which the technique would be compared but rather to a lack of careful, diagnostically-oriented experimentation involving objective tests and representative patient populations. The exploitation of tests in clinical settings under heavy service pressure has resulted in a tendency to strive toward global measures of personality functioning without adequate evaluation of their validity and reliability. The

possibility that a rather molecular technique designed to serve a rather narrow diagnostic function may result in a more powerful screening device than a psychological instrument purporting to measure all dimensions of personality both pathological and normative, has never been adequately explored, especially in relation to schizophrenia. Owing to recent "diagnostic pessimism" concerning the differentiation of the sub-types of this disorder, the need for such psychometric investigation seems particularly cogent. As Langfeldt (91) has recently stated: "I am of the opinion that the subtle diagnostic grouping of the schizophrenic pictures, and individual follow-up investigations of the sub-groups are of the greatest importance for practical diagnosis and prognostication as well as for scientific research." (p.13)

B. The Investigation.

The diagnostic test developed in this study is related to the Lowenfeld Mosaic Test (99, 100, 101), the major differences being the introduction of new geometric shapes; revision of the administration and set employed; and the incorporation of an objective, quantitative scoring system. Requiring the construction of patterns or mosaics from pieces of plastic of various shapes and colours, this technique appears to involve both cognitive and orectic variables. It is postulated that these two dimensions will be reflected in the quantitative scores and ratings based on operational definitions, and that they will yield the desired diagnostic "signs". The

administration and scoring are objective, easy and not time-consuming: the task is simple, straightforward, and usually interesting for even the most deteriorated patient.

In addition to assessing the consistency of the scoring, the reliability and the diagnostic validity of the modified mosaic test in relation to a patient population classified by sex, length of hospitalization, and type of schizophrenia, the technique will be compared with some of the measures which constitute the battery developed for the major research project of which this investigation is a segment. The battery includes: 1. tests of cognitive functioning: The Progressive Matrices (1938) and Mill Hill Vocabulary Scale; 2. visual-motor tests: an adaptation of the Porteus Mazes, a tapping test, and The Differential Diagnostic Technique; 3. an apperceptive test: an adaptation of The Thematic Apperception Test; 4. ratings of behaviour during the examination: The Shakow Co-operation Scale and a symptom and behaviour rating scale devised for the study. The relationship between the modified mosaic test and a specially devised form-association test will also be evaluated.

C. Summary.

The present study is concerned with the ability of a modified mosaic technique to differentiate the types of schizophrenia in a population of hospitalized schizophrenics grouped by sex, chronicity and diagnosis. The relationships among this test and measures of cognitive and orectic functioning,

and overt clinical behaviour, are also investigated.

II. THE DEVELOPMENT OF THE MODIFIED MOSAIC TEST.

A. Historical Review.

The validity of the Lowenfeld Mosaic Test as a technique for the psychodiagnostic appraisal of personality has not been fully established. Although Lowenfeld (101) has reported recently that :

> "...definite and describable varieties of design have been found to appear in neurotic and psychotic subjects; and...a series of designs made by the same subject during the process of psychotherapeutic treatment closely parallels and throws light on the clinical development of the case," (p.25)

these conclusions have never been adequately supported. Two consecutive reviews of the literature by Dörken (30, 31) have revealed that the research on the test, much of which is descriptive, is conflicting, ambiguous and inconsistent. Methodological problems such as scoring reliability and the experimental verification of interpretive hypotheses have seldom been raised, let alone investigated. Reports by Lowenfeld (100, 101), Wertham (172), Diamond and Schmale (27), Bell (4), Wertham and Golden (173), Bowen (8), Maher and Martin (105), and others claim empirical, clinical validity for the test, yet base their generalizations on qualitative, relatively subjective evaluations of the finished design and behaviour during its construction. Studies by Himmelweit and Eysenck (69), and Rioch (142), cast some doubt on the

diagnostic validity of some of the qualitative categories advocated by Wertham (172), Lowenfeld (101), and Diamond and Schmale (27). Employing clinical groups of hysterics, dysthymics, and effort syndromes, Himmelweit and Eysenck (69) were able to demonstrate significant statistical differences between the groups only on objective criteria such as: number of concrete designs made, compactness of the design, and blind matchings of the mosaic to the clinical notes which were devoid of identifying data. This study also reported that the test-retest reliability of mosaic patterns (i.e. the number of pieces and number of colours used) was not high, though this may be a function of the particular criteria employed. Nevertheless, there has been a tendency to avoid the few studies reporting negative findings, and to employ the evasive argument of clinicians' convictions, i.e. "we find it useful".

It is difficult to assess the validity of a technique which provides little quantitative, objective data on the subjects used. Although Lowenfeld and other workers argue that the designs are capable of exact classification, definition, and analysis, subjective categorization of the designs as to their predominant gestalt, inferences concerning the subject's intentions, and observations concerning the mode of construction do not afford any basis for adequate analysis. In these circumstances the validity of the test is something private to each individual user.

Levin (92) evaluated the relationship between Mosaic characteristics which were regarded by Lowenfeld (101) and Wertham (172) as having diagnostic significance, and two criteria: psychiatric diagnosis and scores on the Wittenborn Psychiatric Rating Scales. The results of 178 normal, "maladjusted", neurotic, defective, paretic and schizophrenic subjects were sweepingly negative, and it was concluded that there was little justification for continuing to use the Lowenfeld Mosaic Test in its present form.

The study by Levin (92) concurs with the criticism that there has never been demonstrated satisfactorily any statistical differences between groups differentiated on the basis of the Lowenfeld-Wertham scoring system. It is also in partial agreement with the studies by Himmelweit and Eysenck (69), and Rioch (142), though the role of quantitative categories has been ignored. Pascal (131), in reviewing the problems of standardization and quantification of the Mosaic Test, attacks the attitude of Lowenfeld (101), Wertham (172), and Diamond and Schmale (27) that quantification will not contribute to the usefulness of the test, as one of the major obstacles to any critical evaluation of its validity and reliability.

On the hypothesis that the Mosaic Test's potentiality for clinical diagnosis could only be realized through the utilization of numerical procedures, Wideman (174) developed and initially validated an objective scoring method. Employing operational definitions where quantitative measurement was not

possible he developed 39 categories such as: the number of colours; the percentage of chromatic colour used; colour symmetry; shape symmetry; percentages of the various shapes used; tray area occupied; number of designs constructed; differentiation of concrete and abstract designs; a measurement of compactness of the design; ratings of completeness, complexity and aesthetic quality; and the percentages of various colour combinations. The scoring categories ranged from those which were strictly numerical and simple to score (e.g. percentage chromatic colour used) to a few with a high degree of complexity and subjectivity (e.g. aesthetic quality). The standard Lowenfeld Mosaic Test was administered to 107 normals, 70 schizophrenics, 48 neurotics and 20 organic subjects. Of the 39 categories 32 revealed significant differences between the normal subjects and one or more of the patient groups; the schizophrenics showed the greatest deviation from the normal group; the organics differed almost to the same degree; and the neurotics showed fewer differences. Age, sex and education were found to have little effect on test performance; scoring consistency was satisfactory; and test-retest reliability ranged from low to high. Although the diagnostic differentiation attempted was fairly gross, i.e. normal, neurotic, psychotic, organic, the study demonstrated that scoring categories utilizing quantitative methods have considerable diagnostic validity.

Recent investigations of the relationship between perceptual-motor behaviour and personality characteristics have suggested that the selection, ability to reproduce, and personal interpretation of geometric form may be of diagnostic significance. Since the Lowenfeld Mosaic Test is based primarily on the manipulation of geometric forms, it was possible that the modification of the shapes involved might increase the diagnostic sensitivity of the instrument. Breen (9, 10) and North (126, 127), using a drawing test involving the copying of geometric figures, demonstrated that the relationship between the ability to reproduce angular and circular forms and careful long-term psychiatric diagnosis in over 500 cases was consistent and highly significant statistically. Although it might be argued that the differential ability to draw angular and circular figures paralleled symbolically some disturbance of psychosexual functioning, Breen (9, 10) and North (126, 127) hypothesized that the test was sampling tendencies that were more inclusive than those involved in the expression of sexuality. Common to the group, composed of paranoid and psychopathic personality patients, which exhibited difficulty in executing angular figures was the tendency towards the chronic externalization of hostile, aggressive affect, either projected in delusions of persecution or in the form of direct acting-out in anti-social behaviour. In contrast, these authors argued that the group of catatonic and

depressed patients, which experienced difficulty with the circular shapes, was characterized by a tendency to internalize their hostile feelings in the form of stupors or self-depreciating, guilt-ridden depressions. This "choleric-melancholic", extrapunitive-intropunitive bifurcation, similar to: the chronic anger classification of Thorne (167); the extrapunitive-intropunitive response categories used by Rosenzweig (134) in his picture-frustration study; the compliant - aggressive character-typing of Horney (72); the theoretical speculations of Arieti (3) concerning the expression of hostility in schizophrenic symptomatology; and, not dissimilar from the classical Jungian extraversion - introversion formulation, led Breen (9, 10) and North (126,127) to hypothesize that difficulty with the angular forms was related to the chronic expression of externally directed hostility, whereas difficulty with the circular shapes reflected the internalization process. Breen et al. (11) reported that the differential ability to reproduce the figures was correlated significantly (approximate Pearson coefficient of correlation derived from chi square computations = +.74) with the Funkenstein test (52, 53, 54, 55) which is based on the blood pressure changes in response to mecholyl chloride. Extensive experimental studies have indicated that this somatic measure was related significantly to the expression of hostility (52, 55). The results suggested that the drawing test and the physiological recordings were related facets of

a total process, and they appeared to support indirectly, the hypothesis that hostility is a variable measured by both instruments. Employing blind interpretations of the Blacky Pictures, Weininger (170) demonstrated that patients differentiated on the basis of the Funkenstein and drawing tests as having either externalized or internalized hostility patterns were also differentiated in the same manner by their oral - anal responses to the animal cartoons. The direction of hostility implied in these responses was corroborated by blind analyses of the patients' drawing test results.

Geometric figures have usually been interpreted as symbolizing sexual functioning. Freud (49) stressed the postulate that elongated, pointed, angular objects are symbolic of phallic sexuality and that curved, containing, undulating objects connote feminine sexual behaviour. However, psychoanalytic theory arose from clinical observations and the interpretations of dreams and such observations do not in themselves constitute conclusive empirical evidence on the problem of psychosexual symbolism.

The differentiation of various non-representational shapes on a "sexual" basis by adult populations, both normal and psychiatric, has been investigated by Frank (47), Krout(90), Starer (163) and Winter and Prescott (175, 176). Although these studies demonstrated that the pointed, angular drawings are termed "masculine", and that rounded, containing figures are described as "feminine", the degree of relationship with

the anatomical and physiological aspects of sexuality has not been established. The task of matching the line drawings with either the adjectives masculine and feminine, or with masculine and feminine Christian names, used in these studies, does not afford direct evidence of any relationship between the drawings and sexual structure and behaviour. It is possible that the sexual role in a particular culture is more inclusive, and that the adjectives and Christian names possess connotations such as dominance and submission, and aggressiveness and passivity, in addition to any sexual content. Experiments by McElroy (116) and Jahoda (74) concerned with the preference for shapes in school children in Scotland and the Gold Coast, though possibly consistent with the psychoanalytic theory of sexual symbolism, fail to support each other in terms of the sex preferences found for line drawings with "masculine" or "feminine" properties. The possible relativity of the symbols used to the particular cultures, the level of psychosexual development of the children, and the failure to assess the initial assumption that the forms used connote masculine or feminine sexuality, make the results ambiguous. Levy (93) was unable to find any significant relationship between angular and circular, non-representational drawings and male and female Christian names in a population of 62 fifth grade United States school children split evenly for sex. However, the nature of the task, failure to control intelligence, and the level of psychosexual development of the subjects, make the results of this

investigation also difficult to interpret. Employing the same task but with adult populations, Starer (163) and, Winter and Prescott (175, 176) demonstrated the relationship: masculine name with angular figure, feminine name with circular figure. A recent study by Glatter and Hauck (58, 59) in which non-psychiatric and psychiatric subjects were required to rate 40 simple line designs as either male or female, revealed similar findings. Almost without exception, designs made of straight lines, sharp angles and heavy strokes were designated as "male", whereas gentle curves and waves were termed "female".

The conception that geometric forms might express tendencies that are more inclusive than sexual functioning, though often related to it, has been recognized by many. The concept of the mandala (i.e. the circle with four quartering radii, included by Jung (78) in his speculations concerning archetypal symbolic expression in geometric patterns) supposedly symbolizes integration and wholeness. All the disparate parts of personality are held together around a center and are protected by a circle. In this connection, Martin (108) points out that the circle is an age-old symbol of deity, "that the nature of God is a circle of which the center is everywhere and the circumference is nowhere." (p. 150). Galton (56) refers to the natural fancies for different lines and curves displayed by different individuals, and the tendency of people to pursue their work according to definite lines and shapes. In discussing the aetiology of ideas of beauty Erasmus Darwin

stated:

> "...at our maturer years, when any object of vision is presented to us, which by its waving or spiral lines bears any similitude to the form of the female bosom, whether it be found in a landscape with soft gradations of rising and descending surface, or in the forms of some antique vases, or in other works of the pencil or the chisel, we feel a general glow of delight...." (p.123-124)

Aesthetic formulations have often incorporated the association between curves and beauty and pleasure. Digby (28), in discussing the character latent in the infinite diversity of forms and shapes which can be thrown on the potter's wheel, argues that angles are for strength, curves for beauty. This polarity has even been employed in criticism of the ballet (130):-

> "...people are increasingly returning to the gentle grace of the old ballets as an escape from the angular contemporary world." (p.6)

In 1921 Lundholm (102) investigated the affective tone of non-representational, line drawings, and the results are not dissimilar from the theoretical speculations of Breen (9,10) and North (126, 127), or from the aesthetic formulations. University students trained in introspection were required to match descriptive adjectives to angular and curved lines, and to write spontaneous descriptions of their feelings towards them. Angular lines were rated as: giving a sensation of speed; expressing violent movement or merely violence; unpleasant; furious; sharp; impatient; representing unfeeling vigor and strength; hard; angry; stabbing; vicious; painful; and harsh; whereas curved lines were designated as: slow;

reflecting enduring emotions; graceful; beautiful; expressing kindness, graveness, weakness; representing the weaker and less forceful emotions; and smooth. Two recent experiments present somewhat similar results. Investigating the hypothesis that a dynamically lawful relationship exists between a meaning of a word and the response to it in the form of a line drawing, Scheerer and Lyons (150) required undergraduate subjects to draw lines of their own choosing to correspond to given words, and to match nonsense words with non-pictorial figures as well as familiar words with meaningless designs. The lines drawn in the first task were scored for: horizontal or vertical direction; angularity or curvilinearity; regularity; and pressure. The stimulus words melancholy, delicate, and happy were associated with curved lines, and the words forever, massacre, and stolid were related to the angular and straight lines. The words gold, silver and iron were matched significantly with wavy, jagged, and right-angled lines respectively, and these results are identical with those of Krauss (88), who employed the same task in a study of the physiognomic expression in drawings. In the matching of the nonsense words to meaningless designs, Scheerer and Lyons (150) found that the word Maluma was significantly related to round designs, and Takete to the angular. This relationship between geometric figures and sounds was explained in terms of a physiognomic theory of the fusion of objects, at early stages

of perceptual development, with motion, position, sound, and feeling states, similar to that of Stern (166), Werner (171), and Murphy and Hochberg (125). Block (7), also concerned with the general properties of language and their relationships with emotional functioning, selected 15 bipolar descriptions of emotions, one of which was the dichotomy angular versus rounded, and had each description evaluated by 88 college students using 20 connotative seven-point scales. The angular pole was found to be associated with: anger, envy, fear, humiliation, pride, worry, and, somewhat surprisingly, guilt; whereas the rounded pole was related to; love, nostalgia, boredom, contentment, sympathy, grief, anticipation and elation. Other than the angular - guilt association, these results seem consistent with the present argument.

An ingenious study is reported by Heider and Simmel (67). Several groups of adults viewed cinema pictures in which three geometric figures (a large triangle, a small triangle and a circle) moved in various directions and at various speeds in a field containing a rectangle, one portion of which opened and closed. One group was asked to state what they saw; a second group was asked to state what they saw considering the figures to be human. Though the specific features of human movement were eliminated, nearly all subjects in the first group reported what they saw in terms of animated action. A majority of the subjects reported a connected, meaningful series of events in which the triangles tended to be referred to as "he" and the

circle as "she". The following extract is typical of the accounts given by the subjects of the second group:

> "A man has planned to meet a girl and the girl comes along with another man. The first man tells the second to go; the second tells the first, and he shakes his head. Then the two men have a fight, and the girl starts to go into the room to get out of the way and hesitates and finally goes in. She apparently does not want to be with the first man. The first man follows her into the room after having left the second in a rather weakened condition leaning on the wall outside the room. The girl gets worried and races from one corner to the other in the far part of the room. Man number one, after being rather silent for a while, makes several approaches at her, but she gets to the corner across from the door just as man number two is trying to open it. He evidently got banged around and is still weak from his efforts to open the door. The girl gets out of the room in a sudden dash just as man number two gets the door open. The two chase around the outside of the room together, followed by man number one. But they finally elude him and get away. The first man goes back and tries to open his door, but he is so blinded by rage and frustration that he cannot open it. So he butts it open and in a really mad dash around the room he breaks in first one wall and then another." (p.246-247)

The majority of subjects of the second group judged the large triangle to be aggressive, mean and bullying. Though somewhat less uniform, the view of the small triangle was predominately that of a heroic defiant character. The circle was predominately fearful, timid and female. Heider and Simmel stress that there was particularly striking agreement among the subjects concerning the characteristics of the "participants".

Research on the expressive behaviour of children affords similar results. Employing fingerpainting, brushpainting and drawings with preschool children, Wolff (178) found that lines showing sharpness were characteristic of children who exhibited aggressive behaviour. It was also postulated that circular or elliptical forms signified a tendency for limitation or protection. Alschuler and Hattwick (2) appear to support Wolff's findings. The observation of the artistic productions of 149 nursery school children for over one year revealed that straight lines or elongated figures are characteristic products of aggressive moods and that children with negative feelings towards their mothers tended to destroy rounded forms in their drawings. This latter finding seems somewhat inconsistent with the data of Breen (9, 10) and North (113, 114) concerning the hostile patients' difficulty in executing angular figures. However, owing to the lack of accurate developmental information concerning the symbolic expression of hostility, and specific evaluations of the personalities of those children who exhibited the negative feelings toward their mothers, it is difficult to determine whether the results of these two studies are contradictory.

On the basis of this review of the literature it seems possible that, in addition to any sexual content symbolized or expressed by various geometric shapes, there may be some relationship between such shapes and the expression of hostility or aggressive feeling. It also appears reasonable to

hypothesize that a test incorporating the selection and manipulation of various shapes may be sensitive to hostile affect. If, as has been demonstrated, various psychiatric groups can be differentiated on the basis of the expression of such affect, a test sensitive to hostility may be highly efficient diagnostically. It was decided, therefore, to modify the forms included in the Lowenfeld Mosaic Test by adding several curvilinear shapes and some combining both angular and curvilinear qualities, in the hope that the patterns constructed with such pieces would mirror the expression of hostility and thereby aid in psychiatric diagnosis. Since the dichotomy between the paranoid and non-paranoid forms of schizophrenia may reflect differences in the expression and direction of hostility, the modified mosaic test may be efficient in the diagnosis of the sub-categories of this disorder. Furthermore, this technique should relate positively to other tests and scales purporting to measure hostility and aggression.

In addition to the possible diagnostic significance of the expression of hostility, the level of cognitive functioning may also serve to differentiate the different types of schizophrenia. Henderson and Gillespie (68) observed that the general intellectual faculties of the paraphrenic patient are usually well preserved, that his capacity for work may not be interfered with, and that usually the personality is well maintained. In discussing the clinical aspects of paranoid schizophrenia Mayer-Gross, Slater and Roth (111) point out that

disturbances of thinking, feeling and volition, the symptoms which these authors feel lead to personality deterioration, may be absent or inconspicuous.

An experimental study of deterioration in schizophrenia by Shakow (155) revealed that paranoid subjects resemble normals, in intellectual functioning, much more than they do hebephrenics. Although the paranoid is rigid in his response, he is sufficiently preserved intellectually, whereas the hebephrenic is quite deteriorated intellectually. Roe and Shakow (147), employing the Stanford-Binet Intelligence Scale, found that catatonic patients had the highest mental ages, paranoids and simple schizophrenics were very similar and not much below the catatonic level, while the hebephrenics exhibited a definitely inferior performance. However, the failure to evaluate the effect of differences in age between the various diagnostic groups (i.e. paranoid patients are significantly older on admission than the other types of schizophrenia (111)) on their Stanford-Binet scores, makes the results difficult to interpret. Kendig and Richmond (83) reported that paranoids revealed the highest median Stanford-Binet and Vocabulary Scale, mental ages, catatonics were intermediate in ability, and simple-hebephrenics revealed the lowest median scores. These results accord with clinical observations (68, 111).

Various studies report that the Lowenfeld Mosaic Test affords an estimation of intellectual functioning. Wertham (172)

stated that the mosaics of mental defectives are so characteristic that he speaks of them as "mental-defective designs". He found, not disorganization, but rather successful organization at a low, simple level. A number of very small, simple, compact and complete designs with few different shapes but most of the colours were characteristic. However, this study fails to assess the presence of these "signs" in other disorders, especially in schizophrenia. Diamond and Schmale (27) found no significant relationships between types of designs and levels of intelligence. However, they fail to present any objective, quantitative evidence for their conclusions. Lowenfeld (101) reported findings similar to those of Wertham (172), and claimed that there is correspondence between a judgment of intelligence made from a particular mosaic design and the mental age of its maker. McCulloch and Girdner (114), using the Mosaic Test with mental defectives, reported a product - moment correlation of +.43 between estimates of mental age from the design and the Stanford-Binet mental age, and Woolf and Gerson (180) reported studies which indicated a well-defined relationship between the ranked Binet scores of children and their Mosaic patterns ranked for intelligence. In the most recent study of the relationship between intelligence and the Lowenfeld Mosaic Test, Robertson (145, 146) divided 90 elementary school children into three groups on the basis of their Stanford-Binet intelligence level, and matched the subjects for sex, school grade, and father's occupation. Four judges rated the mosaics for general

intelligence, and for four categories: movement, originality, complexity, and organization of the gestalt. Average correlation coefficients between the four categories and the Stanford-Binet I.Q. were: +.22, +.33, +.38 and +.26 respectively. Correlations between estimates of general intelligence and Stanford-Binet I.Q. levels were significant for two of the four judges (+.42 and +.48). Robertson concluded that the Mosaic Test measures aspects of intelligence which differ largely from those involved in the Stanford-Binet Scale. It appeared that any estimate of general intellectual level from the Mosaic Test was based to some extent on such characteristics as complexity, originality and organization of the designs.

Although the studies reviewed are not conclusive in demonstrating either the degree of relationship between intelligence and mosaic performance or the specific mosaic characteristics upon which an estimation of intelligence is made, it appears that the cognitive abilities of the subject are involved to some extent. It is possible that scoring categories of the modified test based on the ability of the subject to organize and complete a complex design will afford some estimation of cognitive functioning. Since such an assessment may aid in the diagnosis of the types of schizophrenia, the cognitive as well as orectic variables of the modified mosaic test may differentiate efficiently between the schizophrenias.

B. Description and Administration.

i) Test Materials

In her recent book Lowenfeld (101) stated:

> "The shape that at first seemed the most obvious to use as a fundamental form was the circle... Experiment soon proved that it would be impossible to get a satisfactory combination of solid circles with other forms. (Anyone who doubts this can convince himself of its truth by making the attempt.) The circle was therefore rejected." (p.32)

Although it is impossible to combine angular and circular shapes directly, it is possible to include shapes possessing both angles and curves and therefore capable of linking angular with circular forms.

The test materials* used in this study consisted, therefore, of 288 pieces of ⅛ in. thick vynate plastic: four pieces of each of twelve shapes: four angular, jagged, or straight-lined (Fig. 1: 1, 2, 3, 4); four curvilinear, rounded, or undulating (Fig. 1: 5, 6, 7, 8); and four pieces incorporating both angular and circular elements (Fig. 1: 9, 10, 11, 12). Shapes 1, 3 and 4 of Figure 1 are similar to

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Figure 1.

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pieces used in the Lowenfeld Mosaic Test. The sides of the angular and mixed pieces were either of two lengths, and the

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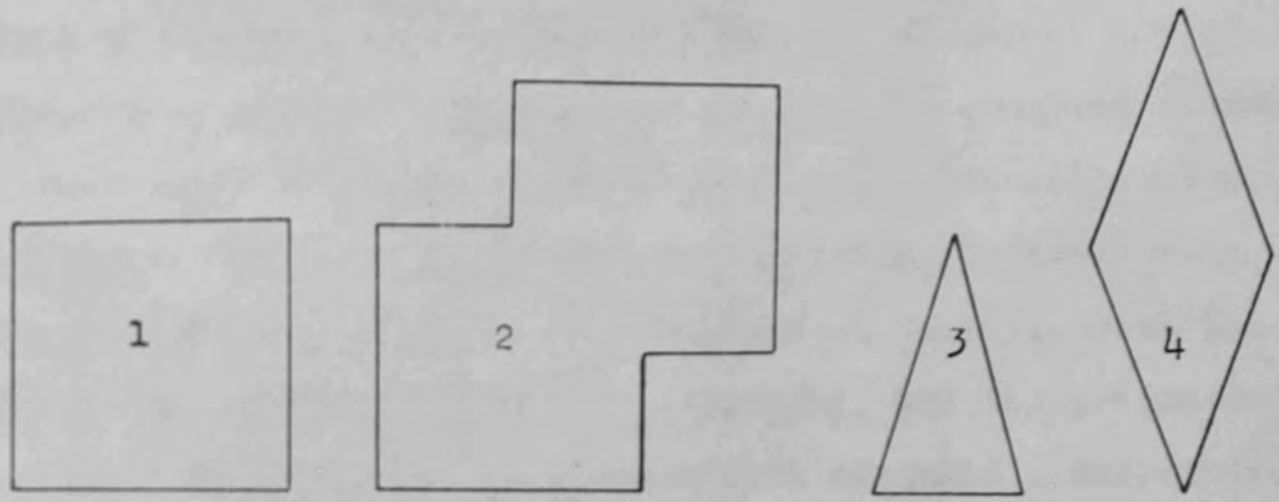
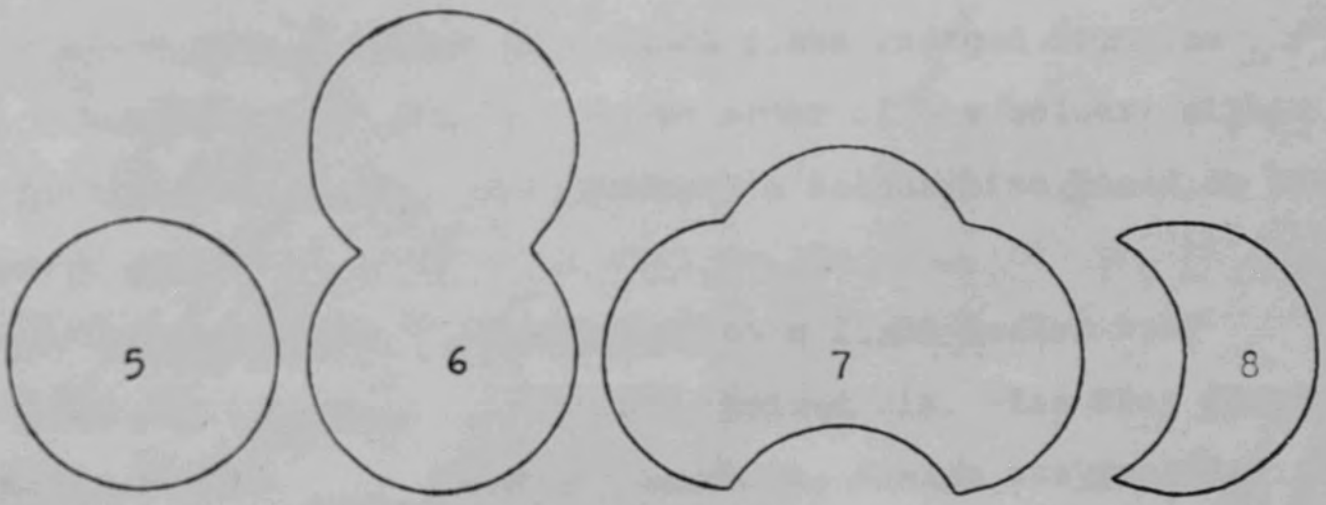
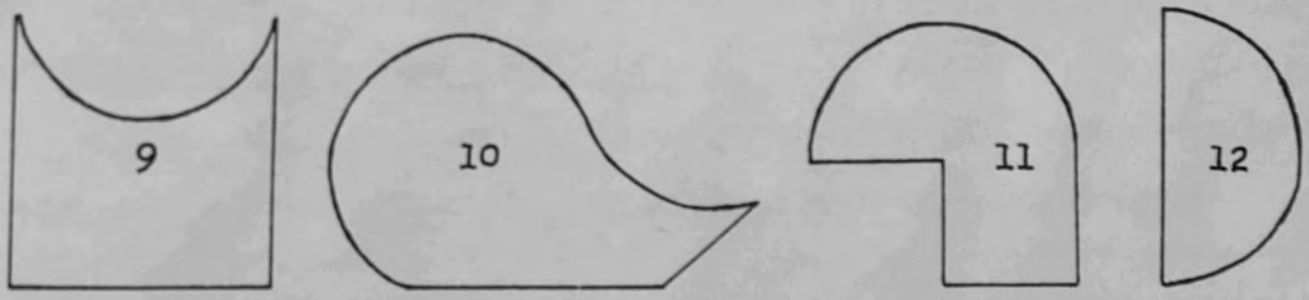


Angular Shapes



Circular Shapes



Mixed Shapes

Figure 1. Pieces Employed in the Modified Mosaic Test (Actual Size)

radii of the arcs of the curvilinear and mixed pieces were similar, to permit interlocking. The exact sizes and shapes of the pieces are illustrated in Figure 1. Each shape was constructed in each of the six colours: red, yellow, green, blue, black and white. It had been hoped to illustrate the colours by means of coloured photography, but the prints contained in Appendix A* do not afford adequate differentiation between green, blue and black. The pieces were arranged in a standard order (Plate 1) in a metal tray set in a wooden container with a hinged top. Each piece emerged from the slot approximately ½ in., and the order of the colours within each slot was randomized to prevent a colour bias based on the use of end pieces.

The designs were constructed on a light wooden tray 12⅝ in. by 10¼ in. with a narrow, raised rim. The tray floor was lined with white paper on which the design was recorded by tracing around each piece and later colouring it appropriately.

ii) Administration and Set

Since the modified mosaic test was the fifth measure in a battery of nine, certain aspects of the situation were

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*The designs are illustrated in the 21 coloured prints contained in Appendix A. In order to keep the selection objective, i.e. free from bias towards the hypothesized and aesthetically pleasing patterns, 19 designs (Plates 3 to 21) were chosen from the total population by means of a table of random numbers. Seven were chosen from each of the paranoid and catatonic groups, and six from the hebephrenic - simple. The remaining two prints (Plates 1 and 2) illustrate the tray arrangement, and the high level of creativity which some subjects attained.

constant for all tests, and the set instituted at the beginning of the session was assumed to be operative throughout. The subject was seated beside the examiner in a well-lighted room free from auditory and visual distraction. No other persons were present during the session nor was the subject ever left alone. An attempt was made to structure the test situation in a brief, pre-battery interview.

It was realized that no rigid formulation for introducing the subject to the tests could be used, for each examiner has his own unique method for establishing and maintaining contact with the often grossly dissociated subjects. It was necessary to permit freedom to deviate as the situation demanded. However, since full co-operation and personal involvement in the situation are difficult to obtain in a schizophrenic population, it was necessary to stress and exaggerate any factor which might increase absorption in the tasks. In contrast to the permissive,anxiety-relieving set common to the traditional projective methods, the subjects were informed directly and by analogy (e.g. the tests as clinical thermometers of mental health) that the tests would contribute to a greater understanding of their personalities. No attempt was made to make light of the examination, smoking was not permitted, and casual conversation kept to a minimum. The examiner attempted to convey the seriousness of the tasks to the subject, and emphasized that he regarded it as such. It was hypothesized that if the tests have some degree of personal implication;

tion; if some anxiety or tension is aroused; if, for perhaps the first time in months, the schizophrenic subject is forced to mobilize his resources to meet a more or less critical situation, the test sample will be more meaningful psychologically.

Ability and willingness to complete the first four items of the test battery were accepted as an adequate demonstration of the resources required to complete the modified mosaic test. Only in exceptional instances was it necessary to emphasize the set for each individual test. On completion of the previous item, the mosaic box was placed directly in front of the subject but behind the tray upon which the design was to be constructed.

The experimenter opened the lid of the container and said: "Here is a task which I think you will find interesting". The following instructions were then given:

> "Look carefully at these pieces of coloured plastic. There are twelve different shapes and six colours. Would you name the colours for me? Let me show you what the different shapes look like."

The different shapes were shown to the subject, care being taken to select a different colour and from a different position within the slot for each separate piece. The selection was made across the container at the back from left to right so as not to bias any one form type. The instructions were continued:

> "Each shape comes in each colour.

> "Using any of the shapes you like, any of the colours you like; as many pieces as you want or as few as you want, I would like you to make something on this tray. Just do anything you like with the pieces, and tell me when you have finished. You can take as long as you like."

In the rare cases in which the subject did not comprehend the nature of the task required, the instructions were repeated. Care was taken not to stipulate whether an abstract pattern or representational design should be attempted, lest such selection be important diagnostically. If there was doubt concerning the number of designs constructed, the subject was asked to describe his production. No direct questioning was employed. On completion of the instructions, additional questions concerning the test were met by means of permissive, non-directive replies. Any comments made during the performance were recorded.

The reaction time and the total time taken to complete the design were recorded. In order to differentiate between abstract and concrete designs, the subject was asked to describe the finished product. He was also asked which shapes and colours he liked and disliked.

C. The Scoring Categories

In his development of an objective scoring system for the Lowenfeld Mosaic Test, Wideman (174) hypothesized that:

> "...while no single quantitative Mosaic Test variable would be a valid indicator of a personality trait in one individual,

> "significant group differences would appear which would have clinical meaning. By utilizing several of these significant scores as "signs" individual subjects might be validly diagnosed." (p. 179)

This rationale was adopted in the present study, and a preliminary list of 102 scoring categories was derived from the pertinent literature, (including the 39 categories used by Wideman (174)), and from clinical experience with other techniques. The first 20 designs collected were scored according to these categories, and it was realized that such a scoring system was unwieldy. Many items were eliminated as being repetitious, too difficult to quantify, infrequent in occurrence, or as psychologically insignificant. In the final list of 25 categories, it was impossible to retain only those factors which were quantifiable. Certain of the categories employed depend upon the judgment of an observer, and, in such instances, Wideman's procedure of employing operational definitions similar to those used by Pascal and Suttell (132) for the Bender - Gestalt test, was followed. The definitions of the scoring categories employed together with any information concerning their previous use, are set out below.

Reaction Time. The time in seconds from the completion of the instructions to the placement of the first piece on the tray, whether or not this piece was exchanged later, was recorded.

Diamond and Schmale*(27) found that depressed subjects exhibited retardation in terms of slow reaction times. However, Levin (92) reported that reaction time on the Mosaic Test failed to differentiate depressions from other psychiatric groups or from normal subjects.

Total Time. The total time, including the reaction time, required to construct the design or designs was recorded to the nearest second. The subject's signal of completion was accepted as the termination of the test.

Lowenfeld (101) reports extreme slowness in some depressed subjects. Wideman (174) reports results suggesting ($P = .04$) that psychoneurotics spend longer than normals, and schizophrenics longer than organics.

Number of Designs. In most cases this category was easy to score but in some instances a subject repeated a number of small designs which were difficult to differentiate, or intended separate areas of one large design as discrete designs. In cases of doubt, the subject's enumeration of the designs was accepted. Plate 17 was scored as 12 designs.

McCullock and Girdner (114) and Wertham (172) reported that multiple designs are characteristic of both mental defectives and schizophrenics. Wertham (172) also described a single, small, compact mass (simple agglutination) as

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*Although the shapes of the Lowenfeld Mosaic Test have been modified radically in the present study, the task involved in both tests is similar. It is argued, therefore, that the results of this investigation may be compared in part with data based on the original Lowenfeld Test.

characteristic of paranoid schizophrenia, and as sometimes found in simple schizophrenia. Diamond and Schmale (27) found multiple or unrelated patterns characteristic of early schizophrenia and post traumatic encephalopthies. Colm (24)reported the repetition of simple designs in children with organic brain disorders. No differences in the number of designs constructed by psychoneurotics or schizophrenics were found by Wideman (174), but both these groups constructed more designs than either normals or organics. Levin (92) found that mental defectives made a greater number of small, simple designs than either neurotic, maladjusted or normal subjects, but not significantly more than schizophrenics.

Number of Pieces. The total number of pieces used in all designs was recorded.

Wertham (172) found that psychotics use few pieces, especially paranoid schizophrenics who often construct simple agglutinations composed of few pieces. Wideman (174) reported that organics use fewer pieces than normals, psychoneurotics or psychotics, and that there were no significant differences between these latter three groups. These results were supported by Levin (92). Himmelweit and Eysenck (69) found no significant relationship between intelligence and number of pieces used by hysterics, effort syndrome subjects and dysthymics.

Number of Shapes. The number of different shapes used in all designs was noted.

Wertham (172) also reported that psychotics use few shapes.

In contrast, Wideman (174) found no differences in the number of shapes employed by the psychiatric groups, and only a suggestion (P = .05) that normals use more shapes than psychoneurotics.

Percentage of Angular Pieces. The percentage of angular pieces used in all designs was computed.

Wideman (174) found that the percentages of the different shapes used (i.e. all angular forms) differentiated between several of his experimental groups. However, since all pieces used possessed the same geometrical properties, i.e. all were angular, the basis for such differential selection is not clear. In order to avoid calculations based on extremely small frequencies, and since the psychological significance of percentages of the individual pieces used is questionable, the pieces used were grouped as to their predominate form elements, and the percentages of the three types of form were computed.

Percentage of Circular Pieces. The percentage of circular pieces used in all designs was computed.

Percentage of Mixed Pieces. The percentage of pieces, composed of both angular and curvilinear elements, used in all designs was computed.

Shape Preference. The subjects were asked which shape they preferred and which shape they disliked. Their choices were recorded as being angular, circular or mixed in order to obtain frequencies large enough for statistical appraisal.

Shape Symmetry. Shape symmetry was scored in four discrete sub-categories: entire or perfect shape symmetry; near perfect shape symmetry; rudiments of shape symmetry; and, no shape symmetry. In all sub-categories, allowance was made for the slight shifting of one or two pieces, and all colour placement was disregarded. Thesesub-categories were defined as follows:

1.) Entire or Perfect Shape Symmetry was scored in two ways, either type being adequate for inclusion in this sub-category:

A. when a design could be folded on any axis so that the halves would mirror each other (Plates 3, 4, 6, 8, 13, 16);

B. when one side of an axis was inversely symmetrical with the other, i.e. a balanced reversal (Designs 2 and 4 of Plate 12).

2.) Near Perfect Shape Symmetry was scored when the design was, for the most part, symmetrical with only a few (20% or less) pieces not symmetrically placed when design is folded (Plate 10).

3.) Rudiments of Shape Symmetry was scored when a few (20% or less) pieces were symmetrically placed when design is folded but the rest were in disorder (Plate 21). If multiple designs were made and if the designs, when folded along a common axis, did not satisfy the criteria for Perfect or Near Perfect Symmetry, either Rudiments of Symmetry or No Symmetry were scored. Rudiments of Symmetry was scored if some semblance of shape symmetry was found in any of the designs (Plates 5, 11, 12, 14, 17), otherwise No Symmetry was scored.

4.) No Shape Symmetry was scored when no vestiges of symmetrical

cal placement could be found in a design or in any of several designs (Plates 7, 9, 15, 18, 19, 20).

Both the exaggeration of shape symmetry at the expense of other variables and a lack of symmetry have been said to characterize the designs of schizophrenics. Wertham (172) and Wertham and Golden (173) reported that formalistic, rigid "supersymmetry" was a pathognomic sign of schizophrenia, and this finding has been supported by the researches of : Diamond and Schmale (27), Ellenberger (33) and Lowenfeld (101). Levin (92) found that schizophrenics had a higher frequency of "supersymmetry" than maladjusted subjects or normals, but no higher than neurotics, mental defectives or organics. Wideman (174) found that "supersymmetry" occurred so infrequently in all groups that the category could not be scored. An examination of the low frequencies reported by Levin (92) casts doubt upon the stability of the differences he found.

Both Wertham and Golden (173) and Diamond and Schmale (27) reported only rudiments of organization and shape symmetry in the designs of advanced schizophrenics. Lowenfeld (101) mentioned that hebephrenic schizophrenics showed a marked lack of interest in symmetry. Although he found no differences between normals and psychoneurotics, and between schizophrenics and organics, in the level of form symmetry achieved, Wideman (174) reported significant differences between normals and both schizophrenics and organics, and a suggestion of differences ($P = .05$ and $.03$) between psychoneurotics and the same two groups.

Robertson (144), in a study of the symmetry of patterns constructed with mosaic-type pieces in only two shapes, found that intellectual ability was a most important factor in attaining perfect symmetry but that sometimes subjects functioning at a low level could construct symmetrical designs. Robertson hypothesized that any relationship between maladjustment and asymmetry is indirect, and is mediated by impairment in cognitive ability. Poor symmetry in psychotics was explained in terms of this cognitive impairment.

Number of Colours. The number of different colours used in all designs was noted.

Wertham (172) and Diamond and Schmale (27) reported that schizophrenics restrict their use of colour, using pieces for form rather than for their colour. Wideman (174) found that normals used more colours than schizophrenics or organics, and that there were no differences between his other groups.

Percentage of Chromatic Colour. The percentage of chromatic colour (red, yellow, green, blue) used in all designs was computed.

Although Wideman (174) computed the percentages of the individual colours used in addition to computing the percentage of chromatic colour, the presence of extremely small frequencies of some of the colours in the present study, necessitated the grouping of the colours used into chromatic and achromatic.

Wertham (172) stated that schizophrenics used a smaller percentage of chromatic colour, and that black and/or white alone were definite schizophrenic 'signs'. Wideman (174) reported that both normals and psychoneurotics used more chromatic colour than schizophrenics. Himmelweit and Eysenck (69) found no differences, in the percentages of each colour used, between any of their psychiatric groups, and Colm (24) found that institutionalized children use colour indiscriminately.

Colour Preference. The subjects were asked which colour they preferred and which colour they disliked. Their choices were recorded as being chromatic or achromatic in order to obtain frequencies large enough for statistical appraisal.

Colour Symmetry. Colour symmetry was scored in four discrete sub-categories in exactly the same manner as Shape Symmetry: entire or perfect colour symmetry; near perfect colour symmetry; rudiments of colour symmetry; and, no colour symmetry. In all sub-categories, allowance was made for the slight shifting of one or two pieces, and the shapes of the pieces were disregarded.

Both Wertham and Golden (173) and Diamond and Schmale (27) reported that schizophrenics often disregard colour and use it indiscriminately. Form symmetry was usually given preference over colour symmetry. However, Wertham (172) found that a few schizophrenics exhibited rigid form and colour symmetry, and Lowenfeld (101) mentioned that the compact, geometrical patterns of paranoid schizophrenics are often symmetrical for both factors. In his study of symmetry, Robertson (144) found that

both normal and maladjusted subjects attended primarily to shape and secondarily to colour, and that a high degree of colour symmetry was most difficult to achieve. Wideman (174) found a suggestion (P = .05) that normals had more perfect colour symmetry than schizophrenics.

Compactness Index. The compactness index was obtained by dividing the total area of the pieces used by the area of the circle which would just circumscribe all pieces of the design or designs. The areas of the individual pieces, computed graphically to the nearest four square millimetre unit, are as follows:

Piece Number (Figure 1)	Area in 4 sq. mm. units
1	254
2	422
3	65
4	151
5	199
6	368
7	412
8	119
9	175
10	236
11	164
12	100

The radius of the circle was determined by means of a compass, and the area was computed in square centimetres by means of the formula πr^2. High indices betokened agglutination or compactness of the design or designs (Plate 18: index 16.4; Plate 6: index 9.3; Plate 15: index 2.4).

Wideman (174) derived an index of compactness by dividing the total area of the pieces by the tray area. Tray area was

scored by placing a sheet of clear plastic, ruled in squares, over the pattern and counting the number of squares touched by the design. However, experimentation with this technique showed that small designs gave a systematically low index, and that designs that gave a moderately high index still revealed considerable space between the pieces. The present index was devised in order to include the concept of agglutination, i.e. pieces packed together in a mass with a minimum of space between each other.

Wideman's (174) study suggested ($P = .05$) that the designs of normals were more compact than those of schizophrenics. Wertham (172) stated that among normal people, loose designs are more likely to be made by impressionistic, imaginative types and compact ones by matter-of-fact people. Wertham and Golden (173) found that an agglutination of a few pieces was characteristic of paraphrenia, and was sometimes found in adolescent schizophrenia simplex, whereas scattered designs were found in advanced schizophrenia. Lowenfeld (101) also found compact designs in paranoid schizophrenia and stated that scattered, overall designs were often diagnostic of catatonic or hebephrenic schizophrenia. Employing independent judgments, Himmelweit and Eysenck (69)reported that 60 per cent of the designs made by dysthymics were compact, and were constructed so that the pieces fitted closely together, whereas only 38 per cent of effort syndrome subjects and 27 per cent of hysterics constructed compact patterns.

Dispersed designs were found in the hypomanic subjects examined by Diamond and Schmale (27).

Compactness Rating. The design or designs were rated for compactness on a four-point scale: compact; nearly compact; little compactness; and scattered. Compact was defined as all pieces touching with little or no space within the design (Plates 4 & 18); Nearly Compact was defined as most pieces touching (> 80%) with a minimum of space within the design (Plate 21); Little Compactness was defined as a few pieces touching (> 20%) with some semblance of agglomeration (Plate7); and, Scattered was defined as most pieces isolated with only a few (< 20%) touching (Plate 19).

A judgmental rating of compactness was made necessary because of the few patterns which exhibited one or two pieces which were isolated from a main, compact pattern, thus giving a spuriously low compactness index. Wideman (174), using a compactness scale to supplement his index of compactness, suggested that designs by normals are more compact than those of schizophrenics (P=.03), and that designs by organics are more compact than those by normals or psychoneurotics (P=.02 and .05).

Concrete - Abstract. On completion of the design or designs, the subject was asked to describe the finished product. Care was taken not to suggest what type of pattern or representational design could have been made. The design was scored as either concrete, i.e. representing some concrete object;

or abstract, i.e. a pattern or non-representational design. The mosaic was scored as concrete if one or more of several designs were identified as representational (Plates 2, 3, 5, 8, 16).

Wertham and Golden (173) and Diamond and Schmale (27) reported that normal subjects made concrete and abstract designs equally often, but that schizophrenic mosaics were usually abstract. In discussing the "delusional dissociated reaction" Lowenfeld (101) stated that paranoids often complete a design and then invent an explanation for it, i.e. designate it as concrete. Himmelweit and Eysenck (69) found that hysterics made a significantly smaller number of concrete designs than dysthymics. Both Rioch (142) and Wideman (174) reported that the concrete - abstract dichotomy was of little diagnostic validity. Flum (36) collected mosaics from 239 adolescents in Jerusalem and found no correlation between content and intelligence as measured by the Cornell - Coxe Performance Ability Scale or the Wechsler - Bellevue Intelligence Scale. However, Flum did find a relationship between content and the handling of colour.

Completeness. Although previous research by Robertson (144) suggested that the concept of completeness is dependent on the symmetry of the design, the separate completeness score devised by Wideman (174) to include asymmetrical, concrete designs was adopted. All designs were rated on a four-point scale as: complete (Plates 2, 4, 6, 8, 13); slightly defective

(Plate 10); markedly defective (Plates 3, 11, 12, 14, 16, 17, 21); or, no discernible pattern (Plates 5, 7, 9, 15, 18, 19, 20). An abstract pattern was rated complete when it exhibited perfect shape symmetry, and the remaining three levels of completeness corresponded to the latter three shape symmetry sub-categories. A concrete design was rated complete when it was judged to be a good representation of its object. The remaining three levels of completeness corresponded to fair, poor and very poor representations. The reliability of these judgments was evaluated by employing independent raters (Table VI).

Several workers (27, 101, 172, 173, 174) have reported that designs made by normals usually have complete configurations whereas designs constructed by schizophrenics often reveal incomplete configurations. Wideman (174) found that his completeness score was more efficient than form symmetry in differentiating normals and psychoneurotics from schizophrenics and organics.

Complexity. The design or designs were rated on a four-point scale as: complex (Plates 2, 8, 12, 13); fairly complex (Plate 6); relatively simple (Plates 3, 4, 10, 11, 16, 17, 21); or, very simple (Plates 5, 7, 9, 14, 15, 18, 19, 20). An attempt was made to evaluate the interaction of such factors as: the elaborateness of the pattern; the number of shapes and colours used, and the way in which they were employed; the level of completeness achieved; and the originality of

the production. The reliability of these relatively subjective assessments was evaluated by using independent judges (TableVI).

Wertham (172) reported that the designs of normals are relatively complex and that a design which was too simple reflected either an intellectual defect or emotional disturbance. Diamond and Schmale (27) stated that normal mosaics are often complex with wide variation in construction. Lowenfeld (101) stressed both ingenuity and complexity as characteristic of normal productions.

Wertham and Golden (173), Colm (24), McCulloch and Girdner (114), Shotwell and Lawrence (159), and Lowenfeld (101) described the designs of mental defectives as simple. Levin (92) found that mental defectives made significantly more simple patterns than psychoneurotics, maladjusted subjects or normals. Robertson (144) argued that variables of organization such as symmetry, which are an integral part of any judgment of complexity, were closely related to cognitive functioning. General intellectual level has been shown experimentally to relate to the complexity of the design (145, 146).

Both Wertham (172) and Lowenfeld (101) stated that simple designs were characteristic of schizophrenia. Levin (92) found a high frequency of simple designs in his schizophrenic group, yet Rioch (142), employing blind judgments of complexity, reported that designs by schizophrenics were found in the top 20 per cent chosen for high complexity and organization. Wideman (174) found that normal patterns were more complex

than those by all his psychiatric groups, and a suggestion (P = .03 and .02) of superior complexity in the patterns of psychoneurotics and schizophrenics as compared with organics.

Aesthetic Quality. A subjective rating of the aesthetic quality of the design or designs was made on a four-point scale: aesthetically pleasing (Plates 2, 8, 12); above average (Plate 13); moderately pleasing (Plates 3, 6, 10, 16); or, little or no aesthetic interest (Plates 4, 5, 7, 9, 11, 14, 15, 17, 18, 19, 20, 21). The inter-judge reliability of this subjective category was not evaluated due to the general poor quality of the productions.

Lowenfeld (101) mentioned that aesthetically pleasing designs are found in both normal and psychiatric groups. Himmelweit and Eysenck (69) reported that the ability to create aesthetically beautiful designs was not correlated significantly with level of intelligence, nor did it differentiate between hysterics and dysthymics. Robertson (144) demonstrated that aesthetically sophisticated subjects were able to arrange pieces asymmetrically in aesthetically pleasing relationships, but otherwise was unable to establish a significant statistical relationship between aesthetic quality and intelligence. Wideman (174) found that designs by normals were aesthetically superior to those of schizophrenics and organics, and suggested that patterns by normals were superior to those by psychoneurotics (P = .04) and that the latter were superior to those by schizophrenics (P = .05).

Horizontal Localization. The localization of the design on the tray in relation to the vertical central axis was categorized as follows:

1) Right: All, or the greatest portion, of the design or designs was placed to the right of the vertical central axis of the tray (Plate 2).

2) Left: All, or the greatest portion, of the design or designs was placed to the left of the vertical central axis of the tray (Plate 3).

3) No Horizontal Localization: The design or designs were evenly distributed about the vertical central axis, i.e. the vertical central axis was approximately at the centre of the design or designs (Plate 21).

When the localization was in doubt a sheet of clear plastic the size of the tray, on which the central axes had been ruled, was employed.

Lowenfeld (101) stated that designs with their lines sloping down from left to right were found in depressions. Although outlay or position on the tray failed to differentiate between hysterics and dysthymics, Himmelweit and Eysenck (69) found that the category possessed high test-retest reliability. Wideman (174) found that horizontal localization differentiated psychoneurotics and organics from schizophrenics.

Vertical Localization. The localization of the design on the tray in relation to the horizontal central axis was categorized as follows:

1) Upper: All, or the greatest portion, of the design or designs was placed above the horizontal central axis of the tray (Plate 6);

2) Lower: All, or the greatest portion, of the design or designs was placed below the horizontal central axis of the tray (Plate 8);

3) No Vertical Localization: The design or designs were evenly distributed about the horizontal central axis, i.e. the horizontal central axis was approximately at the centre of the design or designs (Plate 21).

When the localization was in doubt the plastic sheet with ruled axes was employed.

Lowenfeld (101) observed that an arrow-like design sloping down towards the bottom of the tray was common in depressions. Levin (92) found that the downward arrow design failed to differentiate maladjusted subjects from normals, and that the frequency in the depression group, which was selected by means of the Wittenborn Scale, was not significant statistically. Wideman (174) suggested (P = .04) that vertical localization differentiated psychoneurotics from organics.

Several additional types of response were recorded initially but were later omitted when examination of the data revealed that the frequencies observed were too small for statistical evaluation. These responses included: stating a preference and a dislike for the same shape or colour;

giving concrete or symbolic meaning to individual shapes or colours; overlapping pieces so that the design had a third dimension; and constructing the design with pieces on the tray ledge or outside the tray area. Although they attempted to appraise the mosaic by evaluating the Gestalt formed by the finished design, test behaviour, attitude of the subject, and his introspections, Diamond and Schmale (27) found that information, other than that obtained from the completed mosaic only, contributed little to the diagnostic power of the test. This finding has been supported by Himmelweit and Eysenck (69) who reported that only characteristics of the completed design differentiated between hysterics and dysthymics. In view of these observations, and Wideman's (174) demonstration of the diagnostic validity of objective scoring categories, only categories scored from the finished test, with the exception of the time measurements and the stated shape and colour preferences, were employed in the present study.

D. The Subjects.

The subjects used in this study were 180 institutionalized schizophrenic patients at Runwell Hospital, Wickford, Essex. Each subject was assigned to one of six groups of 30 subjects each on the basis of psychiatric diagnosis and length of hospitalization. Each of these groups was split into two sub-groups of 15 males and 15 females. The groups comprised

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Table I.

TABLE I. Summary of Groups Employed

	Diagnosis						
	Paranoid		Catatonic		Heb-Sim.		Total
	♂	♀	♂	♀	♂	♀	
Acute	15	15	15	15	15	15	90
Chronic	15	15	15	15	15	15	90
Total	60		60		60		180

the first 180 subjects of a population of 270 which constituted an almost complete sample of the testable schizophrenic patients who met the requirements for inclusion in the major study during the period of July 1956 to November 1957. The criterion of testability refers purely to the ability of the subject to complete the present test battery. Cases declared by ward sisters to be hopeless were examined, many successfully. Even subjects who were stuporous and incontinent were often able to complete the battery.

i) Diagnosis. Each subject was assigned to one of the three diagnostic groups on the basis of either an unequivocal, long-term psychiatric appraisal and diagnosis as recorded in the case material, or a direct clinical evaluation and diagnosis by a senior member of the psychiatric staff. Owing to the clinical difficulty in differentiating paranoid schizophrenia from paraphrenia or paranoia (68), and hebephrenic schizophrenia from simple schizophrenia (111), the following three categories were employed: paranoid schizophrenia, including any paranoid psychosis such as paraphrenia or paranoia (such cases were rare in the present hospitalized population); catatonic schizophrenia; and hebephrenic and simple schizophrenia. All diagnoses were recorded at time of testing.

ii) Length of Hospitalization. Each subject was categorized in one of two chronicity groups on the basis of length of hospitalization. Since any definition of

chronicity in terms of acute and chronic was arbitrary on account of the difficulty in establishing the exact date of onset and the extreme variability in the period of time elapsed between onset and admission to hospital, the differentiation attempted was gross. In the present study acute was defined as three years or less cumulative hospitalization, and chronic as greater than three years. The period of hospitalization during separate admissions to any mental hospital contributed to the final estimate.

On completion of the study an investigation by Drasgow (32) was found which demonstrated that there is little possibility of a patient being discharged after he has been hospitalized for three years. The first 100 consecutively-admitted schizophrenics listed on the admission records of 10 years previous to the study were followed to see if and when they had been discharged. Both graphical analyses of the data and the mathematical determination of the curve's equations revealed that the three year mark was the point of diminishing returns. Consequently it appears that the three year criterion for chronicity is less arbitrary than was expected.

Mayer-Gross, Slater and Roth (111) reported that non-paranoid schizophrenics have a longer length of hospitalization than paranoid schizophrenics owing to their younger age on admission to hospital and the insidious nature of their illness. In view of the danger of distorting the representativeness of the diagnostic sample by matching the diagnostic

groups for length of hospitalization within each of the crude chronicity divisions, the variable, except for this acute - chronic dichotomy, was left uncontrolled. Table II reveals that no significant differences in length of hospitalization were found between men and women within any of the diagnostic or chronicity groups, but that the acute hebephrenic - simple schizophrenics spent significantly longer in hospital than either acute paranoid or catatonic schizophrenics. No significant differences in length of hospitalization were

Table II.

found between any of the chronic diagnostic groups. The difference between the acute catatonic and acute hebephrenic - simple schizophrenics may be explained in terms of the cyclic nature of catatonia. The majority of the acute catatonics were new patients, or those who had had previous admissions of only a few months' duration, whereas the majority of the acute - simple schizophrenic patients had had longer continuous admissions.

iii) Age. Subjects between the ages of 16 to 63 years inclusive were chosen, and the sex groups within each diagnostic x chronicity group were matched as closely as possible for mean age. Since paranoids have a greater mean age on admission than non-paranoids (111) it was impossible to match for age in the diagnostic groups without a serious danger of distorting the representativeness of the sample.

TABLE II. Significance of Differences in Length of Hospitalization Between Sex and Diagnostic Groups

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization, II=>3 years

Groups	Statistic	Value
PI: ♂ vs ♀	U	106
PII: ♂ vs ♀	U	88.5
CI: ♂ vs ♀	U	95.5
CII: ♂ vs ♀	U	77.5
HI: ♂ vs ♀	U	99.5
HII: ♂ vs ♀	U	103
PI vs CI	z	0.68
PI vs HI	z	3.85 **
CI vs HI	z	3.12 **
PII vs CII	z	0.48
PII vs HII	z	0.52
CII vs HII	z	1.19

** = <.01

Chance probability of obtaining 2 statistics significant at .01 from 12 calculated statistics = <.01

However, if variables such as cognitive ability were primarily a function of age in the present study, failure to control age in the diagnostic groups would increase the expectation of accepting the null hypothesis; e.g. dilapidation in intellectual processes as a function of age in the older paranoid groups would reduce the likelihood of obtaining the predicted differences between groups, i.e. that paranoids would be superior to non-paranoids in cognitive functioning as measured by various of the instruments employed.

In order to determine whether the various groups differed in mean age, an analysis of variance was computed, the results of which are summarized in Table III. Since the

Table III

interaction F ratios for the diagnostic and chronicity groups were statistically significant ($P = <.01$), it is possible to infer that these experimental conditions produced significant differences in the mean ages of the various groups that cannot be accounted for by the variability of the data. The interaction F ratio for the sex comparisons was not statistically significant.

In order to determine which diagnostic and chronicity groups contributed to the significant variance estimates, t-tests for the differences between independent means were computed, and the results are summarized in Table IV.

Table IV.

TABLE III. Analysis of Variance of Age

Source of Variation	Sum of Squares	df	Mean Square	F
Diagnosis	4145.07	2	2072.54	28.99**
Chronicity	9302.41	1	9302.41	130.10**
Sex	0.20	1	0.20	-
Diagnosis x Chronicity	672.17	2	336.09	4.70*
Diagnosis x Sex	2.25	2	1.13	-
Chronicity x Sex	0.21	1	0.21	-
Diagnosis x Chronicity x Sex	24.19	2	12.10	-
Within Groups	12011.30	168	71.50	
TOTAL	26157.80	179		

** = <.01
* = <.05

TABLE IV. Significance of Differences in Mean Age Between Diagnostic and Chronicity Groups, Sexes Combined

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization, II=>3 years.

Group	Mean Age	Group	Mean Age	Diff.	S.E.	t
PI	41.3	PII	51.4	10.1	1.75	5.77 **
CI	28.7	CII	42.2	13.5	2.32	5.82 **
HI	27.4	HII	46.9	19.5	2.33	8.36 **
PI	41.3	CI	28.7	12.6	1.76	7.16 **
PI	41.3	HI	27.4	13.9	2.05	6.92 **
CI	28.7	HI	27.4	1.3	1.88	0.69
PII	51.4	CII	42.2	9.2	2.34	3.93 **
PII	51.4	HII	46.9	4.5	2.07	2.17 *
CII	42.2	HII	46.9	4.7	2.70	1.74

* = <.05
** = <.001

Chance probability of obtaining 6 statistics significant at .01 from 9 calculated statistics = <.001

All chronic diagnostic groups were significantly older ($P = <.001$) than the comparable acute groups, and the acute paranoids were significantly older ($P = <.001$) than the acute non-paranoids. Chronic paranoids were significantly older ($P = <.001$) than chronic catatonics, and there was a suggestion that they were also significantly older ($P = <.05$) than chronic hebephrenic - simples. There were no statistically significant differences between acute or chronic catatonics and hebephrenic - simples.

As a rough check on the possible relationship between age and modified mosaic test characteristics, the 15 younger and 15 older acute paranoid subjects were compared on seven of the scoring categories which were found to be successful in differentiating the various groups. With diagnosis and chronicity controlled it was hoped that any significant age relationship would be made obvious. The results of the analysis are summarized in Table V.

Table V.

Although the difference in mean age between the two samples was statistically significant ($P = <.001$), no significant differences were found between the two groups on any of the test categories. From these results there seems to be no reason to suspect that the age variable is strongly related to the mosaic scoring categories employed. Wideman (174) reported that, on the whole, the relationship

TABLE V. Effect of Age on Mosaic Categories

Significance of Differences Between the 15 Younger and 15 Older, Paranoid I

Category	Statistic
Age	t (9.15; S.E. 1.30; df 28) **
No. of Designs	U (106) *
Percent Angular	U (106) *
Shape Symmetry	Fisher exact probability *
Colour Symmetry	Fisher exact probability *
Concrete vs Abstract	Fisher exact probability *
Completeness	Fisher exact probability *
Complexity	Fisher exact probability *

* = >.10
** = <.001

of age, sex and education to Mosaic Test characteristics appeared to be slight. These findings were supported by Levin (92).

iv) Treatment and Physical Condition. Only subjects whose case material did not indicate either demonstrable organic involvement, especially cerebral pathology such as epilepsy and arteriosclerosis, or mental deficiency were chosen. All subjects over the age of 63 years were excluded because of the increasing danger of coexisting physical disease. Normal or corrected to normal vision, normal motor functioning (catatonics with a marked degree of cerea flexibilitas were usually untestable), and comprehension of English were required.

An attempt was made to exclude subjects who had undergone psychosurgery. However, on completion of the statistical analysis of the data it was found that one chronic catatonic woman had undergone a prefrontal leucotomy. Subjects undergoing electrical coma therapy, insulin coma therapy, or prolonged narcosis were excluded, or were, in 5 instances, accepted three weeks after therapy. No subjects were receiving any form of psychotherapy at time of testing. It was impossible to equate the groups for history of treatment though examination revealed that it was strikingly similar for all groups.

It was also impossible to control the use of mild sedation, especially in the form of tranquillizers such as chlorpromazine,

Serpasil and Pacatal. However, examination of case records showed that only 38 of the 180 subjects were receiving sedation at the time of testing though examination of the frequency of sedation in the diagnostic groups revealed that there were possible (X^2= 6.05; df = 2; P = >.02) differences between the groups. Nineteen of the 60 catatonics were receiving drugs at the time of testing as compared to ten paranoids and nine hebephrenic - simples. However, since medication is not necessarily correlated with the gravity of the disturbance, and since there is no positive evidence that such medication affects the performance on psychological tests, there appears no reason to suspect that mild sedation had any differential effect on the various psychological measures.

v) Intelligence. Intelligence was left free to vary in the present study because of the possibility that level of cognitive functioning, as reflected in the modified mosaic test characteristics, might differentiate between the groups employed.

E. The Method of Data Analysis.

The 180 mosaic designs were scored for 25 characteristics by the investigator and these were assessed statistically. Other attributes of the subjects such as age and length of hospitalization; data from examinations of the consistency of the scoring and the test - retest reliability; comparisons of significant mosaic scoring categories with each other and

with scores selected from the other tests and rating scales employed; and data from a form - association test also required statistical evaluation.

In the relatively small samples used the degree of skewness of the data made any assumption of normality untenable. Moreover, certain assumptions associated with the use of parametric statistical methods concerning the underlying continuity of some of the data could not be met, and much of the measurement used was statistically weak, i.e. classification in terms of nominal scales or continuous ordinal measurement based on percentages. In view of these factors, a variety of distribution-free or nonparametric statistical techniques, as advocated by Walker and Lev (169), McNemar (117), and Siegel (161), were employed to test the significance of the differences and relationships between the groups.

Owing to the large number of group comparisons required in the analysis of the mosaic scoring categories, it was first necessary to demonstrate an over-all difference among the groups before the significance of the difference between any two of the samples could be tested. In order that there should be no posteriori capitalization on chance, k sample or over-all tests were computed, and, as advocated by Siegel (161), only when the k sample tests were significant were tests for significant differences between any two of the k samples employed. For discrete categories, the chi square

test for k independent samples (161) was employed, and for continuous measurements, the Kruskal-Wallis one-way analysis of variance by ranks (161, 169) was computed.

The significance of the difference between two discrete, independent samples was tested by either the Fisher exact probability test (161) or a chi square test with one degree of freedom and including Yates correction for continuity, depending upon the size of the expected frequencies. For discrete, related samples either a binomial test (161) or the chi square one-sample test (161) was employed. The significance of the difference between two continuous, independent samples was evaluated by means of the Mann-Whitney U test which was converted to a z score and assessed by means of the normal distribution when the samples were large. Differences between two continuous, related samples were tested by means of the Wilcoxon matched-pairs signed-ranks test (161) or its z score equivalent for large samples.

The extent of association or relation between two sets of attributes, at least one of which was measured on a nominal scale, was evaluated by means of a contingency coefficient (161) based on chi square computations. Correlation between two continuous measures was assessed by means of the Spearman rank correlation coefficient (117, 161). The level of significance of a particular coefficient was determined by means of the appropriate statistical test. In all computations, both of degrees of difference and of relation-

ship between groups, care was taken to correct for ties and to adapt the formula employed to the number of cases used.

Since the samples involved were relatively small and the measurements often weak statistically, a rather stringent level of significance was adopted in the hope that it would aid in offsetting the effects of chance sampling fluctuations. Differences or relationships between the groups were considered statistically significant when the estimates of probability reached the .01 level of confidence, and were considered suggestive of significance but requiring further confirmation when the .05 level of confidence was attained. Although many of the hypotheses concerning the mosaic test were directional, i.e. a prediction of the direction of the difference was made, one-tailed tests of significance, as recommended by McNemar (117) and Siegel (161), were not employed. Not only was the investigator prepared to accept a deviation of any size in the unexpected direction, he concurred in the judgment of Burke (17, 18) who argued that psychology is not yet mature enough to ignore the other direction or tail in hypotheses:

> "Nowhere in the field can we have sufficient a priori confidence in the outcome of any genuinely new experiment to justify the neglect of differences in the unexpected direction." (p. 387)

In the light of this argument only two-tailed tests of statistical significance were employed in the present study.

As an additional check on the chance probability of

obtaining at least n significant results from a series of statistical tests, the chance probability for each group of statistical tests was computed from the probability graphs presented by Sakoda, Cohen and Beall (149).

F. Consistency of the Scoring.

Levin (92) reported that the scoring of mosaics by three independently trained judges yielded proportions of agreement which ranged from .45 to 1.00. In addition to this high interjudge agreement it was also found that a layman, trained in the scoring, was able to agree with Levin from 75 to 100 per cent of the time. Comparing his scoring with that of another trained psychologist Wideman (174) reported that all phi coefficients reached or exceeded .59, a figure comparable to a Pearson r of .90, except the rating of aesthetic quality which approximated a Pearson coefficient of .63.

As Wideman (174) pointed out it would have been preferable to have had all the designs scored independently by two or more psychologists who were unfamiliar with either the test or the patients. However, these optimum conditions could not be provided. Although the present investigator knew the claims made for the Lowenfeld Mosaic Test, had formed the hypotheses concerning the modified instrument, and possessed knowledge of the patient's diagnosis at the time the tests were scored, he made a conscious attempt to be unbiased by his knowledge. His scoring was compared to

that of a psychologist* who had little knowledge of the test, and who had been trained on only six representative designs by means of instructions written by the investigator. The psychologist then scored a group of 60 designs devoid of all identifying information, which had been selected from the experimental population by means of a table of random numbers, for the four qualitative scoring factors which had been shown to differentiate the groups. The quantitative characteristics were omitted from the analysis since their scoring could not vary. The results of the analysis are summarized in Table VI.

Table VI.

The contingency coefficients for shape symmetry, colour symmetry, and completeness were extremely high; the coefficient for the rating of complexity was somewhat less. All were statistically significant ($P = <.001$). These results suggest that any bias in the scoring has been successfully controlled, and that the scoring system devised is reliable. It is possible that the slightly lowered coefficient for the rating of complexity was due to a difficulty in evaluating the interaction of a number of separate factors.

G. Retest Reliability.

The meaning of a retest coefficient obtained for a scoring dimension of a personality test, especially in a

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TABLE VI. Consistency of Scoring of Qualitative Mosaic Categories

Contingency Coefficients and Chi Square Tests of Significance

Category	C	X^2	df	P
Shape Symmetry	(+).64	42.86	1	<.001
Colour Symmetry	(+).63	41.57	1	<.001
Completeness	(+).61	36.17	1	<.001
Complexity	(+).49	19.87	1	<.001

Upper limit for the contingency coefficient for a 2 x 2 table = .707

Chance probability of obtaining 4 statistics significant at .001 from 4 calculated statistics = <.001

patient population, is not clear. If it is possible that various aspects of personality change through time in response to internal and external stimuli, the usual statistical criterion of temporal reliability becomes questionable. Some authors (172, 174) have argued that patients show more consistent behaviour on projective tests than normals, and that such consistency or rigidity is characteristic of mental illness. However, it seems doubtful whether such an argument is completely valid. Clinical observation suggests rigidity in response may be specific to particular disorders, e.g. the postulated rigidity of paranoid behaviour as compared to the phasic performance of catatonics. It is possible that all a clinician can expect of a personality test used with patients is that the subject's performances at different times should be congruent with the more enduring or core aspects of his personality, but not statistical reliability as usually understood, for the subject himself may have changed. In their discussion of the validation of projective techniques Macfarlane and Tuddenham (103) stated:

> "...but since reliability is implied by validity it is perhaps possible to circumvent the difficulties involved in measuring reliability provided that one can demonstrate that his test makes possible valid predictions with respect to other variables." (p.42)

In the hope that a few of the scoring categories of the modified mosaic test might reflect the more central dimensions of personality an attempt was made to retest

a sample of the original population. It was postulated that retesting would reveal that some of the characteristics of the designs were consistent.

Great difficulty was experienced in obtaining a sample of subjects which was representative of the original population owing to the high discharge rate of acute patients, and the moderate incidence of treatment such as E.C.T., Insulin Coma, and leucotomy in the original population at time of retesting. The structure of the sample employed is summarized in Table VII.

Table VII.

In the hope that the re-test study would reflect not only reliability and function stability but also independence of tester - subject relation, sixty patients were tested at a median length of six months from time of original testing (Range: 1 to 12 months) by an inexperienced, undergraduate psychology student from Bedford College, University of London. The modified mosaic test and one other technique (the tapping test) were administered on the wards out of context of the full battery with its specific set. An attempt was made to instruct the student to employ the set developed for use with the test but it is doubtful whether this was accomplished. The designs obtained were scored blindly, i.e. with no identifying information, for the 14 characteristics which had been shown to differentiate between the various groups, and these results were compared to those from the original

TABLE VII. Summary of Retest Groups Employed

	DIAGNOSIS						
	Paranoid		Catatonic		Heb-Sim.		Total
	♂	♀	♂	♀	♂	♀	
Acute	2	2	4	3	5	2	18
Chronic	8	8	6	7	5	8	42
Total	20		20		20		60

testing. These comparisons are summarized in Tables VIII, VIIIa and IX.

Tables VIII and VIIIa

Table IX

Of the 15 reliability coefficients computed 11 were statistically significant ($P = <.01$ and 2 were suggestive of significance ($P = <.05$). Only two comparisons failed to show evidence of consistency.

In addition to the possible variability in performance by a schizophrenic population, the factor that the test was administered by a student examiner may have contributed to a lowering of the reliability coefficients. It appears that the specific set required was not utilized correctly and that the subjects were hurried in constructing the designs. Table VIIIa reveals that the retest group took significantly less ($P = <.001$) total time than was required originally. Nevertheless, whereas Wideman (174) found some evidence of retest reliability for 24 of 37 scoring categories, the present study found 13 of 15 characteristics to be consistent. Although the reliability coefficients are somewhat low for individual prediction, they are deemed sufficiently reliable for the analysis of group tendencies.

H. General Procedure.

All subjects used in the present study were examined by either the investigator or his wife, both psychologists

TABLE VIII. Test - Retest Reliability of Significant, Continuous Mosaic Scoring Categories

Spearman Rank Correlation Coefficients

Category	r_s	t	df	P
No. of Designs	+.58	5.39	58	<.001
Percent Angular	+.40	3.36	58	<.01
Percent Circular	+.26	1.90	58	>.05
Percent Mixed	+.36	2.95	58	<.01
No. of Colours	+.39	3.24	58	<.01
Percent Chromatic	+.40	3.36	58	<.01

Chance probability of obtaining 5 statistics significant at .01 from 6 calculated statistics = <.001

TABLE VIIIa. Test - Retest Comparison of Mosaic Total Time

Wilcoxon Matched-Pairs Signed-Ranks Test

Category	T	z	P
Total Time	476	3.24	<.001

TABLE IX. Test - Retest Reliability of Significant, Discrete Mosaic Scoring Categories

Contingency Coefficients and Chi Square Tests of Significance

Category	C	X^2	df	P
Shape Liked	(+).06	0.68	1	>.30
Shape Disliked	(+).14	3.97	1	>.02
Shape Symmetry	(+).24	11.05	1	<.001
Colour Symmetry	(+).30	18.47	1	<.001
Concreteness	(+).29	17.25	1	<.001
Completeness	(+).27	14.67	1	<.001
Complexity	(+).33	23.63	1	<.001
Horizon. Local.	(+).27	14.93	1	<.001
Vertical Local.	(+).18	6.12	1	>.01

Chance probability of obtaining 6 statistics significant at .01 from 9 calculated statistics = <.001

experienced in the psychodiagnostic appraisal of psychotics. These examiners standardized as far as possible their administration of the tests and their clinical approach, so as to minimize any inter-examiner variability. Ninety subjects were tested by each examiner, and there was no significant difference ($X^2 = 1.44$, df = 1, $P = > .20$) in the number of males and females seen by each. There was no significant difference ($X^2 = 4.06$, df = 2, $P = > .10$) in the number of subjects from the various diagnostic groups which were tested by either examiner.

As was mentioned previously, the modified mosaic test was the fifth measure in a battery of seven, and one behaviour rating scale was completed during the examination. The battery took approximately two hours to complete, and all but a few cases were finished in one afternoon session. Several subjects required one, or, at the most, two extra sessions to complete the battery. On completion of the experimental groups used in the present study, 26 cases had been omitted because they either refused or were unable to complete the test battery. The group omitted comprised: 11 paranoid, 7 catatonic, and 8 hebephrenic - simple schizophrenics.

III. Results and Discussion of the Mosaic Comparisons.

1. Results.

A. Over-all or k-Sample Analyses. The results of the Kruskal-Wallis one-way analysis of variance by ranks of the eleven continuous mosaic scoring categories are presented in Table X.

Table X

Although all sample values for each category differed somewhat, only five categories revealed significant ($P = < .01$) sample differences, and one category was suggestive ($P = < .05$) of significant differences. The sample differences in the remaining five categories appeared to represent merely chance variations such as are to be expected among random samples from the same population. It seems reasonable to conclude that the scoring categories: number of designs, per cent angular, per cent circular, per cent mixed, per cent chromatic colour, and possibly, number of colours vary significantly with the nature (sex, diagnosis, chronicity) of the groups employed. Since the Kruskal-Wallis test compares favourably (asymptotic efficiency = 95.5 per cent) with the parametric F test (161), the confidence in the differences found is strengthened. It seems justified, therefore, to employ procedures for testing the significance of the difference between any two of the samples for the six significant, continuous mosaic scoring categories.

TABLE X. Analysis of Variance by Ranks of Continuous Mosaic Scoring Categories

Category	df	H
Reaction Time	11	15.95
Total Time	11	15.15
No. of Designs	11	31.51 ***
No. of Pieces Used	11	18.76
No. of Shapes Used	11	14.90
Percent Angular	11	67.84 ***
Percent Circular	11	60.03 ***
Percent Mixed	11	26.58 **
No. of Colours Used	11	21.08 *
Percent Chromatic Colour	11	31.21 **
Compactness Index	11	14.05

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 5 statistics significant at .01 from 11 calculated statistics = <.001

The results of the chi square tests for k samples of the 13 discrete mosaic scoring categories are presented in Table XI.

Table XI.

The results indicated that the null hypothesis that the samples have been drawn from the same or identical populations can be rejected for eight, or possibly nine, of the discrete categories. It appears that the differences between samples in the remaining four categories could be accounted for by the variability of the data. It seems reasonable to conclude that the scoring categories: shape liked and shape disliked, shape symmetry, colour symmetry, concreteness, completeness, horizontal and vertical localization, and possibly complexity ($P = <.05$) are not independent of the sex, diagnostic, and chronicity groups employed. It seems justifiable, therefore, to analyse further these significant, discrete mosaic scoring categories by means of two-sample statistical tests.

In summary, the difference will be tested between any two of the sex, diagnostic, or chronicity samples on the following 15 mosaic test characteristics which have revealed statistically significant ($P = < .01$) or suggestively significant ($P = <.05$) over-all or k-sample differences: Number of Designs, Percent Angular, Percent Circular, Percent Mixed, Number of Colours Used, Percent Chromatic Colour, Shape Preference, Shape Symmetry, Colour Symmetry, Concreteness, Completeness,

TABLE XI. k-Sample Chi Square Results of Discrete Mosaic Scoring Categories

Category	df	X^2
Shape Liked	5	53.98 ***
Shape Disliked	10	31.20 ***
Shape Symmetry	5	26.34 ***
Colour Liked	2	1.70
Colour Disliked	5	5.04
Colour Symmetry	5	24.59 ***
Compactness Rating	5	8.84
Concreteness	5	35.59 ***
Completeness	5	28.97 ***
Complexity	5	14.59 *
Aesthetic Quality	5	9.29
Horizontal Localization	10	23.83 **
Vertical Localization	10	37.84 ***

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 8 statistics significant at .01 from 13 calculated statistics = <.001

TABLE XII. Results from Comparisons of Sexes Within Each Diagnostic and Chronicity Group on Significant Mosaic Scoring Categories (P Values and Direction of Difference)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization, II=>3 years

Category	PI	PII	CI	CII	HI	HII
No. of Designs						
Percent Angular						
Percent Circular					♀*	
Percent Mixed						
Shape Liked						
Shape Disliked						
Shape Symmetry						♂*
Percent Chromatic Colour			♂*			
No. of Colours						
Colour Symmetry						♂*
Concreteness						
Completeness						♂*
Complexity						
Horizontal Localization						
Vertical Localization						

* = <.05

Chance probability of obtaining 5 statistics significant at .05 from 120 calculated statistics = >.50

Chance probability of obtaining 3 statistics significant at .05 from the 20 calculated statistics for HII = >.05

the sex groups in the present investigation prevent any conclusive generalization concerning the interaction of sex. Nevertheless, since no significant sex differences were demonstrated on any of the scoring categories evaluated, the sexes were combined within each diagnostic x chronicity group in the hope that the larger groups (30) would increase the sensitivity of the statistical analysis.

C. Chronicity. The results of the chronicity comparisons on each of the significant mosaic scoring categories are summarized in Table XIII. The chance probability of obtaining

Table XIII

14 comparisons significant at the .01 level of confidence from 57 calculated was $< .001$.

Of the 15 scoring categories six showed very significant differences ($P = < .01$) between the acute and chronic groups, and one revealed a difference that was possibly significant ($P = < .05$). Examination of Table XIII suggests that these differences were a function of the interaction between chronicity and diagnosis. Not only was there variability among the diagnostic groups within which a particular scoring category was able to differentiate between acutes and chronics, the direction of the difference between these groups was usually not consistent.

In the comparisons of the acute and chronic paranoids five scoring categories were significant at the .01 level,

TABLE XIII. Results from Chronicity Comparisons Within Each Diagnostic Group on Significant Mosaic Scoring Categories (P Values and Direction of Difference)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization, II=>3 years

Category	PI vs PII	CI vs CII	HI vs HII
No. of Designs	PII ***	CI ***	HI ***
Percent Angular	PI ***		HI ***
Percent Circular		CI ***	HII ***
Percent Mixed	PII ***		HI ***
Shape Liked			
Shape Disliked			
Shape Symmetry			
Percent Chromatic Colour	PI ***	CII ***	
No. of Colours	PII **	CI ***	HII ***
Colour Symmetry			
Concreteness			
Completeness	PI *		
Complexity			
Horizontal Localization			
Vertical Localization			

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 14 statistics significant at .01 from 57 calculated statistics = <.001

and one was suggestive of significance (P = <.05). The chance probability of obtaining five categories significant from the 15 computed was <.001. Acute paranoids used a greater percentage of angular pieces; used a greater percentage of chromatic colour, and made designs which were possibly more complete. The chronic paranoids made more designs, used a greater percentage of mixed pieces, and employed a greater number of colours. (Plates 2 - 8: Appendix A).

The chance probability of obtaining four of the 15 comparisons of the acute and chronic catatonics significant at the .001 level was <.001. Acute catatonics constructed more designs, used a greater percentage of circular pieces, and employed a greater number of colours. The chronic catatonics used a greater percentage of chromatic colour. (Plates 9 - 15: Appendix A).

Of the 15 comparisons made between the acute and chronic hebephrenic - simples five were significant at the .001 level, and the probability of obtaining these results was <.001. Acute hebephrenic - simples constructed more designs, and used a greater percentage of angular and mixed pieces, whereas the chronics used a greater percentage of circular pieces and employed more colours. (Plates 16 - 21: Appendix A).

The seven scoring categories which failed to show any chronicity differentiation were: shape preference (like and dislike), shape symmetry, colour symmetry, concreteness, complexity, and horizontal and vertical localization. Although

it was expected that the categories which may be related to cognitive functioning would show the greater differentiation between acutes and chronics, only one, or possibly two, of these categories (number of designs, shape symmetry, colour symmetry, completeness, complexity) differentiated between the groups, whereas five of the nine which possibly relate to the orectic aspects of personality (percent angular, percent circular, percent mixed, shape preference, percent chromatic colour, number of colours, concreteness, localization) showed such a differentiation.

D. Diagnosis. Since seven characteristics of the designs varied significantly with chronicity, both acute and chronic diagnostic comparisons were made. The results of these comparisons for each of the significant mosaic scoring categories are summarized in Tables XIVa and XIVb, and are illustrated graphically in Figures 2, 3, 4 and 5.

Tables XIVa and XIVb

Figures 2, 3, 4 and 5.

All of the 15 mosaic scoring categories showed significant differences ($P = < .01$) between two or more of the experimental groups employed. Of the 138 separate comparisons made, 50 showed very significant differences ($P = < .01$), and another ten revealed differences that were possibly significant ($P = < .05$). The chance probability of obtaining 50 comparisons significant

TABLE XIVa. Results from Comparisons of Diagnostic Groups on Significant Mosaic Scoring Categories (P Values and Direction of Difference)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization, II=>3 years

Category	PI vs CI	PI vs HI	CI vs HI	PII vs CII	PII vs HII	CII vs HII
No. of Designs	CI***	HI***	HI***	CII*		
Percent Angular	PI***	PI***		PII***	PII***	CII***
Percent Circular	CI***	HI***	CI***	CII***	HII***	HII***
Percent Mixed	CI***	HI***	HI***			HII**
Shape Liked	---------- See Table XIVb ----------					
Shape Disliked	---------- See Table XIVb ----------					
Shape Symmetry	PI**	PI***			PII*	
Percent Chromatic	PI***	PI***	HI***	PII***	PII***	
No. of Colours	CI***	HI***	CI***	CII***	HII***	
Colour Symmetry	PI**	PI***				
Concreteness	PI***	PI**		PII**	PII**	
Completeness	PI*	PI***			PII*	
Complexity		PI*				
Horizon. Local.	---------- See Table XIVb ----------					
Vertical Local.	---------- See Table XIVb ----------					

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 50 statistics (Tables XIVa and XIVb) significant at .01 from 138 calculated statistics = <.001

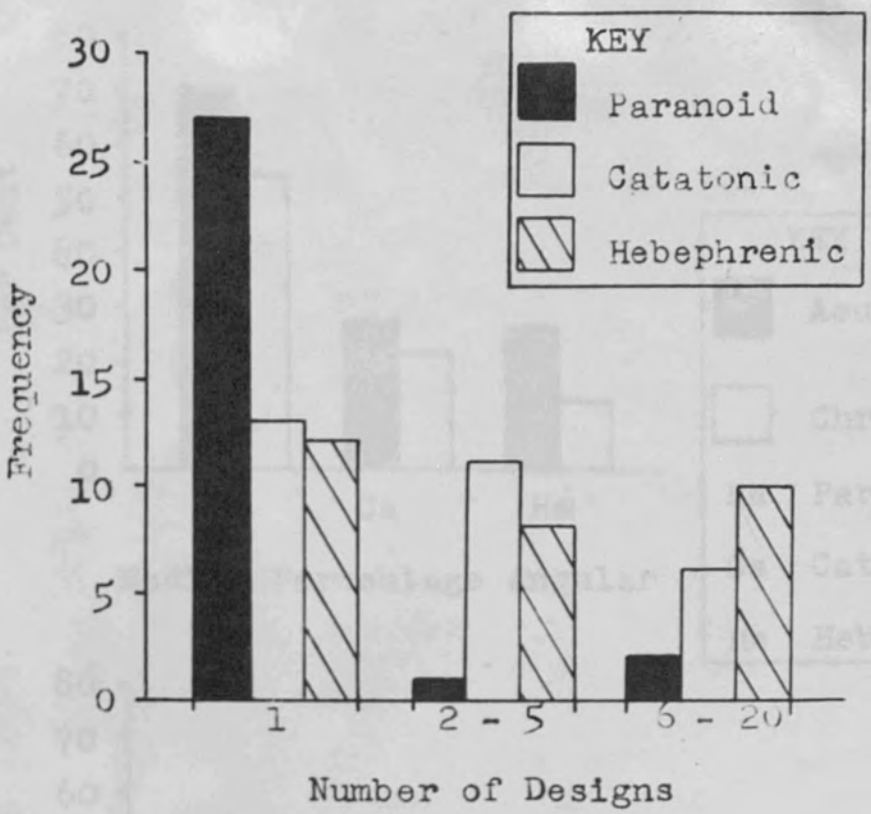
TABLE XIVb. Results from Comparisons of Diagnostic Groups on Significant Mosaic Scoring Categories (P Values and Direction of Difference)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple;
I=<3 years hospitalization, II=>3 years;
_____ = direction of difference

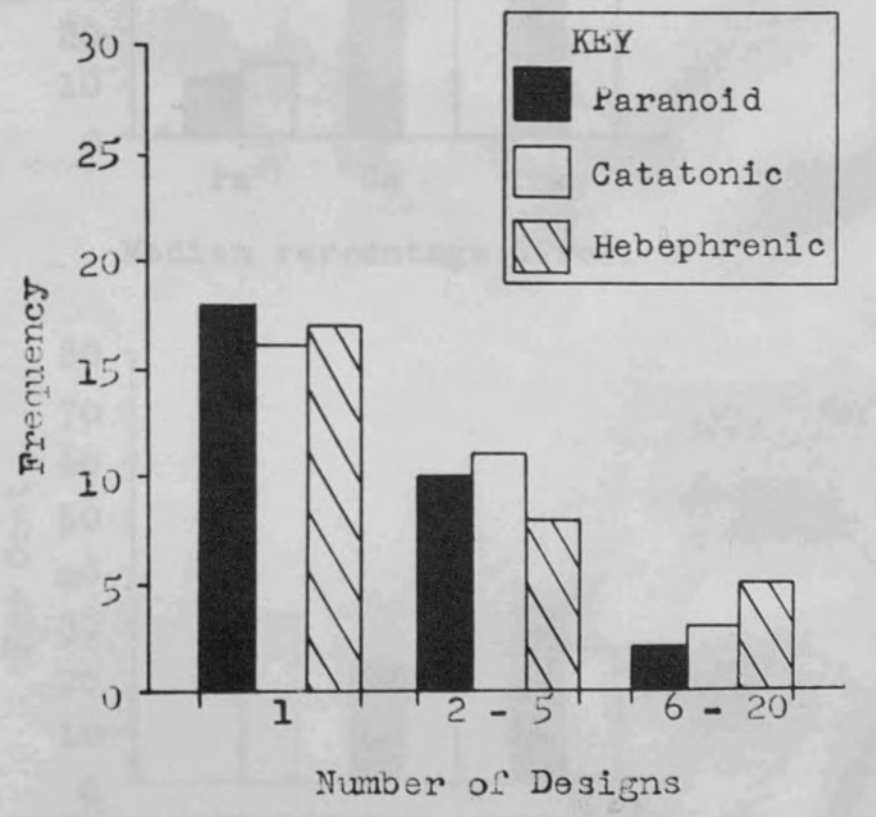
Category	PI vs CI	PI vs HI	CI vs HI	PII vs CII	PII vs HII	CII vs HII
Shape Liked:						
Ang. vs Cir.	PI***		HI*	PII***	PII***	
Ang. vs Mixed	PI**	PI**				
Cir. vs Mixed						
Shape Disliked:						
Ang. vs Cir.				CII**	HII*	
Ang. vs Mixed	CI*	HI**		CII**	HII**	
Cir. vs Mixed						
Horizon. Local.:						
Right vs No Loc.						
Left vs No Loc.	PI***	PI**				
Right vs Left						
Vertical Local.:						
Upper vs No Loc.	PI***	PI**			PII*	
Lower vs No Loc.		PI*				
Upper vs Lower						

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 50 statistics (Tables XIVa and XIVb) significant at .01 from 138 calculated statistics = <.001



ACUTE



CHRONIC

Figure 2. Frequency of Designs Made In Diagnostic and Chronicity Groups

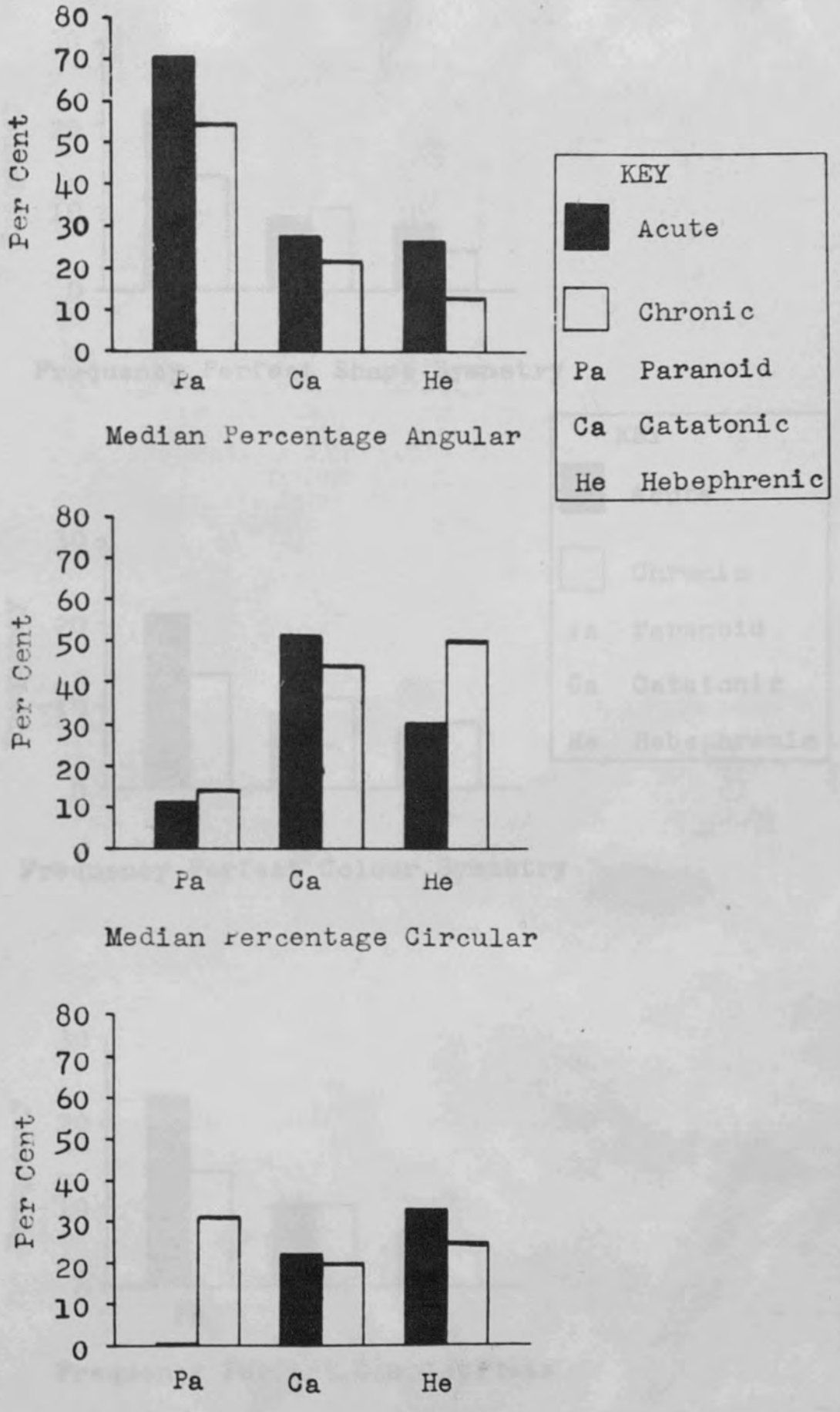
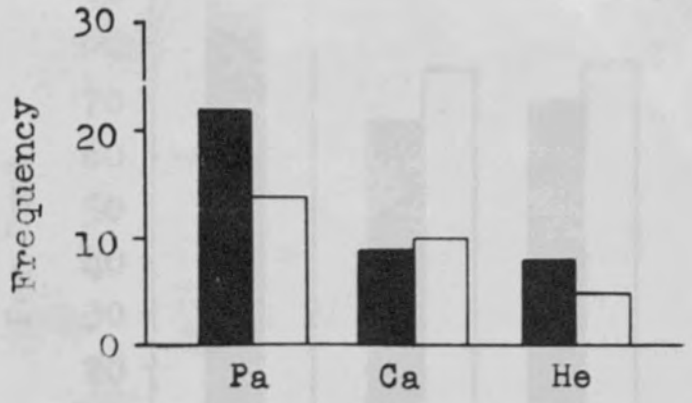
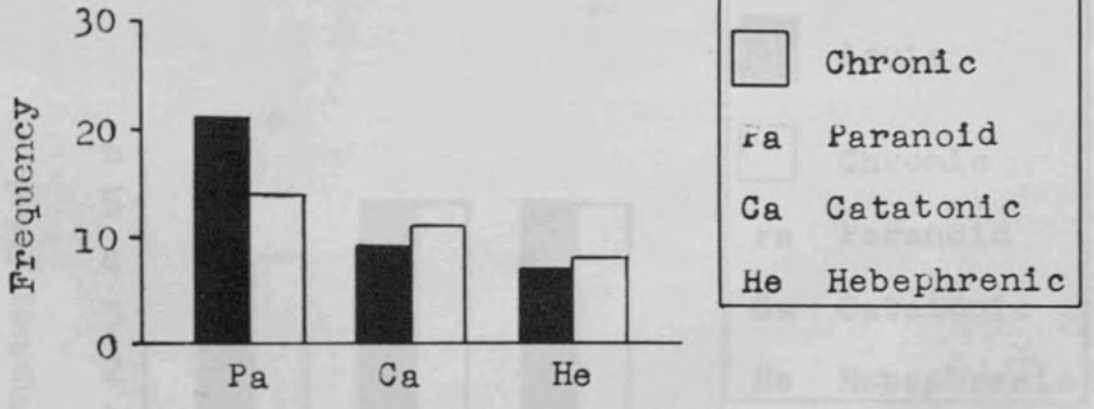


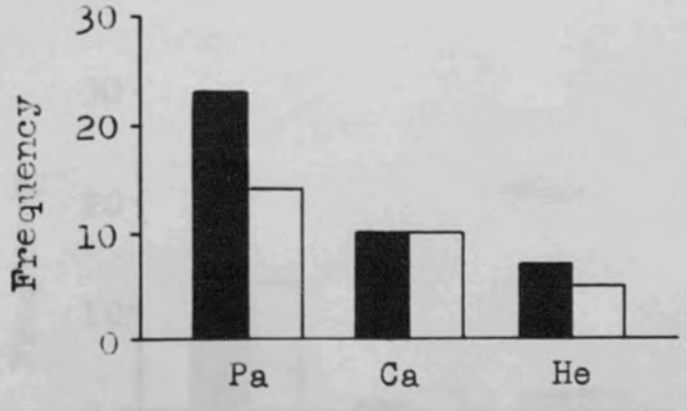
Figure 3. Median Percentage of Form Used In Diagnostic and Chronicity Groups



Frequency Perfect Shape Symmetry

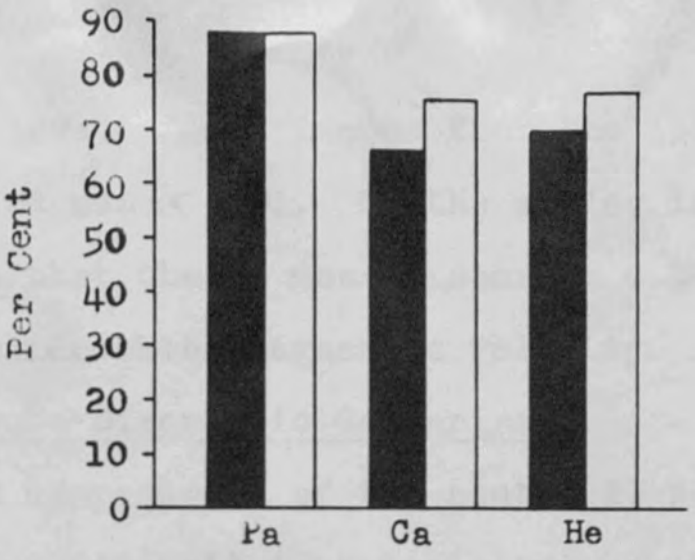


Frequency Perfect Colour Symmetry

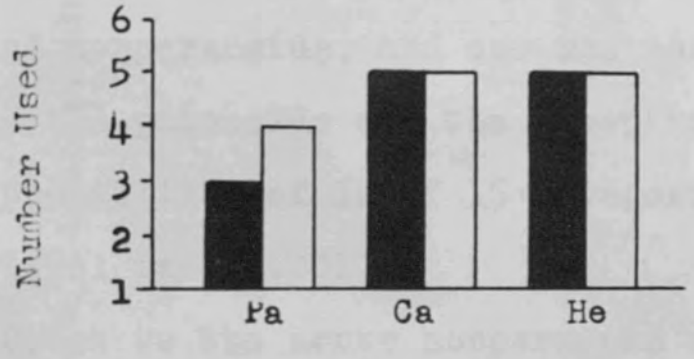


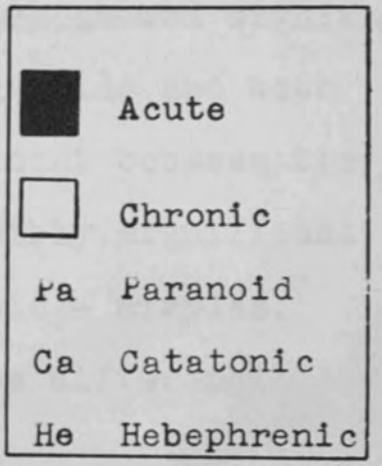
Frequency Perfect Completeness

Figure 4. Frequencies of Perfect Shape Symmetry, Perfect Colour Symmetry and Perfect Completeness in Diagnostic and Chronicity Groups

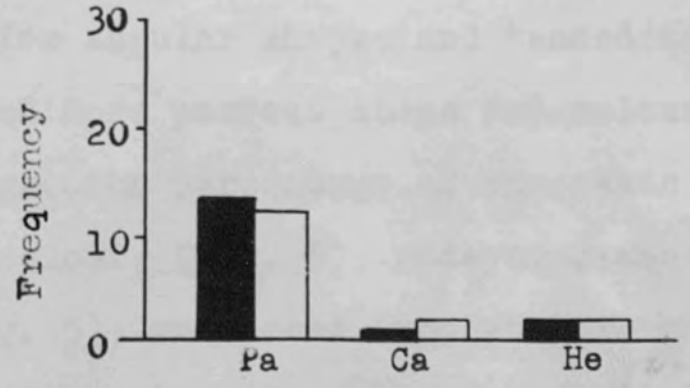


Median Percentage Chromatic Colour





Median Number of Colours Used



Frequency Concrete Designs

Figure 5. Percentage of Chromatic Colour, Median Number of Colours and Frequency of Concrete Designs in Diagnostic and Chronicity Groups

at the .01 level of confidence from the 138 statistics which were computed was < .001. On the whole, it seems reasonable to conclude that the 14 mosaic scoring categories employed possess considerable diagnostic validity.

i) Acute Diagnostic Comparisons.

In the comparisons of the acute diagnostic groups, a paranoid - nonparanoid (catatonic and hebephrenic - simple) dichotomy was quite marked. Twelve categories showed significant differences (P = < .01) between the paranoids and both nonparanoid groups, one was probably significant between the paranoids and nonparanoids, and one was possibly significant between only the paranoids and the hebephrenic - simples. The chance probability of 12 of 15 categories differentiating at the .01 level was < .001.

In contrast to the acute nonparanoid subjects, the acute paranoids: constructed fewer designs (Fig. 2); used a greater percentage of angular pieces (Fig. 3); used a smaller percentage of circular and mixed pieces (Fig. 3); stated a preference for angular shapes and tended to dislike mixed forms; showed more perfect shape and colour symmetry (Fig. 4); employed a greater percentage of chromatic colour (Fig. 5); used fewer colours (Fig. 5); made a greater number of concrete designs (Fig. 5); made more complete designs which were also possibly more complex (Fig. 4); and possibly tended to localize the design in the upper left section of the tray.

The differentiation between the acute catatonic and

acute hebephrenic - simple, subjects, although not as marked as that between the paranoids and nonparanoids, was nevertheless highly significant ($P = < .001$). Five of the scoring categories showed significant differences between the two groups, and one category was possibly significant.

In contrast to the acute hebephrenic - simple subjects, the acute catatonics: made fewer designs (Fig. 2); used a greater percentage of circular pieces (Fig. 3); used a smaller percentage of mixed pieces (Fig. 3); tended to prefer the circular shapes; used less chromatic colour (Fig. 5); and employed more colours (Fig. 5). No differences between these groups were found in: the percentage of angular form used; the shape disliked; shape and colour symmetry; concreteness; completeness; complexity; and localization.

Although these comparisons demonstrate the efficiency of the 14 mosaic scoring categories in the differential diagnosis of the experimental groups, further analyses were required in order to extract clusters of scores which could serve as diagnostic "signs", i.e. possess diagnostic validity for individual cases as well as for groups. In other words, in order to state that a cluster of scores was indicative of a specific diagnostic x chronicity group, it was necessary to demonstrate not only that the cluster of scores differentiated the group from the others but also that it was characteristic of the group itself. For example, it was realized that a category such as the percentage of angular form used might

differentiate between paranoids and non-paranoids while failing, within the paranoid group itself, to differ significantly from the use of circular or mixed form, i.e. the use of angular form, while differentiating paranoids and non-paranoids, might not be characteristic of the former group.

In addition to the group comparisons, each of the categories was evaluated separately for each diagnostic x chronicity group. Categories which showed statistically significant differentiation within the groups as well as significant between - group differentiation could then be considered as diagnostic "signs".

The results of the within group analysis of the acute diagnostic groups are summarized in Tables XVa, XVb and XVc.

Tables XVa, XVb and XVc.

Of the 69 separate calculations made 28 showed significant differences and another 11 revealed differences that were possibly significant. The chance probability of obtaining 28 calculations significant at the .01 level from the 69 computed was $< .001$. The number of significant statistics within each acute diagnostic group varied from seven to eleven (Paranoid =10 Catatonic = 11; Hebephrenic - Simple = 7). The chance probability of obtaining 6 statistics significant from the 23 computed for each group was $< .001$.

In terms of both the group comparisons and the within group analysis, the acute paranoid schizophrenics: made few

TABLE XVa. Results from Comparisons Within Acute Diagnostic Groups of Significant Mosaic Scoring Categories (P Values and Direction of Difference)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization; Ang.=Angular, Cir.=Circular, Mix.=Mixed; Chr.=Chromatic, Ach.=Achromatic; Con.=Concrete, Abs.=Abstract

Comparison	PI	CI	HI
Percent Angular vs Circular	Ang.***	Cir.***	
Percent Angular vs Mixed	Ang.***		
Percent Circular vs Mixed		Cir.***	
<u>Shape Liked</u>:			
Angular vs Circular	Ang.*	Cir.***	
Angular vs Mixed	Ang.***		
Circular vs Mixed	Cir.**	Cir.***	
<u>Shape Disliked</u>:			
Angular vs Circular			
Angular vs Mixed	Mix.**		Ang.*
Circular vs Mixed			Cir.*
Percent Chromatic vs Achromatic Colour	Chr.***	Chr.***	Chr.***
Concrete vs Abstract		Abs.***	Abs.***

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 28 statistics (Tables XVa, XVb and XVc) significant at .01 from 69 calculated statistics = <.001

TABLE XVb. Results from Comparisons Within Acute Diagnostic Groups of Significant Mosaic Scoring Categories (P Values and Direction of Difference)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization; (<)=few, (>)=many; (+)=perfect or high, (-)=poor or low

Comparison	PI	CI	HI
Number of Designs	(<)***		
Number of Colours		(>)***	(>)**
Shape Symmetry	(+)*	(-)*	(-)*
Colour Symmetry	(+)*	(-)*	(-)**
Completeness	(+)**		(-)**
Complexity		(-)***	(-)***

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 28 statistics (Tables XVa, XVb and XVc) significant at .01 from 69 calculated statistics = <.001

TABLE XVc. Results from Comparisons Within Acute Diagnostic Groups of Significant Mosaic Scoring Categories (P Values and Direction of Difference)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization; Rht.=Right, Lft.= Left, N.L.=No Localization

Comparison	PI	CI	HI
Horizontal Localization:			
Right vs Left			
Right vs No Local.		N.L.*	
Left vs No Local.	Lft.*	N.L.**	
Vertical Localization:			
Upper vs Lower	Upp.**		Upp.*
Upper vs No Local.	Upp.**	N.L.**	
Lower vs No Local.		N.L.**	N.L.***

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 28 statistics (Tables XVa, XVb and XVc) significant at .01 from 69 calculated statistics = <.001

designs (90% made one design); used a high percentage of angular form (Mdn = 71%); stated a preference for angular shapes and tended to dislike the mixed (prefer angular 60%; dislike mixed 43%); showed high shape symmetry (73% perfect or near perfect shape symmetry) and colour symmetry (70% perfect or near perfect colour symmetry); employed a greater percentage of chromatic colour (Mdn = 88%); used a medium number of colours (Mdn = 3); represented approximately half of the designs (43%) as concrete objects (often machines or flowers); made more complete designs (77% complete or slightly defective) which were moderately complex, especially when compared to those by hebephrenic - simples; and, possibly tended to place the design in the upper left of the tray (43%). (Plates 2, 3, 4, 5 of Appendix A.)

Characteristic of the mosaics made by the acute catatonics were: a medium number of designs (37% made 2 to 5 designs); a high percentage of circular form (Mdn = 51%); a stated preference for the circular shapes (prefer circular 77%); relatively poor shape and colour symmetry (30% perfect or near perfect shape and colour symmetry); a moderate percentage of chromatic colour (Mdn = 66%); a large number of colours (Mdn = 5); abstract designs (97%); medium completeness (30% complete or slightly defective); low complexity; and, a tendency to employ the whole tray area (47%). (Plates 9, 10, 11, 12 of Appendix A.)

Characteristic of the mosaics made by the acute hebephrenic - simple schizophrenics were: a relatively large

number of designs though not significantly so (33% made 6 to 20 designs); a moderate percentage of mixed pieces (Mdn = 33%); a tendency to state a dislike of both the circular and angular shapes; relatively poor shape symmetry (27% perfect or near perfect shape symmetry) and poor colour symmetry (23% perfect or near perfect colour symmetry); a moderate percentage of chromatic colour (Mdn = 70%); a large number of colours (Mdn = 5); abstract designs (93%); poor completeness (23% complete or slightly defective); low complexity; and, a tendency to employ the upper section of the tray or to scatter the pieces without any horizontal localization (47% employed the whole tray area). (Plates 16, 17, 18 of Appendix A.)

ii) Chronic Diagnostic Comparisons.

In the comparisons of the chronic diagnostic groups, a paranoid - nonparanoid dichotomy was quite evident though not as markedly as between the acute groups. Six categories showed significant differences between the groups, four were suggestive of significance, and four failed to show any significant differentiation. The chance probability of six of 15 categories differentiating at the .01 level was $< .001$.

In contrast to the chronic nonparanoid subjects, the chronic paranoids: used a greater percentage of angular form (Fig. 3); employed significantly less circular form (Fig. 3); stated a preference for the angular shapes whereas they were disliked by the nonparanoids; used a greater percentage of

chromatic colour (Fig. 5); employed fewer colours (Fig. 5); and, made a greater number of concrete designs (Fig. 5). There was a possibility ($P = < .05$) that the chronic catatonics made more designs than the chronic paranoids (Fig. 2), and that the designs by the chronic paranoids were superior in shape symmetry and completeness (Fig. 4) to those by the hebephrenic - simples. In contrast to the latter group, the chronic paranoids also possibly tended to place their designs in the upper section of the tray. The categories which failed to differentiate between these groups were: percentage of mixed form; colour symmetry; complexity; and horizontal localization. In general, the ability of the categories possibly relating to cognitive functioning to differentiate between thegroups was less than in the acute diagnostic comparisons, whereas the characteristics which may reflect the orectic aspects of personality were strikingly similar in their diagnostic efficiency for both acute and chronic populations.

Only three categories showed significant differences between the chronic catatonics and hebephrenic simples, and although the chance probability of obtaining this number of comparisons significant was $< .001$, the differences may be spurious. Only the type of form employed appeared to have any diagnostic validity, and the differences found were against both expectation and the direction of differences found in the acute diagnostic comparisons. The chronic catatonics used a greater percentage of angular form (Fig. 3) whereas the chronic

hebephrenic - simples used a greater percentage of circular and mixed form (Fig. 3). These differences may be a function of relatively unrepresentative and heterogeneous chronic non-paranoid samples.

The results of the within group analysis of the chronic diagnostic groups are summarized in Tables XVIa, XVIb and XVIc.

Tables XVIa, XVIb and XVIc.

Of the 69 separate calculations made 23 showed significant differences and another 10 revealed differences that were possibly significant. The chance probability of obtaining 23 calculations significant at the .01 level from the 69 computed was $< .001$.

The number of significant statistics within each chronic diagnostic group varied from six to ten (Paranoid = 7; Catatonic = 6; Hebephrenic - simple = 10). The chance probability of obtaining > 5 statistics significant from the 23 computed for each group was $< .001$.

On the basis of both the between-groups and within-groups analyses, the chronic paranoid schizophrenics: made few designs (60% made one design); used a moderate percentage of angular form (Mdn = 55%); stated a preference for angular shapes and tended to dislike the mixed (prefer angular 57%; dislike mixed 43%); showed moderate shape symmetry (47% perfect or near perfect shape symmetry) and colour symmetry (47% perfect or near perfect colour symmetry); employed a high

TABLE XVIa. Results from Comparisons Within Chronic Diagnostic Groups of Significant Mosaic Scoring Categories (P Values and Direction of Difference)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; II=>3 years hospitalization; Ang.=Angular, Cir.=Circular, Mix.=Mixed; Chr.=Chromatic, Ach.=Achromatic; Con.=Concrete, Abs.=Abstract

Comparison	PII	CII	HII
Percent Angular vs Circular	Ang.***		Cir.***
Percent Angular vs Mixed	Ang.**		
Percent Circular vs Mixed		Cir.*	Cir.**
<u>Shape Liked</u>:			
Angular vs Circular	Ang.*	Cir.***	Cir.**
Angular vs Mixed	Ang.***		
Circular vs Mixed		Cir.***	Cir.**
<u>Shape Disliked</u>:			
Angular vs Circular		Ang.*	Ang.*
Angular vs Mixed	Mix.**		
Circular vs Mixed			
Percent Chromatic vs Achromatic Colour	Chr.***	Chr.***	Chr.***
Concrete vs Abstract		Abs.***	Abs.***

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 23 statistics (Tables XVIa, XVIb and XVIc) significant at .01 from 69 calculated statistics = <.001

TABLE XVIb. Results from Comparisons Within Chronic Diagnostic Groups of Significant Mosaic Scoring Categories (P Values and Direction of Difference)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; II=>3 years hospitalization; (<)=few, (>)=many; (+)=perfect or high, (-)=poor or low

Comparison	PII	CII	HII
Number of Designs	(<)**	(<)*	(<)*
Number of Colours		(>)**	(>)*
Shape Symmetry			(-)***
Colour Symmetry			(-)*
Completeness			(-)***
Complexity	(-)**	(-)***	(-)***

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 23 statistics (Tables XVIa, XVIb and XVIc) significant at .01 from 69 calculated statistics = <.001

TABLE XVIc. Results from Comparisons Within Chronic Diagnostic Groups of Significant Mosaic Scoring Categories (P Values and Direction of Difference)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; II=>3 years hospitalization; Rht.=Right, Lft.= Left, N.L.=No Localization

Comparison	PII	CII	HII
<u>Horizontal Localization</u>:			
Right vs Left	Lft.*		
Right vs No Local.			
Left vs No Local.			
<u>Vertical Localization</u>:			
Upper vs Lower			
Upper vs No Local.	Upp.*		
Lower vs No Local.			N.L.**

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 23 statistics (Tables XVIa, XVIb and XVIc) significant at .01 from 69 calculated statistics = <.001

percentage of chromatic colour (Mdn = 88%); employed a relatively high number of colours (Mdn = 4) though not significantly so; represented forty percent of the designs as concrete; made moderately complete designs (47% complete or slightly defective) which were low in complexity; and possibly tended to localize the designs in the upper area of the tray in comparison with the chronic hebephrenic - simples. (Plates 6, 7, 8 of Appendix A.)

Characteristic of the mosaics made by the chronic catatonics were: a medium number of designs (37% made 2 to 5 designs); a tendency to employ more circular form than mixed (Mdn = 42%); a stated preference for circular form and a tendency to dislike the angular (prefer circular 87%; dislike angular 47%); relatively poor shape and colour symmetry (37% perfect or near perfect shape and colour symmetry); a high percentage of chromatic colour (Mdn = 76%); a large number of colours (Mdn = 5); abstract designs (93%); medium completeness (33% complete or slightly defective); low complexity; and no definite localization. However, as was mentioned only the type of form used differentiated between the chronic catatonics and chronic hebephrenic - simples, and so most of the above scores could be indicative of either non-paranoid group. (Plates 13, 14, 15 of Appendix A.)

Characteristic of the mosaics made by the chronic hebephrenic - simples, mindful that only the type of form employed differentiates this group from the chronic catatonics, were:

relatively few designs (57% made one design); a moderate percentage of circular form (Mdn = 50%); a stated preference for the circular shapes and a tendency to dislike the angular (prefer circular 63%; dislike angular 47%); poor shape symmetry (17% perfect or near perfect shape symmetry) and poor colour symmetry (27% perfect or near perfect colour symmetry); a high percentage of chromatic colour (Mdn = 77%); a large number of colours (Mdn = 5); abstract designs (93%); poor completeness (17% complete or slightly defective); and a slight tendency to employ the whole tray area. (Plates 19, 20, 21 of Appendix A.)

In addition to possible variables such as increased unrepresentativeness of the chronic diagnostic samples and the heterogeneity introduced by combining hebephrenic and simple schizophrenics, the drop in efficiency in differentiating the chronic groups may be a function of personality and intellectual deterioration in relation to length of hospitalization or duration of illness. Categories reflecting the orectic aspects of personality, and especially those indicative of cognitive functioning, lost much of their diagnostic validity in the chronic population. Even the chronic paranoids, although differentiated efficiently from the chronic nonparanoids, appeared to lose some of their distinctive test characteristics. It was found that the chronic paranoids made more designs, used less angular form, used more mixed form, used less chromatic colour, and employed a greater number of colours

than the acute paranoids. Although not statistically significant, there also appeared to be a reduction in shape symmetry, colour symmetry, completeness ($P = < .05$) and complexity in the chronic paranoid group. These characteristics seemed similar to those found in the nonparanoid groups, especially the acute catatonics and hebephrenic - simples. To test these observations, the chronic paranoids were compared to the acute nonparanoid groups on each of the 15 significant mosaic scoring categories. The results of these comparisons are summarized in Table XVII.

Table XVII.

Ten of the 15 categories showed significant differences between the chronic paranoids and the acute nonparanoids. Of the 46 separate comparisons made 22 revealed significant differences, and five showed differences that were possibly significant. The chance probability of obtaining 22 comparisons significant at the .01 level from the 46 computed was $< .001$.

In contrast to the acute nonparanoids, the chronic paranoid subjects: made fewer designs; used more angular form; used less circular form; used more chromatic colour; made more concrete designs; stated a preference for angular form and a dislike of the circular and mixed form; and tended to localize their designs in either the upper or lower left section of the tray. The chronic paranoids also used more mixed form and fewer colours than the acute catatonics but less mixed form and more colours than the acute hebephrenic - simples.

TABLE XVII. Results from Comparisons of Diagnostic Groups on Significant Mosaic Scoring Categories (P Values and Direction of Difference)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple;
I=<3 years hospitalization, II=>3 years;
_____=direction of difference

Category	CI vs PII	HI vs PII	Category	CI vs PII	HI vs PII
No. of Designs	CI***	HI***	Shape Liked:		
Percent Angular	PII***	PII***	Ang. vs Cir.	PII***	PII*
Percent Circular	CI***	HI***	Ang. vs Mixed		
Percent Mixed	PII***	HI***	Cir. vs Mixed		
Shape Symmetry			Shape Disliked:		
Percent Chromatic	PII***	PII***	Ang. vs Cir.	CI*	
No. of Colours	CI***	PII***	Ang. vs Mixed	CI**	HI**
Colour Symmetry			Cir. vs Mixed		HI*
Concreteness	PII**	PII**	Horiz. Local:		
Completeness			Rht. vs Lft.	CI*	
Complexity			Rht. vs No		
			Lft. vs No	PII**	PII*
			Vert. Local:		
			Upp. vs Low.		
			Upp. vs No	PII***	PII**
			Low. vs No	PII**	PII***

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 22 statistics significant at .01 from 46 calculated statistics = <.001

Other than the number of designs constructed, only categories possibly relating to orectic functioning differentiated between the groups, and, in terms of such categories, the chronic paranoids were more similar to the acute paranoid group. The categories which may reflect organizational or cognitive tendencies, shape and colour symmetry, completeness and complexity, failed to show any significant differences which suggests that there has been impairment in cognitive functioning in the chronic paranoids to the extent of that found in acute nonparanoid subjects. In terms of affective expression, the chronic paranoids appeared quite similar to their acute counterparts. Since there was also no apparent cognitive differentiation between the chronic catatonics and hebephrenic - simples, it seems reasonable to conclude that, in addition to variables such as sample purity and relative lack of orectic differentiation between the chronic nonparanoid groups, the reduced diagnostic efficiency of the scoring categories in the chronic population was partly a function of cognitive impairment possibly toward a common terminal point. Since it was found that such impairment is not necessarily a function of age (Table V), it may be a reflection of the natural progress of the disease or due to the long period of institutionalization.

iii) Interrelationship of Scoring Categories.

The results of the diagnostic x chronicity comparisons suggested not only that many of the scoring categories were related but that there were two main clusters of scores. In

order to eliminate duplication in scoring, and to investigate this grouping tendency, the extent of relation between the scoring categories was evaluated by means of Spearman rank correlation coefficients and contingency coefficients based on chi square computations. The results of these tests of association are summarized in Tables XVIII and XIXa, XIXb and XIXc.

Table XVIII.

Tables XIXa, XIXb and XIXc.

Four of the 12 coefficients computed for the continuous mosaic scoring categories and 37 of the 70 computed for the discrete measures were significant at the .01 level of confidence. The chance probability of obtaining 41 coefficients significant at .01 from the 82 which were calculated was $< .001$. Another 12 coefficients were possibly significant ($P = < .05$). Although most of the correlation and contingency coefficients are somewhat low, it seems reasonable to conclude that the statistically significant coefficients demonstrate tendencies toward association that are psychologically meaningful for groups.

Number of Designs: The number of designs constructed showed a significant positive association with: percentage of mixed form used and number of colours; and, a significant negative association with; shape and colour symmetry, completeness, complexity, and horizontal and vertical localization.

TABLE XVIII. Extent of Relation Between Continuous Mosaic Scoring Categories

Spearman Rank Correlation Coefficients

Category	No. of Designs	% Angular	% Circular	% Mixed	% Chromatic
% Angular	-.15*	-------	-------	-------	-------
% Circular	-.06	-------	-------	-------	-------
% Mixed	+.26***	-------	-------	-------	-------
% Chromatic	+.11	+.13	-.18*	-.003	-------
NO. of Colours	+.37***	-.07	+.08	+.20**	-.43***

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 4 statistics significant at .01 from 12 calculated statistics = <.001

TABLE XIXa. Extent of Relation Between Discrete Mosaic Scoring Categories

Contingency Coefficients and P Values

Category	Shape Symmetry	Colour Symmetry	Complete -ness	Complexity
No. of Designs	(-).49*** df=2	(-).44*** df=2	(-).48*** df=2	(-).30*** df=2
% Angular	(+).27*** df=2	(+).21* df=2	(+).24** df=2	(+).12 df=2
% Circular	(-).21* df=2	(-).19* df=2	(-).21* df=2	(-).07 df=2
% Mixed	(-).21* df=2	(-).18* df=2	(-).24** df=2	(-).15 df=2
% Chromatic	(+).12 df=2	(+).18* df=1	(+).05 df=1	(+).08 df=2
No. of Colours	(-).34*** df=2	(-).52*** df=2	(-).30*** df=2	(-).13 df=2
Colour Symmetry	(+).57*** df=1	———	———	———
Complete -ness	(+).67*** df=1	(+).55*** df=1	———	———
Comple -xity	(+).44*** df=1	(+).38*** df=1	(+).51*** df=1	———

* = <.05
** = <.01
*** = <.001

Upper limit for the contingency coefficient for: 2 x 2 table = .707; 3 x 3 table = .816

Chance probability of obtaining 37 statistics (Tables XIXa, XIXb and XIXc) significant at .01 from 70 computed = <.001

TABLE XIXb. Extent of Relation Between Discrete Mosaic Scoring Categories

Contingency Coefficients and P Values

Category	Shape Liked	Shape Disliked	Concrete-ness	Horizon. Localiz.	Vertical Localiz.
No. of Designs	_____	_____	(-).16 df=2	(-).43*** df=4	(-).41*** df=4
% Angular	(+).44*** df=4	(-).24* df=4	(+).26** df=2	(+).17 df=4	(+).28** df=4
% Circular	(+).37*** df=4	(-).24* df=4	(-).25** df=2	(-).24* df=4	(-).28** df=4
% Mixed	(+).33*** df=2	(-).09 df=2	(-).13 df=2	(-).12 df=2	(-).12 df=2
Shape Liked	_____	(-).27** df=4	_____	_____	_____
Shape Symmetry	_____	_____	(+).08 df=1	(+).33*** df=2	(+).29*** df=2
% Chromatic	_____	_____	(+).09 df=2	(+).10 df=2	(+).22** df=2

* = <.05
** = <.01
*** = <.001

Upper limit for the contingency coefficient for: 2 x 2 table = .707; 3 x 3 table = .816

Chance probability of obtaining 37 statistics (Tables XIXa, XIXb and XIXc) significant at .01 from 70 computed = <.001

TABLE XIXc. Extent of Relation Between Discrete Mosaic Scoring Categories

Contingency Coefficients and P Values

Category	Concrete-ness	Horizon. Localiz.	Vertical Localiz.
No. of Colours	(-).10 df=2	(-).36*** df=4	(-).33*** df=4
Colour Symmetry	(+).05 df=1	(+).28*** df=2	(+).25** df=2
Concrete-ness	_____	(+).15 df=2	(+).27*** df=2
Complete-ness	(+).05 df=1	(+).32*** df=2	(+).28*** df=2
Comple-xity	(+).12 df=1	(+).10 df=2	(+).10 df=2
Vertical Localiz.	_____	(+).55*** df=4	_____

* = <.05
** = <.01
*** = <.001

Upper limit for the contingency coefficient for: 2 x 2 table = .707; 3 x 3 table = .816

Chance probability of obtaining 37 statistics (Tables XIXa, XIXb and XIXc) significant at .01 from 70 computed = <.001

The negative association with the percentage of angular form used was possibly significant.

Percentage Angular: The percentage of angular form employed revealed a significant positive association with: shape symmetry, completeness, shape preferred, concreteness, and vertical localization; and a possibly significant association with colour symmetry. The negative relationship with number of designs and shape disliked was also possibly significant.

Percentage Circular: The percentage of circular form used showed a significant positive association with the shape preferred, and a significant negative association with concreteness and vertical localization. The negative relationship with: percentage chromatic colour, shape and colour symmetry, completeness, shape disliked, and horizontal localization was possibly significant.

Percentage Mixed: The percentage of mixed form used showed a significant positive association with: number of designs, number of colours, and shape preference; and a significant negative association with completeness. The negative relationship with shape and colour symmetry was possibly significant.

Shape Preference: Owing to the low test - retest reliability and the possible spurious significance of the shape preference, only the relationship between shape preference and type of form used and the association between shape liked and shape

disliked were evaluated. The shape preferred revealed a significant positive relationship with the type of form used and was associated negatively with the shape disliked. The negative relationship between shape disliked and the percentages of angular and circular form employed was possibly significant.

Shape Symmetry: Level of shape symmetry achieved showed a significant positive relationship with: percentage angular form, colour symmetry, completeness, complexity, and horizontal and vertical localization; and a significant negative relationship with number of designs and number of colours. The negative association with percentages of circular and mixed form was possibly significant. The positive contingency coefficients between shape symmetry and colour symmetry (.57) and completeness (.67) were high (maximum coefficient for a 2 x 2 table = ,707), which suggests that the association between these three scoring categories in a schizophrenic population is extremely strong. It seems reasonable to conclude, therefore, that the three categories are facets of the same psychological variable, and that completeness, possibly the more inclusive category, could replace shape and colour symmetry in future use of the Modified Mosaic Test.

Percentage Chromatic Colour: The percentage of chromatic colour employed showed a significant positive relationship with vertical localization, and a significant negative association with number of colours used. The positive association with colour symmetry and the negative association with the

percentage of circular form were suggestive of significance.

Number of Colours: The number of colours used revealed a significant positive association with: number of designs, percentage of mixed form; and a significant negative association with: shape and colour symmetry, percentage of chromatic colour, completeness, and horizontal and vertical localization. The association with percentage of chromatic colour and colour symmetry was relatively strong as might be expected.

Colour Symmetry: The level of colour symmetry achieved showed a significant positive relationship with: shape symmetry, completeness, complexity, and horizontal and vertical localization; and a significant negative relationship with number of designs and colours. The positive association with percentage angular form and percentage chromatic colour, and the negative association with percentage circular and mixed form were possibly significant.

Concreteness: The construction of a concrete or representational design rather than an abstract pattern showed a significant positive association with the percentage angular form and the vertical localization, and a significant negative association with the percentage circular form.

Completeness: The level of completeness achieved showed a significant positive association with: percentage angular form, shape and colour symmetry, complexity, and horizontal and vertical localization; and a significant negative association with: the number of designs and colours and the percentage of

crudely estimated by examination. A moderate degree of inter-relationship was revealed when each of the following categories was compared with the others: number of designs; number of colours; shape symmetry; colour symmetry; completeness; complexity; horizontal localization; and vertical localization. Of the 28 coefficients, 89.3 percent showed a degree of association significant at the .01 level of confidence, 85.7 percent at the .001 level. Comparison of these categories with the categories: percentage angular; percentage circular; percentage mixed; percentage chromatic colour; and concreteness revealed considerably less association. Of the 40 coefficients 25 percent showed a degree of relationship significant at the .01 level, only 10 percent at the .001 level. However, owing to the lack of appropriate statistical analysis the nature of these, or any alternative, clusters cannot be determined conclusively.

2. Discussion of Results.

A. Over-all or k-Sample Analyses.

The failure to obtain a significant over-all difference among the diagnostic x chronicity x sex samples on seven of the mosaic scoring categories can be attributed to methodological factors and to the extreme variability in the scores on several of the categories as well as to other unidentified factors. It also seems reasonable to suppose that some of the sample differences found in these seven categories represent merely chance fluctuations such as are to be expected

among random samples from the same population.

Reaction Time: In addition to other factors, the failure to demonstrate significant differences among the samples may have been due to the extreme variability of the data which ranged from one second to 18'02".

Total Time: Once more, wide discrepancy in variance (28" to 108'41") was one of the factors reducing the possibility of demonstrating significant differences among the samples.

Number of Pieces Used: The failure to demonstrate significant differences among the groups in terms of the number of pieces used tends to support the findings of Levin (92)* and Wideman (174). Although there was a slight tendency by the acute male paranoids to use fewer pieces, the difference was not sufficient to affect the over-all analysis, and therefore the finding by Wertham (172) that paranoids use few pieces was not corroborated.

Number of Shapes Used: The failure to demonstrate significant differences among the samples in terms of the number of shapes employed supports the results of Wideman (174). Although the lack of comparable psychoneurotic, organic and non-psychiatric groups prevent generalization outside of the schizophrenic population studied, it seems doubtful whether Wertham's (172) hypothesis that psychotics use few shapes is

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*As was argued in the footnote on page 33, although the Modified Mosaic Test differs in many ways from the standard Lowenfeld Mosaic Test, the task involved in the two measures is essentially similar and, therefore, some comparison may be made between the results of the present investigation and those from studies using the Lowenfeld Test.

tenable. Schizophrenics, especially chronic nonparanoid subjects, tend to use many shapes.

Compactness Index: The method employed in scoring compactness may have contributed to the failure to demonstrate significant differences among the groups. The area of the circle which would just circumscribe all pieces when compared to the total area of the pieces gave indices of approximately the same magnitude for designs which filled the whole tray area as for those which formed a small agglutination in one section of the tray. The rating, based on the concept of agglutination with little space between pieces, failed to differentiate for the same reason. However, it is possible that this concept of compactness vs dispersion enters into, in part, the scoring of horizontal and vertical localization (i.e. a design tends to be more compact if it is definitely localized on the tray in relation to the horizontal and vertical planes (Appendix A., Plate 18) in contrast to designs scattered on the tray with no specific localization (Appendix A. Plate 19)). Nevertheless, in terms of the present scoring of compactness there was no corroboration of the findings by Wertham and Golden (173) and Lowenfeld (101) that paranoids construct compact designs, and the observation by Lowenfeld (101) that nonparanoid schizophrenics tend to make scattered over-all designs.

Colour Preference: The stated preferences for one of the six colours approximated a random distribution. Since the

obtained frequencies of the individual colours were too small for statistical appraisal, the preferences were grouped as chromatic or achromatic. This coarse grouping tended further to reduce any differences among the samples.

Aesthetic Quality: The failure to demonstrate significant differences among the samples in terms of the aesthetic quality of the mosaic seems due, not only to the subjective nature of the scoring but also to the almost uniform low quality among the groups. Although several of the abstract patterns were outstanding, and a few of the concrete designs ingenious and most pleasing, the great majority possessed little aesthetic interest. These results are consistent with Wideman's (174) finding that the designs by schizophrenics were inferior in aesthetic quality to those by normals and psychoneurotics.

B. Sex Comparisons.

The failure to demonstrate significant differences between the sexes on any of the mosaic scoring categories supports the argument of Wideman (174) that the relationship between sex and mosaic characteristics is slight. Breen (9, 10) and North (126, 127) also found no sex difference in the differential treatment of the angular and circular figures of the Differential Diagnostic Technique. However, as was mentioned previously, the small numbers used in the sex comparisons prevent any conclusive generalizations concerning the interaction of sex.

The lack of differentiation between the sexes in their

use of angular and circular form seems to argue against an interpretation of form in terms of the theory of psycho-sexual symbolism in its narrowest sense. If the forms connoted only sexual functioning it would seem reasonable to expect differential treatment of the forms on the basis of sex whereas, if the shapes reflect more inclusive processes such as the expression of hostility, such differentiation, in a schizophrenic population, might not be expected.

C. Chronicity Comparisons.

The demonstration of significant differences between the acute and chronic groups on six of the mosaic scoring categories confirms, in essence, studies such as those of Rabin, King and Ehrmann (135) which have reported differences between acute and chronic schizophrenics on variables such as verbal performance. Contrary to Noyes (128), Freyhan (51), and others who argue that any classification of schizophrenia is artificial and useless, and contrary to Mayer-Gross (110) who reported that the unpredictable state of the schizophrenic was not suited for psychometric techniques, such a technique in the form of the modified mosaic test has demonstrated significant differences between short-term and long-term schizophrenics. On the basis of these results it seems reasonable to conclude that there is little justification for assuming homogeneity in schizophrenia as a nosological entity.

Although these results are contrary to those of Wideman (174), who reported no relationship between chronicity and

mosaic characteristics, it is highly probable that his results were a function of his technique of comparing the designs of first admission schizophrenics and those by patients who had more than twelve months' hospitalization. In terms of the criterion for chronicity derived empirically by Drasgow (32), both groups could be considered as being acute.

Since the chronic groups were significantly older than the comparable acute groups, the chronicity differentiation might be interpreted as being a function of age. However, the results of the investigation reported in Table V, which corroborate studies by Levin (92) and Wideman (174), suggest that the association between age and mosaic characteristics is slight.

The question still remains as to whether the chronicity differentiation reflects the natural progress of the disease, a process of institutionalization, or a combination of both variables. It is obvious that, with the present methodology, no conclusions in this respect can be offered. However, the fact that supposedly deteriorated and dilapidated chronic subjects were able to muster enough resources to complete the present test battery suggests that this important question could be investigated in future studies.

Although workers such as Shakow (155) have warned against the tendency to consider schizophrenic deterioration as positively related to length of hospitalization or even to length of period of illness, it was postulated that the mosaic charac-

teristics possibly reflecting cognitive functioning would differentiate between the acute and chronic groups. On the basis of the finding by Rabin, King and Ehrmann (135) that long-term schizophrenics were significantly lower than short-term schizophrenics in vocabulary performance, it was hypothesized that the chronic subjects would be inferior to the acute subjects in terms of shape and colour symmetry, completeness and complexity.

The failure of the categories possibly related cognitive functioning to differentiate the chronicity groups, and the demonstration of significant differences by six of the categories possibly associated with orectic aspects of personality was, therefore, unexpected. As measured by characteristics of the mosaic designs which possibly reflect intellectual processes, there appears to have been no significant differences between the acute and chronic schizophrenics in level of intellectual functioning. However, until evidence is presented which supports the assumption that the possibly cognitive characteristics of the mosaics are positively associated with other standard measures of general and attained cognitive ability, this inference must remain tentative. Nevertheless, it is interesting to note that King (84) found only minor trends in psychomotor performance between groups of chronic schizophrenics divided on the basis of duration of illness. Although he was able to differentiate between a subacute group comprising 54 percent pseudoneurotic schizophrenics and the

chronic schizophrenics, on the basis of retardation in the psychomotor response, further analysis indicated that this differentiation was not a function of intelligence. In other words, if there was any differentiation between acute and chronic schizophrenics, it did not appear to be due to differences in cognitive functioning.

It is obvious from the results of the chronicity comparisons that, in addition to chance sample fluctuations and contrary to King (84), who found that differences in psychopathological type resulted in only minor trends in psychomotor performance, the variability in the data was due primarily to the interaction of diagnosis. Not only did some of the categories fail to reveal significant chronicity differentiation for all diagnostic groups, the direction of the differences found was not consistent. It seems justifiable, therefore, to discuss separately the results of the chronicity comparisons for each diagnostic group.

i) Paranoid Schizophrenics: Although the construction of multiple designs by the chronic paranoids might, in isolated instances, be interpreted as reflecting an attempt to impress the examiner, the tendency to repeat simple patterns inferior in symmetry and completeness suggests a disturbance in thought processes. Wideman (174) reported that both psychoneurotics and schizophrenics made more designs than normals, and attributed the repetition to preoccupation.

Cameron (19, 20, 21) has reported that one of the most

striking characteristics of thinking in schizophrenics is inability to maintain adequate boundaries. In this vein, one might argue that faced with the definite yet arbitrary task of "making something", the subjects were unable to define the limits of the task free from interruption from internal stimuli. The intrusion of personal preoccupations, possibly in the form of delusions and hallucinations, into the immediate perceptual sphere might disturb attention to external stimuli. Unable to attend to the task in order to abstract the task into its essentials (form and colour symmetry, completeness) and keep them in mind, and to plan ahead, the subject possibly perseverates in terms of the motor movements first initiated, i.e. the selection and combining of pieces. William McDougall (115) in discussing his principle of conation outlasting the cognition which initiates it, reported , "at table one thinks momentarily of taking salt and continues the conversation,while one's hand carries out the purpose thus momentarily formed..." (p. 282). This tendency to act without consciousness is possibly analogous to other complex actions which are performed without awareness, such as automatic drawing (especially "doodling") and writing, automatic knitting, etc. The formulation is similar, in essence, to the "deflection of attention" hypothesis advocated by Foulds (39, 40, 44) to account for the effect of distraction on Maze performance in the affective disorders, and is not dissimilar from the concept of "concrete attitude" discussed by Goldstein (61). If these assumptions

are correct, one might infer that the chronic paranoid schizophrenics exhibited a greater degree of thought disorder than the comparable acute group. Clinical impression supports this inference.

Although the processes involved may be somewhat different, it is tempting to employ the concept of restriction of attention and accompanying motor perseveration to explain the studies (24, 92, 114) which report that multiple designs are characteristic of mental defectives and organics. However, the present formulation must be considered as being tentative until it can be evaluated in the light of the diagnostic comparisons and the correlation matrices.

It is possible that the same type of explanation can be applied to the number of colours employed. By perseverating in terms of the shapes used, i.e. using most, if not all, of the pieces of one shape, as was common in the chronic paranoids, the maximum number of colours was necessarily assured. Another feasible explanation concerns the rather concrete behaviour of using the end pieces of each shape. If, because of disturbances in attention, no definite design requiring specific colours is conceived, the selection of the colours, either closest to hand or easiest to extract from the slot (end pieces), would assure the use of a large number of colours. The randomization of the colours in the slots resulted in the end pieces being of different colours. On considering these possible explanations, the psychological significance of

differences between groups in terms of the number of colours used seems dubious.

A similar process may explain the tendency of the chronic paranoids to use more mixed pieces. As attention to external stimuli becomes diminished and behaviour becomes more concrete, the simplest motor behaviour might be to select the pieces which were closest at hand, i.e. those in the center of the tray. If this is the case, the chronic subjects might be expected to use more mixed pieces. Examination of the mixed pieces used revealed that shape No. 9 (Fig. 1) which was the most accessible (Plate 1) was by far the most common mixed shape chosen.

Although the validity of Wertham's (172) statement that paranoid schizophrenics tend to construct few designs cannot be assessed without comparing the diagnostic groups, the results of the chronicity comparisons only partly support his observation. In terms of the present paranoid sample, only the acute subjects tended to make few designs.

Until all the evidence presented in this investigation can be integrated and discussed, no definite conclusions can be offered concerning the interpretation of scoring categories such as the percentages of the forms employed. It may, however, be useful to present a number of tentative explanations which may be clarified by the additional evidence of later sections, and which may suggest future experimental work.

On the basis of the hypothesis that the angular shapes

reflect or symbolize an emotional reaction encompassing clinical concepts such as: aggression, hostility, extrapunitiveness, and drives toward destruction, impairment, damage or hurt of an object external to the self; one might argue that the acute paranoid subjects exhibited a greater tendency to externalize or project affect associated with such impulses. It could be argued that the clinical expression of the reaction is an intricate, logical, and systematized delusional system centering primarily around delusions of persecution. Suspiciousness, defensiveness, bitterness, cynicism, hatred, assertiveness, unco-operativeness, and overt aggression are concomitants of the delusional projection. In other words, the paranoid subjects exhibit the chronic hostility or anger reaction discussed by authors such as Thorne (167) and Grant (64).

> "... anger reactions probably tend to radiate or generalize with the development of an increasing range of excitants resulting in displacement or diffusion until the anger may be described as free-floating and tending to infuse a wide variety of neutral situations with hostile feeling tone." (p. 334)

Following the formulations of Cameron (19, 20, 21), it might be argued that the paranoid cannot maintain an adequate division or keep compartmentalized, his cognitive and orectic functions. Unable to maintain such boundaries, his dominant affective state, i.e. hostility, is generalized so that it colours the immediate perceptual field. Not only do the dissociative aspects such as delusions of persecution interrupt

attention to external stimuli, the interpretation of the world as a hostile and threatening place governs the selection and manipulation of external reality. In that the patients share the cultural stereotype concerning the affective connotations of form and faced with the task of constructing a mosaic with pieces, some of which symbolize externalized hostility or aggression, those shapes are chosen which best express the predominate affective state. Just as in the Differential Diagnostic Technique (9, 10, 126, 127) paranoid subjects are unable to control their drawings of the angular forms, so in constructing a mosaic, the paranoids seems almost unable to control their selection of the angular shapes, i.e. they employ angular shapes predominately. It is postulated that preoccupation with hostility has greatly determined the selection and use of form.

In that a paranoid is able to externalize or project his hostility in a "Not I but thee" formulation, he might not withdraw from reality or exhibit any thought disorder to the extent of a nonparanoid schizophrenic. Close contact with the real world in the form of blaming all troubles on it, may result in a diminution of attention to internal stimuli and thereby minimize the loss of correspondence between thinking and reality. It would appear that the acute paranoids are reasonably successful in their projection whereas the pattern becomes less well established and more easily disorganized as the duration of illness and/or the length of institutionalization increases. Clinically, this transition may be reflected

in a qualitative change in the content of the delusional system (from those of persecution to those of grandeur), and increasing thought disorder. In terms of performance on the modified mosaic test, the transition may be reflected in the decreased use of the angular form.

Although the percentage of chromatic colour used cannot be adequately discussed until the evidence of later sections has been evaluated, several of the specific findings of other workers can be examined in the light of the chronicity comparisons.

In contrast to the study by Himmelweit and Eysenck (69) which reported no differences, in the percentages of each colour used, between any of their psychiatric groups, the present results suggest that a chronicity differentiation within a paranoid schizophrenic sample is possible, in that acute paranoids use a high percentage of chromatic colour. This finding is somewhat contrary to those reported by Wertham (172) and Wideman (147). Wertham stated that schizophrenics used a smaller percentage of chromatic colour and that black and/or white alone were definite schizophrenic 'signs', and Wideman reported that schizophrenics use less chromatic colour than normals and psychoneurotics. It is doubtful if statistically significant differences would be found between groups of normals and psychoneurotics and an acute paranoid schizophrenic group who used as high a median percentage of chromatic colour as 88 percent. In addition,

black and/or white alone was not found in any of the acute paranoid mosaics. Although reduced chromatic colour, and even purely achromatic patterns, may be found in other diagnostic x chronicity groups, the results of the chronicity comparisons for the paranoid schizophrenics illustrate the danger of assuming schizophrenia to be a homogeneous nosological category.

Although most projective techniques assume a strong association between colour and affectivity, the nature of such a relationship, if it exists, cannot be assessed in the present study. Indeed, the whole question of the colour-emotionality hypothesis is confused and contradictory. Recent studies by Fortier (37, 38), based primarily on Rorschach, Mosaic Test and easel painting data, attempted to demonstrate the association between an individual's response to colour and his affective drives. However, as Keehn (81) has pointed out, Fortier's arguments are based on ad hoc reasoning concerning techniques which have in no way been standardized (easel and finger painting, etc.) and projective tests (Lowenfeld Mosaic Test, Rorschach Technique, etc.) of questionable validity. In addition, Eysenck (34, 35), Clarke (23), Lindberg (95) and Keehn (81) have reported that there is little correlation among tests involving colour as a scorable response. If a particular personality variable (e.g. some affective attribute) was associated with a strong reaction to colour, one would expect such a reaction to be manifested on all tests involving a response to colour. In other words, there is no definite

experimental evidence which conclusively supports the colour-affectivity hypothesis.

Studies concerned with the preference and use of colours by psychotics are no less confused. Goldstein (60), and Keehn and Sabbagh (82) have reported that schizophrenics show an increased reaction to colour, the latter study demonstrating that the schizophrenic performance is similar to that found in mental defectives and children. These findings appear contrary to the typology of Kretschmer (89) in which cyclothymes are colour-reactive and schizothymes are form-reactive. Granger (63) reviews eight studies which support the Kretschmerian dichotomy. A study of colour in paintings by psychotics, by Robertson (143), also supports Kretschmer's general position. Robertson analyzed a group of 176 subjects, including schizophrenics, depressives, psychopaths and neurotics, and concluded that the main variable underlying all the peculiarities in the use of colour in paintings by seriously disordered subjects is a diminished feeling for colour or a reduced reactivity. In other words, the schizophrenics exhibited a reduction in colour reactivity. In terms of the mosaic test, one is faced with the problem of defining "colour reactivity". Is colour reactivity defined only in terms of the attention paid to the bright chromatic colours, or is it a more inclusive concept which encompasses the awareness and selection of all colours both chromatic and achromatic? Are the acute paranoid schizophrenics more or

less, colour reactive? These questions concerning the interpretation of colour, if they can be clarified at all by the present investigation, will be discussed further in later sections.

There remains one possible explanation for the predominant use of chromatic colour by the acute paranoids and the converse increase in the use of achromatic colour by the chronics which cannot be adequately assessed without the evidence of the diagnostic comparisons. However, it might be postulated that the amount of achromatic colour employed is partly a function of the number of colours used. If the perseveration hypothesis put forth to account for the number of colours chosen is essentially correct, i.e. that the more disturbed subjects tend to use most of the pieces of one shape, a considerable percentage (approximately 33 percent) of achromatic colour would be assured. The acute paranoids, not exhibiting this perseverative tendency to such a marked degree, restricted the number of colours employed and thereby the chance probability of including a high percentage of achromatic colour was reduced. If, for reasons unknown (possibly due to their hostile motives expressed in suspiciousness, defensiveness, and a hesitancy to commit themselves), the acute paranoids restricted their choice of the angular shapes to the first one or two pieces of each type (Appendix A; Plate 1), only chromatic colours would be used.

Another explanation must also be considered. The mosaics

of the acute paranoids tended to be more complete ($P = <.05$), owing partly to their superior concrete representations (62% fair or good PI vs 42% PII). Since nearly all of the acute concrete designs represented objects not including achromatic colour, a purposive choice of the chromatic colours was made. This is in contrast to the chronic paranoid's perseverative, almost random colour selection. However, whether any of these explanations concerning the use of colour are valid must remain to be substantiated.

ii. Catatonic Schizophrenics: It is possible to consider the acute phase of the nonparanoid schizophrenias, especially catatonic schizophrenia, as being characterized by the more florid symptomatology, thought disorder, affectomotor pressure, assaultiveness, stupor, bizarre behaviour, etc. Guertin (65), in a transposed factor analysis of activity ratings of schizophrenics as contrasted to a hypothetical normal model, isolated a factor which he interpreted as psychotic reintegration or reorganization. It appeared that nonparanoid schizophrenics, having gone through the acute phase, present sufficient reintegration to present a fairly passive adjustment to ward routines even though interest, animation, sociability and communicability are still minimal. Mayer-Gross, Slater and Roth (111) point out that catatonic behaviour is primarily a disturbance in acute schizophrenia and that catatonic stupor or excitement lasting for years is rare. In the light of these findings and on the basis of the "attention to internal stimuli-

motor perseveration" hypothesis, one might predict that the acute catatonic schizophrenics would make more designs.

Many workers have concurred with Kraepelin's (86) astute observation that one of the primary psychopathological mechanisms in catatonia is a disturbance or blocking of attention. Freusberg (50) argued that the automatic actions of catatonics are associated with a state of weakness of consciousness, and that the motor disturbance is an expression of the degree of psychic tension. Sommer (162), in his study of inhibition of mental processes, stressed the diminution of attention to external reality in catatonics. He argued that the numerous stereotypies and repetitions of former reactions found in his word association experiments and the catalepsy exhibited clinically were related to fixations entirely of psychological origin. Vogt (168) also mentioned a narrowing of consciousness in catatonia, and argued that it was definitely associated with behavioural perseveration. He reported that there was a continuation of psychic processes or their correlates, even after being replaced in consciousness by other ideas. Verbigeration and catalepsy existed because no conscious (external) idea could "interest" the patient.

The "diminution of attention" formulation of the Kraepelinian school was employed by Jung (77) to explain the catatonic behaviour of repeating the stimulus words in the word association experiments. He argued that the repetition was a function of their inability to pay attention due to the distracting influence of affectivity which occupied their

"whole mental field". In his discussion of dementia praecox as contrasted to paranoia, Suttie (166) reported that the disorder was characterized by the loss of interest in external phenomena (e.g. people) and its diversion to fantasy. Disturbances in coherence of thought and action are attributed to inattention. Mayer-Gross, Slater and Roth (111) have commented on the similarity between catatonic vagueness, perplexity and interrupted motor functions and a state of "absentmindedness". These authors observed that a catatonic's interest in what is going on around him seems to vanish until he becomes almost entirely unresponsive to any external stimuli.

It might be argued that, in catatonic schizophrenia, there is an inability to attend to external stimuli due to almost continual preoccupation with autistic or dereistic thinking. Perseveration in terms of the motor movements first initiated by the instructions of the modified mosaic test could conceivably be a result of this inversion of attention.

Taking this argument further, one might postulate that the more attention is directed solely to internal stimuli the greater the degree of motor disturbance. It is possible that perseveration such as posturing, flexibilitas cerea, echopraxia and echolalia, and attention to bowel and bladder functioning are positively related to a state of inattention to external reality. The adages "numb with fear" and "blind with rage" should not be taken lightly.

In a recent study of the influence of distracting stimuli on the concrete conceptual performance of schizophrenics,

Chapman (22) found that schizophrenics paid more attention than normals to the distracting stimuli of a card sorting task. On the basis of Cameron's (19, 20, 21) formulation, the patients were not maintaining adequate boundaries in their thinking; they were "over-including". Chapman interpreted his findings as indicating that the schizophrenic's inappropriate dealing with objects in a conceptual task is in part a distraction phenomenon, rather than solely the results of an inability to form concepts. It is interesting to note that Hunt and Cofer (73), in formulating their concept of psychological deficit, suggested that many of the data supposedly indicating regression in schizophrenia could be accounted for on the basis of variables such as attention.

It is also important to remember that Pavlov (80, 133) described stereotyped, and even cataleptic, responses in dogs with salivary conditioned reflexes plus inhibitory conditioning when both types of signals were given in immediate (and hence contradictory) succession over a period of time. In other words, the stereotyped posturing was a displacement of paradoxic inhibition. Saliva would flow at the conditioned stimulus, but when the animal was given food he would turn to it but would not eat it. Masserman (109) also reported the development of stereotyped behaviour in frustrated cats, and Maier (106) demonstrated that repeated frustration (a second frustrating or "distracting" stimulus) pushed beyond the tolerance of the rat results in a replacement of adaptable

behaviour by stereotyped, nonadaptable responses. When forced to jump for food, which was in clear view, Maier's animals would repeat a stereotyped pattern of jumping to the other opening, blocked by a locked-in card. They failed to react adaptively to the obvious.

Pavlov (133) attempted to explain stereotyped behaviour both in animals and humans in terms of inhibition, a concept not too dissimilar from the "inversion of attention" hypothesis put forward in this investigation. Pavlov (133) stated:

> "For every one of our animals there is a maximal stimulus, a limit of harmless functional strain, beyond which begins the intervention of inhibition..... A stimulus, the intensity of which is beyond the maximum, instantly elicits inhibition, thus distorting the usual rule of the relationship between the magnitudes of effect and the intensity of excitation." (p.51)

It was inferred that states of immobility (narcolepsy and catalepsy) were a function of generalized inhibitory processes that are produced by excessive stimulation. Pavlov (133) argued that this excessive stimulation, which can be a product of cultural conditioning in humans, is fear-provoking. The extreme condition of fright is a state of total and overwhelming inhibition which involves bodily processes and perception. In other words, this functional arrest is embodied, in its extreme form, in immobility and an apparent lack of awareness of external reality.

It seems possible that the Pavlovian concept of "excessive stimulation and its resulting inhibition" could be inter-

preted in terms of an increase in attention to threatening internal stimuli and a concomitant decrease in sensitivity to external reality. In the extreme, there is a suppression of motor activity and a disruption of the ability to discriminate stimuli from the external environment. It is conceivable that, depending on the degree of autism, the concomitant psychomotor phenomena would range from vagueness, perplexity and perseveration such as repeating designs on the mosaic test and stimulus words in association experiments, to echolalia, echopraxia and complete immobility.

Some mention must be made of the early investigations of perseveration which, although lacking in statistical sophistication, support the present interpretive hypotheses. Employing a battery of perseveration tests, including: sensory tests (time and speed); motor tests (stroke patterns, letters forward and backwards); and ideational tests (naming names, objects, etc.), Jones (76) demonstrated that, on both sensory and motor tests, intropunitive subjects (manics and depressives) had higher perseveration scores than normal controls. Stephenson (164), using Spearman's X-Y tests, i.e. three trials of an habituated activity such as omitting letters or drawing stroke patterns as rapidly as possible for 30 seconds (X), and then reverse the habituated activity (Y), found that high P-factor or perseveration scores accompanied marked "mental deterioration" regardless of diagnosis. He reported that depressives had high P-scores, and that schizo-

phrenia (used as a homogeneous sample) split into two groups. P-scores were highest in the inaccessible patients (probably nonparanoid), and these scores were observed to change with accessibility. In a study of the autonomic correlates of perseverative tendencies, Mays (112) found that catatonic schizophrenics perseverated more than normal controls, on tasks involving repetitive patterns of bells and buzzers. Shipley (157), in a cross-validatory study of Mays' findings, reported that catatonic schizophrenics revealed marked perseveration on motor tasks involving: resistance to adaptation; degree of conditioning; and degree of irradiation to non-reinforced stimulus patterns.

It also appears possible to reconcile the present argument with the Freudian interpretation of schizophrenia. In his discussion of narcissism, Freud (48) argued that, in schizophrenia, libido is withdrawn from the external world and is directed into the Ego, i.e. there is a withdrawal of interests from external reality. All affective charge which was cathected on external objects is withdrawn and deposited on the self; a state which Freud defined as primary narcissism. Such a state seems not dissimilar from that which has been postulated in terms of the inversion of attention. The concept of regression used in the original Freudian formulation could be interpreted on the basis of the progressive preoccupation with internal stimuli and its resulting reduction of consciousness to an exceedingly primitive level. In that the earliest

stages of ontogenetic development reveal little ability to think in terms of general classes or to detect particulars, i.e. to attend to more than the simplest aspects of the external environment, schizophrenic behaviour could be considered infantile or archaic. In both infant and "regressed" psychotic, any affective display is possibly primarily a reaction to autistic thoughts and is, therefore, often inappropriate by external standards.

Bruner (14), on the basis of the Freudian theory that schizophrenia (i.e. nonparanoid schizophrenia) is characterized by a regression to primary narcissism and thereby a withdrawal from object relationships, predicted a breakdown of such phenomena as size and shape constancy. A similar prediction could be made in terms of the "increasing lack of awareness of external stimuli" hypothesis presented in this investigation. Lovinger (98), in a simple size-constancy experiment, predicted that, under experimental conditions involving minimal distance cues, schizophrenics considered in poor contact with reality would manifest less size constancy than either normals or schizophrenics considered in good contact. The results of this study supported the hypothesis, and Lovinger concluded that the schizophrenic break with reality involves not only more complex psychological functions, but basic perceptual processes as well. Crookes (25) found that schizophrenics had a significantly lower constancy on the average than neurotics, psychopaths and normals of similar

age and I.Q., though some gave high values. Raush (138) also demonstrated a disturbance of perceptual constancy in schizophrenia, but found a difference between the performances of paranoids and nonparanoids. The paranoid subjects (possibly the high-scorers of Crookes' study) exhibited significantly higher size constancy scores than the nonparanoids, i.e. the paranoids were closest to normal behaviour. Raush concluded, "The paranoid schizophrenic reacts to the environment in a highly consistent manner. His misinterpretations and delusions tend to persist in spite of environmental changes. Actually, he does not withdraw from reality; rather, he misinterprets it in terms of the consistencies required from his own frame of reference." (p.179)

It seems possible to reconcile experimental evidence, clinical observation (both Kraepelinian and contemporary) and rather diverse systems of theoretical speculation by the "attention" formulation proposed in the present investigation. Narrowing of consciousness and disruption of attention, inhibition as a function of excessive stimulation, and regression to primary narcissism can be given operational definitions in terms of the present formulation and can be investigated experimentally.

The tendency of the acute catatonics to use more circular shapes is consistent with the "inversion of attention" hypothesis. On the basis of the argument that the circular shapes reflect or symbolize an emotional reaction encompassing

clinical concepts such as: passivity, submissiveness or intropunitiveness; one might postulate that the acute catatonics exhibited a greater tendency to internalize or introject hostile or aggressive feeling.* In terms of the hypotheses postulating diminution of attention, Pavlovian inhibition, or Freudian regression to primary narcissism, one might argue that clinical manifestation of the intropunitive reaction is a reduction of attention to external reality and a tendency to withdraw from object relationships. Depressed affect, self-depreciation, submissiveness, passivity and, in the extreme, echolalia**, echopraxia** and catalepsy, might be considered the behavioural concomitants. In other words, the catatonics, especially in the acute phase, may exhibit an intropunitive reaction which is directly opposite in nature to the chronic anger or hostility reaction found in the paranoid disorder. It seems possible that such subjects presented with the forms of the modified mosaic test would use those

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*It might be argued that the use of circular form only reflects an aversion to the angular shapes (possibly owing to their hostile connotations), i.e. the circular pieces, without specific affective connotations, were used as a chance alternative for the distasteful angular shapes. However, this argument appears to be untenable owing to the fact that the acute catatonics demonstrated and stated, to a statistically significant extent, a preference for the circular shapes rather than for the angular or mixed. It is expected that the associations between the percentage of circular form used and the other tests and behavioural ratings will further clarify this issue.

**Although echopathological phenomena necessarily include contact with the behavioural environment, it is argued that such behaviour involves a drastic reduction of attention and perseveration of simple, isolated aspects of the external situation.

shapes which express or reflect their predominant affective state, i.e. the circular forms. It is interesting to note that Lowenfeld (101),using her standard set of angular forms, found a pattern in the form of a circle ("This is generally regular, completely closed, and hollow in the centre." (p,272)) recurring in the designs of strongly autistic schizophrenics (probably nonparanoid). A design by a catatonic was described as: "At first glance the result seemed completely incoherent... On closer examination, however, a certain organization was discernible, and this was of concentric circles..." (p.279)

This formulation is not entirely novel. Arieti (3) has stressed the importance of guilt and fear of hostility in the aetiology of catatonia, especially concerning the dynamics of ritual behaviour and stupor. Rapaport (137), in a study of selective remembering, found that catatonics were unable to recall aggressive content in short stories. Breen (9, 10) and North (126, 127), in their investigations of schizophrenic drawing, found that catatonics exhibited greater difficulty in copying the circular figures of the Differential Diagnostic Technique. In an attempt to account for this drawing behaviour by subjects noted for phasic symptomatology, these authors argued that catatonics may suppress and repress their hostility and overcompensate for it with an amenable, likeable and compliant façade. Inability to express or externalize the hostility generated by everyday life situations may have resulted in a continuous build-up of hostility until it culminated in

either self-punishing, guilt-ridden depression or stupor, or in an outburst of impulsive, uncontrolled aggression. These two modes of expression, it was argued, are both aspects of an intropunitive personality structure.* Not only are aggressive outbursts usually followed by withdrawal (stupor) but the outbursts themselves are qualitatively different from those of the extrapunitive paranoids. Mayer-Gross, Slater and Roth (111) have described catatonic excitement as an outburst of general hyperkinesis or uncontrolled motor discharge, and have argued that this impulsive behaviour is seldom prepared or cunningly planned (i.e. in contrast to paranoid aggression). It is argued that aggressive outbursts in catatonics tend to be short-lived compared with the stuporose end of the scale, and that therefore any group sample would tend to include more cases in the latter phase. However, this fact points to the need for intra-individual studies of the phases.

A theoretical explanation of catatonia quite similar to that presented in this investigation has been given by

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*Breen (9, 10) and North (126, 127) argued that the intropunitive reaction was reflected in both the stuperose and hyperactive phases of catatonia (and the depressed and manic cycles of a manic-depressive psychosis) and that the drawing test response of difficulty in executing curvilinear forms was similar in both. The results of the present investigation suggest that the drawing test and the use of form on the modified mosaic test may reflect a more immediate expression of hostility. It is conceivable that intra-group variability in the data of this study may have been partly a function of this tendency of the measures to mirror immediate affective expression. Future intra-individual investigations of catatonia may well demonstrate separate test behaviour during the stuperose and hyperactive phases and during partial remission.

Milici (120) in his analysis of catatonic stupor in relation to affectivity, inhibition and introversion. Although the definition of introversion and its relationship with affectivity are not clear, Milici argued that with: "...increasing inhibition and introversion of thinking, the person becomes absent-minded, abstracted; attention and comprehension are impaired; memory becomes vague and faulty; orientation is disturbed; bewilderment ensues." (p.486) Introversion has strong elements of guilt: "... a remorseful haunting by the past, a feeling of great wrong committed, a fear of impending calamity for which the patient may consider himself responsible." (p. 487) Preoccupation with death is also dominant. This author points out that relative clearness of thinking is replaced by preoccupation with dereistic associations with resultant disturbance of intellectual functions, and he concludes: "Externalization of attention, on the other hand - either forced or stimulated by situations which attract the patient's interest, or require his attention - rouses the patient from his stuporous state..." (p.489)

As a phylogenetic comparison, it is interesting to note that both Seward (154) and Miller (121) stress the inhibition of behaviour as a reaction to a feared situation, in contrast to the hyperactivity characteristic of aggressive reactions. Miller reported that certain animals react to fear by remaining motionless and mute, and that fear often produces results suggestive of the cerea flexibilitas of catatonics. In his

extensive studies of aggressive behaviour in rats, Seward demonstrated that amount of activity was inversely related to passive subordination. He reported that a badly terrorized animal may cling to the wall of the cage with both forefeet for long periods, when pressed he may stand like a statue, and when thrown, he lies on his back with paws in the air, often for extreme periods of time. If less completely cowed, the subordinate animal is characterized by slow, hesitant movements. In humans, Dollard (29) has reported that the reaction to fear in military combat is often marked by interference with speech, meaningless gestures, and the continued maintenance of peculiar postures.

On the basis of the present formulation, it seems quite possible that the attention and interest of the catatonic is torn from the external environment as a function of internalized hostility. In contrast to the paranoid's negative interest or preoccupation with external reality (i.e. as a source of all his woes), the catatonic does not seek the cause of his troubles outside of himself. Attention to dereistic stimuli which have strong components of guilt, feelings of inadequacy and worthlessness, etc. exaggerates the loss of correspondence between overt behaviour and reality. It seems possible that this intropunitive process is in essence the inhibition-producing excessive stimulation that Pavlov discusses, and is the basis of the Freudian concept of primary narcissism.

In terms of the diminution of attention hypothesis and the extent of thought disorder said to characterize the acute phase, one might expect that the acute catatonics would use more mixed shapes. It was postulated that the selection of such shapes would be associated with diminished attention to the external environment. Although the use of mixed shapes by the acute subjects was not statistically significant, the trend was in the predicted direction ($P = > .10$).

Although the relatively greater use of achromatic colour by the acute catatonics might be interpreted as evidence supporting the colour-affectivity hypothesis (i.e. achromatic colour associated with depressed affect), the perseveration hypothesis proposed in a previous section also conforms to the data. The use of a greater number of colours by the acute subjects may have determined the increase in achromatic colour. However, further evidence will be required before any definite conclusion can be drawn.

iii) Hebephrenic-Simple Schizophrenics: The interpretation of the results of the hebephrenic-simple chronicity comparisons is severely restricted owing to the heterogeneity of the samples employed. Not only is the intentional combination of hebephrenia and schizophrenia simplex a possible source of variability. The considerable clinical difficulty in differentiating these disorders, especially after long hospitalization, also contaminated the groups, in that a few atypical catatonics or deteriorated paranoids may have been

diagnosed incorrectly. Taking these considerations into account, the only definite conclusion that can be drawn is that five of the scoring categories of the modified mosaic test were able to differentiate between the possibly unrepresentative acute and chronic samples employed.

The construction of more designs by the acute hebephrenic-simples seems consistent with the proposed formulation of diminished attention. Mayer-Gross, Slater and Roth (111) have reported that thought disorder is most marked in the acute phase of hebephrenia, and that some degree of adjustment to reality can take place during later stages. This observation is supported, in essence, by the factor analysis of activity ratings of schizophrenics made by Guertin (65). Even the simple schizophrenics, who are supposedly characterized by the absence of all florid symptomatology in the early stages, may exhibit definite thought disorder when admitted to hospital, i.e. those simple schizophrenics without florid abnormal signs may be the tramps, petty criminals and prostitutes who remain in the community. Autistic preoccupation and resulting motor perseveration may well explain the acute subject's construction of multiple designs.

The tendency of the acute subjects to use more angular shapes and fewer circular than the chronics seems somewhat inconsistent with the "attention" formulation, and may be a function of unrepresentative samples. However, there does appear to be some association between the test behaviour and

reported clinical observations. Mayer-Gross, Slater and Roth (111) report that impulsive outbursts of aggressive behaviour are not infrequent in the early stages of hebephrenia. Even the projection or externalization of hostility in the form of paranoid-like persecutory delusions is not uncommon. Kant (79), in a clinical investigation of 64 simple schizophrenics, reported that 65 percent revealed aggressive behaviour such as threats, attempts at assault and destruction of property, and 39.7 percent crude, aggressive sexual behaviour such as attempted rape, at time of onset. This aggressive behaviour lessened in frequency as the illness progressed. Guertin (65) reported that the chronic nonparanoid schizophrenics who were represented by his chronic reintegration factor were low in verbal hostility. On the basis of these findings, there may be some justification for expecting the acute subjects to use more angular shapes and the chronics to employ more circular. However, the nature of the sample makes any such speculations extremely tentative.

The tendency of the acute hebephrenic-simples to use more mixed shapes is consistent with the "concrete-behaviour" hypothesis already proposed.

No interpretation of the use of colour by the hebephrenic-simples can be made other than that the results seem inconsistent with either of the explanations which have been put forth. On the basis of the colour-affect hypothesis, one might have expected either the acute or the chronic subjects

to have demonstrated a definite colour preference, and in terms of the perseveration formulation, the acute subjects should have used more chromatic colour.

D. Diagnostic Comparisons.

The results of the diagnostic comparisons offer an abundantly clear demonstration of the high efficiency of the modified mosaic test in the diagnostic differentiation of the schizophrenias. Furthermore, the data support indirectly the traditional descriptive classification of the schizophrenias, and substantiate the thesis that schizophrenia is not a homogeneous nosological entity.

i) Acute Diagnostic Comparisons: In general, the results of the acute diagnostic comparisons are remarkably consistent in their support of the interpretive hypotheses proposed in conjunction with the chronicity data. As was expected, scoring categories which may reflect both cognitive and orectic aspects of personality afforded a statistically significant differentiation among the diagnostic groups, and, in so doing, tend further to substantiate the "diminution of attention" and "expression of hostility" hypotheses presented in this study.

The tendency of the acute nonparanoids to make more designs than the acute paranoids is consistent with the findings of the chronicity comparisons, and supports the hypothesis that the construction of multiple designs is

related to psychomotor perseveration which is conceivably a function of diminished attention to external stimuli. On the basis of this formulation, one might have expected that the acute catatonics would have constructed the greatest number of designs. If almost continual autistic thinking can result in overt perseverative phenomena such as echolalia, echopraxia, flexibilitas cerea, and immobility, one might expect considerable evidence of perseveration on the mosaic test. Although the acute catatonics constructed more designs than the comparable paranoids, they made fewer than the hebephrenic - simples. This finding seems to be due to the cyclic or episodic nature of catatonia. Whereas the great majority of hebephrenic - simple subjects were examined during a florid phase marked by severe thought disorder, approximately 33 percent of the acute catatonics were tested during a stage of partial remission in which there was evidence of only moderate thought impairment. Comparison of the catatonic subjects in remission with those in the florid phase revealed that the florid subjects tended to make a greater number of designs ($X^2 = 4.96$; df = 1; P = > .02). There was also some evidence that the florid catatonics made more designs than the hebephrenic - simples ($X^2 = 1.96$; df = 1; P = > .10). In other words, these findings are consistent with the proposed attention hypothesis.

The diagnostic comparisons confirm the finding previously reported that the acute paranoids tend to make few designs,

and thus partly corroborate the observations of Wertham (172). However, the data fail to support his finding that a single design is necessarily diagnostic of the disorder.

The use of form by the acute schizophrenics is in complete accord with the hypotheses presented in the discussion of the chronicity comparisons. On the basis of the assumption that the angular and circular shapes reflect or symbolize the expression of hostility, one might infer that the acute paranoids tend to externalize or project hostile feeling, i.e. are extrapunitive; and that the acute nonparanoids tend to internalize or introject such affect, i.e. are intropunitive. As has been mentioned previously, this formulation, i.e. categorizing schizophrenia in terms of an extrapunitive - intropunitive bifurcation, is similar to that proposed by Arieti (3), Breen (9, 10), Breen et al (11), North (126, 127), Funkenstein (52, 55) and Rosenzweig (148).

No definite conclusions concerning the origins or mechanisms involved in the expression of hostility can be offered, for such conclusions would require further careful experimentation and developmental observations. It may, however, be useful to present a possible explanation which might suggest future research.

Although it is not argued that man possesses a biologically determined aggressive instinct, or drive towards destruction and death, it is postulated that all higher organisms exhibit innate offensive or attack mechanisms, i.e. an

attempt to remove or surmount an actual or perceived obstacle to psychobiological homeostasis through increased effort or a variation in mode of approach. Such behaviour is "aggressive" only in the sense of the original Latin meaning of aggressare, i.e. it is a frequent or persistent attempt to step toward or overcome. Biologically, when a particular need is not being adequately satisfied, certain persistent and unpleasant internal stimuli arise, such as the vigorous contractions of the stomach musculature in hunger. Such frequent tissue irritations set off compensatory or corrective activities such as the release of stored energy, marked changes in respiration, blood pressure, and blood movements to the executive muscle centres, which appear to assist the organism in the attempt to satisfy the need and restore equilibrium. In other words, such behaviour is a constructive aspect of an individual's psychobiological development. In the infrahuman organism or the human infant, this step towards an obstacle, or "attack" behaviour is more or less a pattern of motility (e.g. Mittelmann's (123) native urge toward motility) free from the common connotations of aggression and hostility. These patterns may, to the observer, appear "destructive", but only because the primitive organism fails to make a value judgment on either the frustrating obstacle or his behaviour. However, as Schilder (151) has pointed out, such effort directed at overcoming an obstacle is possibly the origin of later aggressive or hostile behaviour. The

"attack" behaviour can possibly become instrumental in relationship to other systems, e.g. sex, hunger, etc.

Although "offensive" behaviour is a positive element in the process of adapting to the environment, only a limited number of stress situations can be adequately solved by means of it. In infancy, when such behaviour is complicated by social interaction (i.e. with the needs of others), direct approach may be unsuccessful, the frustration continues, and the pain, irritation and unpleasantness connected with it become associated with the objects, situations or persons involved. As Stern (165) has argued, the person exposed to an emotionally involving situation often associates his affective state with elements of the situation.* Thus a reaction which primarily involves only a tendency to increased activity and variation in method in order to cope with a specific situation might incorporate an associated social element, i.e. it might now possess connotations of hate or hostility. The infant who is in the process of learning a complex system of adapting to basic needs such as hunger, thirst, elimination, rest, etc. is necessarily inhibited in any predominant "attack" behaviour. Persistence in such behaviour in the face of inhibiting factors (adult behaviour, etc.) may possibly

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* This formulation is not dissimilar from the concept of stimulus generalization in stimulus - response learning theory. Brogden (13) reported that when a conditioned reflex was elaborated to a specific conditioned stimulus, similar stimuli, neutral before formation of the conditioned reflex, had become capable of evoking the conditioned reflex.

be the behaviour which is termed "hostile" or "aggressive".

What types of treatment and what stages of development are crucial in reinforcing "attack" behaviour, only future research can unfold. Possibly, continual retribution for expressing "attack" behaviour instills fear of such behaviour and contributes to its suppression. Horney (72) has argued that a person may fear his own hostility and, dreading real or imagined punishment for expressing such affect, may habitually direct it toward the self, i.e. become intropunitive. On the other hand, one might speculate that "offensive" behaviour which is reinforced by deprivation and rejection (i.e. lack of interaction with the infant which may possibly produce feelings of being unwanted, unjustly treated, deprived of attention, etc.) may persist in terms of the chronic expression of hostility, i.e. hostility directed towards the environment. Variation in the child's interaction with the sources of frustration (probably parents), possibly governs the mode of hostile discharge which ranges from overt antisocial behaviour to hostile fantasy, i.e. is extrapunitive.

Although the present formulation is woefully oversimplified and the actual mechanisms involved are far from understood, it seems reasonable to postulate that some such explanation is applicable to the schizophrenias. In terms of a physiognomic fusion of an intense affective state with correlative aspects of the environment, it seems possible that certain elements of the environment could symbolize or reflect

the hostility which is so basic in the aetiology of the disorder.

Any hypothesis concerning the aspects of the environment which possess affective connotations is very speculative. However, it is argued that unverbalized cultural stereotypes concerning the affective connotations of geometric form exist. It is conceivable that our 20th Century Western culture associates predominately angular or straight-lined forms involving thrusting, launching, projectile qualities with the overt expression of force, hostility, or aggression (weapons, fire, lightning, penis, etc.). Certain curvilinear objects are undoubtedly used for destructive purposes (cannon balls, hand grenades, etc.); but it would appear that these are anomalies which are scotomised in the process of forming symbolic stereotypes. It may well be that in our stereotyped associations we have not yet assimilated many of the modern means of mass destruction (atomic clouds, etc.) but retain only simple, almost-archaic forms (knife, arrow, spear, rifle, etc.).

The position regarding the affective connotations of curvilinear forms is even more speculative and tentative. It seems possible that curvilinear forms possess strong connotations of femininity, not only in anatomical terms (e.g. breasts) but also in terms of the female role in our culture. It is conceivable, therefore, that curvilinear forms, in connoting femininity, may also represent its passive and

submissive aspects. In pathological conditions where submissiveness and passivity have been grossly exaggerated, it seems reasonable to postulate that curvilinear shapes might also be associated with intropunitiveness. In other words, submissiveness, passivity and, in the extreme form, intropunitiveness may be derivatives of the feminine role and, because of this intimate relationship, are associated with the curvilinear forms. It is interesting to recall that Lundholm (102) demonstrated that grace, beauty, weakness, etc. were also associated with the curvilinear shapes.

It is argued that the schizophrenics share in the unverbalized cultural stereotype concerning the affective connotations of form and, depending upon the nature of their disorder (i.e. extrapunitive or intropunitive), employ mosaic forms which reflect or are associated with their predominant affective state. For example, preoccupation with a hostile environment (e.g. paranoid schizophrenia) results in a selection of the angular shapes which reflect or symbolize the hostile affect. This excessive preoccupation, which might have led them to select the angular shapes on the Differential Diagnostic Technique, devised by Breen (9, 10) and North (126, 127), had selection been involved, conceivably interfered with their skill in drawing the angular shapes. It may well have been that they were: "Trying too hard". It is concluded that, in terms of the modified mosaic test, acute paranoid schizophrenics are characterized by their use of the angular shapes,

whereas the comparable nonparanoid schizophrenics tend to employ a higher percentage of circular. It is also concluded that this differential use of form may be a function of the expression of hostility. Furthermore, it is argued that the anomalous use of form (e.g. catatonics using a high percentage of angular form) may be found, in future investigations, to bear a close relationship with such affective expression.

Mention must be made of the possible effect on the characteristics of the mosaic designs, especially the use of form, induced by the unusual set established in the present investigation. In explaining differences in Thematic Apperception Test fluency in replication studies with psychoneurotics, Foulds (46) argued that such inter-study variability was possibly due to differences between examiners in terms of the amount of interrogation or probing employed. Faced with an inquisitive, delving examiner, dysthymics may construe the questions as revelations of their own inadequacies, and withdraw further from the test situation. A reduction of TAT fluency might be a concomitant of such withdrawal. In like fashion, the rather stress-producing, ego-involving set used in the present investigation may have served, not only to convey some degree of personal implication but also to exaggerate the expression of hostility. It is conceivable that informing the subjects that an attempt was being made to find out more about their personalities aroused increased indignation and animosity in the paranoid schizophrenics, and aggra-

vated feelings of inadequacy and worthlessness in the nonparanoid subjects. Bruner and Postman (15) have argued that a subject, stimulated in a way which is threatening or capable of arousing anxiety, is likely to misperceive a stimulus presented to him, fail to perceive critical stimuli, or see something which is derogatory or contradictory to the character of the actual stimulus. Although only future experimentation can establish the validity of a formulation such as this, it seems reasonable to conclude that the mosaic characteristics may have, to some degree, reflected experimentally induced affect. In the light of Foulds' argument, it is quite possible that the low test-retest reliability found for the percentage of circular form used was determined by a non-involving test situation. Needless to say, this type of set raises the question of the ethical justification of producing pain in the course of a diagnostic appraisal. It is argued that the ultimate goal of accurate, objective diagnosis, and eventual treatment, of the schizophrenias drastically outweighs any possible temporary psychological injury to the subject. In essence, the present test procedure is no different from a vast number of common medical diagnostic techniques, such as air encephalography and lumbar punctures, which may cause temporary inconvenience. It seems highly improbable that the set used in the present study causes more than mild and ephemeral psychological damage at most, and it has contributed significantly to the involvement of the subjects in the test

situation.

Although the tendency of the nonparanoids to use a greater percentage of mixed shapes than the paranoids is consistent with the "inversion of attention - concrete behaviour" hypothesis already presented, mention must be made of a possible alternative interpretation. Breen (9, 10) and North (126,127) have reported that hebephrenic and simple schizophrenic drawing behaviour on the Differential Diagnostic Technique is characterized by gross lack of control or inaccuracy. There is no differential treatment of the angular and circular forms, and there is greater difficulty with the mixed shapes than is typically found in paranoid or catatonic schizophrenia. According to the theoretical rationale used with the test, such drawing behaviour reflects the lack of any appreciable capacity for the sustained control or expression of either hostile or passive needs, and is common in socially unproductive individuals with no more than an elementary level of ego integration. This formulation is similar to that implied in Rosenzweig's (148) description of the impunitive reaction and said to be characteristic of hebephrenic schizophrenia. In impunitive reactions the individual attempts to avoid blame altogether, whether of himself or others, and to consider frustrating situations with a conciliatory attitude. In the extreme, this failure to express hostility, either extrapunitively or intropunitively, results in impulsive, erratic, chaotic behaviour - behaviour without aim or direction.

In the light of the arguments of Breen (9, 10) and

North (126, 127) and Rosenzweig (148), it might be postulated that the greater use of the mixed forms by the nonparanoid schizophrenics, especially by the hebephrenic-simples, is a reflection of the regressive or impunitive reaction. However, until the results of the correlation matrices can be discussed no definite conclusions regarding the use of the mixed form can be drawn.

In general, the results of the stated shape preferences (i.e. shape liked and disliked) are consistent with the use of form, and suggest that the affective connotations of form can be expressed verbally as well as behaviourally. This continuity between verbal expression and behaviour, especially in the nonparanoids, is most interesting, for many authors stress the disjunction between thought and action. It is quite probable that it is on the basis of such consistencies in psychopathology that the original descriptive nosology was constructed, and it appears to be these factors which are largely overlooked by contemporary workers. On such omissions, psychodiagnostic pessimism is based.

Although the evidence of following sections is required to throw light on the interpretation of the use of colour, the results of comparisons among acute diagnostic categories could be construed as supporting the perseveration hypothesis already presented. In every case, the group employing more colours used less chromatic colour, i.e. they employed relatively more achromatic colour. This relationship between the

percentage of chromatic colour used and the number of colours used, found in both the chronicity and the present comparisons, appears to be more than a mere chance association. However, it is also appreciated that these data do not discount the validity of a colour-affectivity explanation.

It appears obvious that there is considerable similarity and interrelationship among the categories shape and colour symmetry, completeness, and complexity. Indeed, the dependence of completeness on shape symmetry and its more inclusive character casts doubt upon the usefulness of a separate category of shape symmetry. It also appears that the category colour symmetry adds little diagnostic power to the test which is not already incorporated in the notion of completeness. The inability of the complexity category to differentiate among the groups makes it of dubious diagnostic value.

The results partially support the findings of Wertham and Golden (173), Diamond and Schmale (27), Ellenberger (33), Lowenfeld (101), and Levin (92) that a high degree of symmetry is found in the mosaics of schizophrenics, but fail to substantiate the claim that such symmetry is characteristic of the schizophrenias. In terms of the present population, only the acute paranoids exhibited superior shape and colour symmetry, and completeness. Lowenfeld's (101) finding that hebephrenics showed a marked lack of interest in symmetry is corroborated, but such lack of interest is not specific to hebephrenia for no differencesin shape or colour symmetry

were found between the acute catatonics and hebephrenic-simples. It seems highly probable that the categories of symmetry and completeness are related to level of cognitive functioning which is partly a function of relatively unimpaired attention to the external environment. As the boundaries of thinking become fluid and attention becomes fixated on internal stimuli, ability to organize and plan ahead deteriorates. Extreme autistic preoccupation is reflected in behaviour which amounts to motor perseveration, i.e. the random placement of pieces on the tray. This formulation is essentially similar to that presented by Robertson (144) to explain asymmetry in the patterns of psychotics.

The results of the concreteness comparisons suggest that the studies (92, 142, 174) which found that the concrete - abstract dichotomy was of little diagnostic validity were guilty of treating schizophrenia as a homogeneous disease entity. The present investigation supports Lowenfeld's (101) observation that paranoids often construct representational designs, although it does not corroborate her interpretation that they complete a design and then invent an explanation for it. The great majority of acute paranoids began with the plan of a concrete object in mind and often systematically achieved a reasonable representation of it. Although this behaviour may be interpreted as reflecting the superior level of cognitive functioning or contact with reality of the acute paranoids, the writer feels that a process similar to Freudian

displacement may also be involved. In her analysis of adolescent mosaics, Flum (36) found no association between content and intelligence, but did demonstrate a relationship between content and possible orectic variables. It is postulated that some paranoids tend to transfer, redirect or cathect their hostility to definite, recognizable, concrete aspects of reality, i.e. they construct representational mosaics. This behaviour may be similar to the tendency of some well-preserved, well-integrated paranoids to enumerate objects in the pictures of the Thematic Apperception Test rather than construct a potentially hostile and dangerous story. One cannot help but think of the ethological parallel described by Lorenz(97).

> "Taking on a peculiar threatening attitude, they (stickleback fish preparing to fight) incessantly stand on their heads and, like Father William, they do it again and again. At the same time they turn broadside on towards each other, and each erects threateningly the ventral spine on the side nearer his opponent. All the while they seem to be pecking at the bottom for food. In reality, however, they are executing a ritualized version of the activity normally used in nest-digging. If an animal finds the outlet for some instinctive action blocked by a conflicting drive, it often finds relief by discharging an entirely different instinctive movement. In this case, the stickleback, not quite daring to attack, finds an outlet in nest-digging." (p.48)

The construction of concrete designs sometimes entails the use of shapes other than angular. In a few instances, shapes which were appropriate to the object were employed in preference to the angular forms (e.g. circular shape no. 8 used as a mouth,and Plate 8). However, as can be seen in

Appendix A, Plate 2, angular shapes were usually incorporated ingeniously into their representations. Comparison of the paranoids who constructed concrete designs with those who made abstract patterns failed to show any significant difference($Z = 0.80$; $P = > .42$) in terms of the percentage of angular form used.

The main conclusion that can be drawn from the results of the localization comparisons is that the acute paranoids tended to place their mosaics in a definite section of the tray, whereas the nonparanoids revealed no such intentional placement. Although there was a slight preference by the paranoids for the upper left section of the tray, this behaviour was only demonstrated to a statistically significant degree when contrasted with the scattered quality of the nonparanoid productions, and, therefore, may be of no psychological significance.

The interpretation of this "definite placement vs no localization" dichotomy is far from clear. The following arguments are tentative and must be confirmed or rejected by the evidence of the correlation matrices and/or future research.

Several workers have postulated that spatial localization reflects or symbolizes orectic aspects of personality. In her interpretations of drawings of the human figure, Machover (104) argued that a figure placed high on the page suggests optimism, whereas a figure placed in the lower section indi-

cates pessimism. She reported that paranoids often exhibit the upper localization. Levy (94) has argued that children who place their drawings of human figures in the upper half of the page have rather high standards of achievement. Upper localization in adults supposedly indicates insecurity, and left horizontal placement suggests self-consciousness or introversion. Levy also reports that depressed or defeated individuals will occasionally place their drawing in the lower half of the page. Buck (16) has stated that horizontal placement of the drawings of the Tree.- House.- Person Technique is indicative of an individual's intellectual control over his affect, and that the psychological centre of the page is to the left of the geometric centre. In their study of 2083 Tree - House - Person drawings by children, Jolles and Beck (75) argued that Buck's interpretive hypotheses concerning localization were valid, and reported that drawings above the page centre reflected striving or ambition as contrasted to the depressive mood associated with below-centre figures. This interpretation is similar to Mira's (122) hypothesis that upward movements on the Myokinetic Test are related to elated moods, and downward movements to depression. Lowenfeld (101) reported that mosaics sloping down from left to right were found in depressions, but this finding was not corroborated by Levin (92).

Although the drawing studies are of doubtful validity owing to their questionable experimental design, one might

argue that the localization of the mosaics is associated with affective expression. On the basis of the evidence presented above, one might argue that the definite placement by the paranoids is related to variables such as strivings for dominance or ascendance. However, the present results are not entirely consistent with such an explanation, for not only is the paranoid trend towards upper left localization tenuous, the nonparanoid behaviour, especially that of the catatonics, is counter to expectation. On the basis of the affect-localization hypothesis, one might have postulated that the nonparanoids would demonstrate considerable below-centre placement. Such localization was not demonstrated.

An alternative and perhaps more reasonable explanation can be framed in terms of the "attention" hypothesis presented previously. On account of a diminution of attention to external stimuli and concomitant motor perseveration, the nonparanoids construct multiple designs. Since the paranoids tended to make only one or two small designs (there was also a slight tendency for the acute paranoids to use fewer pieces), the chance probability of these designs revealing definite localization was far greater than the multiple mosaics made by the nonparanoids which required a greater tray area. In other words, it appears that it is much more difficult to construct a large number of designs in only one section of the tray than to confine only one or two in a specific area. It is postulated, therefore, that the placement of the designs

by the paranoids may be a random or chance occurrence, and that any statistically significant differentiation obtained by comparing the paranoid and nonparanoid subjects may be without psychological significance.

The results of the comparisons of the scoring categories within the acute diagnostic groups support, almost entirely, the results of the comparisons between those groups. In other words, in nearly every case, a scoring category which demonstrated ability to differentiate between the three diagnostic groups, also exhibited considerable internal or within-group consistency, e.g. the acute paranoids not only used a greater percentage of angular form than the nonparanoids, but in terms of their own use of form, also used a greater percentage of angular form than circular and mixed. Although the majority of the comparisons are consistent with the interpretations previously presented, the colour and localization comparisons merit comment.

The chromatic - achromatic colour comparison suggests that there is a strong preference for chromatic colour in all the diagnostic groups, and that differences between the groups were only in the amount of chromatic colour used, not in terms of preference between chromatic and achromatic. This finding seems somewhat contrary to any affectivity-colour hypothesis (one might expect, at least, no significant difference in type of colour selected, not a preference for chromatic colour significant at $< .001$), and may be more

consistent with the "diminution of attention - motor perseveration" formulation.

Although the results of the localization comparisons for the nonparanoids, especially for the catatonics, seem reasonably consistent with previous findings, the paranoid comparisons indicate that there was a more definite preference for upper vertical placement than was thought previously. However, it is argued that this result is not necessarily incompatible with the explanation previously offered. Although further experimentation will be required to establish the validity of this hypothesis, it is postulated that the upper section of the tray, the section nearest the container, was the most accessible area, and, therefore, received the majority of designs. The nonparanoids employed the upper section of the tray as well but confounded a score of upper localization by perseverating, in terms of multiple designs, into the lower half.

ii) Chronic Diagnostic Comparisons: Considering the possibility of increased diagnostic contamination in the chronic sample, the chronic diagnostic comparisons are amazingly consistent with the acute findings, and, in general, appear to support the interpretive hypotheses offered previously.

The paranoid - nonparanoid comparisons, though somewhat less efficient in their diagnostic differentiation, are extremely similar to the acute findings, and require little comment. It should be noted that the relationship between

number of colours and percentage of chromatic colour is in the predicted direction. The lack of considerable differentiation between the chronic catatonics and hebephrenic-simples may be due to the clinical similarity of the two groups after prolonged hospitalization. In terms of the chronic reintegration or reorganization hypothesis already discussed in reference to the chronic catatonics, the use of a greater percentage of angular form by the catatonics is not surprising.

The tendency of the chronic groups, including the paranoids, to deteriorate towards a common terminal point was mostly in terms of cognitive functioning. On the basis of the attention formulation, there appears to have been an appreciable degree of diminution in attention to external stimuli in all chronic groups. The results of the comparisons of the chronic paranoids with the acute nonparanoids suggest that, although there is still reasonable orectic differentiation between the groups. there is a definite impairment in the chronic paranoid's intellectual functioning. This finding supports the results of the chronicity comparisons.

iii) Summary of the Diagnostic Comparisons: Although it is argued that the modified mosaic test is highly efficient in differentiating the types of schizophrenia, i.e. the scoring categories employed have considerable diagnostic validity, it must be stressed that the differentiation has been in terms of groups. As Meehl (118) has warned, it is possible for a test to differentiate significantly between

two groups, and still be useless in making predictions in the individual case. Until a discriminative function based on the present or additional scoring factors can be extracted, not only for the schizophrenias but also for psychoneurotic and nonpsychiatric populations, and until such time as cross-validatory data can be collected, the modified mosaic test should be used only for research - not as a differential diagnostic instrument in clinical practice.

iv) Interrelationship of Scoring Categories: The correlation matrices of the scoring categories are, in general, quite consistent with the interpretive hypotheses already presented.

In terms of the diminution of attention formulation, it is interesting to note the relatively high degree of association among the category number of designs and the categories: percentage mixed; number of colours; shape and colour symmetry; completeness; complexity; and localization. On the basis of Robertson's (144) demonstration of the relationships between levels of symmetry and complexity of spontaneous designs and cognitive functioning, it seems reasonable to postulate that these categories may reflect cognitive processes, probably the extent of attention to external reality. The Spearman rank correlation coefficient of -.43 between number of colours used and percentage of chromatic colour, and the failure of the latter category to relate significantly to any of the possibly orectic categories, suggest that there

is little evidence to support the colour-affectivity hypothesis. It seems probable that the amount of chromatic colour employed was partly a function of the number of colours used. The positive relationship among percentage mixed form and, number of designs and number of colours, and the possible negative association with the other possibly cognitive categories suggest that the perseveration hypothesis may be valid as an explanation for the use of the mixed shapes. It is interesting that a positive association was found between the percentage of mixed form used and shape preference. It seems possible that preference for a shape is largely determined by the predominant type of form used. The subjects were asked which shape they preferred after the completion of the mosaic, and it seems reasonable to postulate that the choice was based primarily on the pieces before the subject on the tray.

In general, the associations among localization and the other categories are consistent with the perseveration explanation presented previously. However, it was somewhat surprising to find a significant positive relationship between percentage angular and vertical placement, and a significant negative relationship between the latter category and percentage circular. Although the evidence of the correlations with the other tests and rating scales is required to throw further light on the nature of these associations, it may be that there is some relationship between affective expression

(possibly hostility) and localization. On the other hand, the variable of diagnosis may be the shared factor, not the affective connotations, e.g. the paranoids who used the greater percentage of angular form also tended to make definite placement, and one might argue that it is still the superior cognitive level of the paranoids which is being reflected. It seems such is the case in the associations found among the percentages of angular and circular form used and categories such as shape and colour symmetry, and completeness.

The associations among the percentages of angular and circular form used and concreteness is consistent with the displacement hypothesis already discussed. However, further evidence will be required before any definite conclusions regarding any relationship between the expression of hostility and concrete behaviour can be drawn.

E, Summary of Conclusions.

The main conclusions from the sex, chronicity and diagnostic comparisons of the present investigation are that in a schizophrenic population:-

1. There were no sex differences in any of scoring categories utilized.

2. Acutes and chronics were differentiated within each of the diagnostic groups, mainly in terms of the scoring categories thought to be associated with the orectic aspects

of personality.

3. All scoring categories employed afforded differentiation between the diagnostic groups. This differentiation weakened slightly among groups of chronic patients.

4. Possible hypotheses concerning the explanation of the scoring categories have been discussed, the chief of them concerning the diminution of attention and the expression of hostility, but further evidence from the correlations with other tests and rating scales is needed. Many of the interpretive hypotheses presented require further careful experimentation.

IV. Relationships Between the Modified Mosaic Test and Other Tests and Behaviour Ratings.

A. The Tests.

i) Progressive Matrices (1938).

As Foulds (45) has pointed out, the untimed Progressive Matrices can be regarded as assessments of general intellectual ability, and the timed version as a measure of general intellectual efficiency. He argued that general intellectual capacity is an inference from the assessment of ability together with other relevant evidence and cannot be evaluated directly. Since the assessment of general intellectual ability was of more immediate significance in the present investigation, the untimed Progressive Matrices (1938) were administered as the first test of the battery.

Rather than allow the subject to record his own answers, the choices were recorded by the examiner. However, in all other respects the standard instructions (139) were followed. Owing to the disproportionate influence of chance in the performances of older subjects of limited ability, their centile scores seemed spuriously high. Since the centile points for dull subjects over the age of 30 have not been accurately determined, the raw Matrices score was employed.

ii) The Mill Hill Vocabulary Scale.

Since the Mill Hill Vocabulary Scale has been regarded (45) as an index of maximum attained intellectual level regardless

of present intellectual capacity, as contrasted to the estimate of general intellectual ability afforded by the Matrices, the scale was employed as the second test of the battery. It was hypothesized that both the Matrices and Vocabulary scores would show a high degree of association with mosaic characteristics (shape and colour symmetry, completeness, complexity) which were thought to reflect cognitive functioning.

The stimulus words were shown and read to the subject by the examiner who recorded all responses. Form Senior I of the test was continued until six consecutive definitions and synonyms had been failed. In the case of six initial failures, form Junior I was employed. In all other respects, the standard (140) administration and scoring were followed. Because of difficulties with the centile scores similar to those found with the Matrices, the total raw score (definitions + synonyms) was used.

iii) Porteus Mazes with Distraction.

Using a psychoneurotic population Foulds (39, 40, 44) has demonstrated that distraction, in the form of counting, temporarily disrupted the pattern of affective disturbance and resulted in a speeding up of the performance on the Porteus mazes by dysthymics as compared to non-dysthymics. In the hope that mosaic scoring categories (percentage form used, percentage colour employed, concreteness) possibly related to affective functioning might be associated with the Maze performance under distraction, the adaptation of the Porteus

Mazes by Foulds (39, 40, 44) was included as the third test of the battery.

A slight modification of Foulds' procedure was that subjects were instructed on maze Year 5 and were then presented Years 6, 7, 8, 9, 10, 11, 12 and 14; mazes Adult I and II were not employed. The total time in seconds from the completion of the instructions to the finish of the maze was recorded. Subjects were stopped after 2 wrong directions on Years 5 to 11 and after 4 on Years 12 and 14, otherwise the time was recorded until the terminus was reached. On completion of the first set of nine mazes, an identical set was introduced with the same instructions except that the subject was asked to repeat numbers after the examiner. During the performance, the examiner counted consecutively from one, at intervals of approximately 2 seconds. The ratio of the total time of the second performance to the total time of the first converted to a percentage was the measure of distractibility extracted.

iv) The Tapping Test.

Although workers (57, 84, 119, 156), including Kraepelin (87), have used speed of tapping as a psychodiagnostic device in schizophrenia, only three investigations have studied the spatial dispersion of tapping in conjunction with psychiatric groups. Penrose and Wilson (134) required normal and schizophrenic subjects to tap with a stylus on a plate as fast as they could for 25 seconds, and found marked differences in

the spatial distribution of their responses. The normal records showed no tendency towards the organization of the dots into specific configurations, and there was a variable degree of random scattering around focal points. In the schizophrenic records the dispersion of the dots was usually far greater than that of the normals but sometimes it was much less. In a study of neuroticism in children, Himmelweit and Petrie (70) employed dispersion of tapping as one of a large test battery. Using the method of having the subject tap as rapidly as possible with a pencil on a sheet of paper for two 10 second trials, they then computed the ratio of length of major axis of patterns of dots to the minor axis, measured in millimetres. This method, which they attributed to an unpublished study by Eysenck (1945), failed to differentiate between their groups of disturbed children. It was reported that the study by Eysenck revealed that adult neurotics spread dots over areas of varying sizes. In the hope that the spatial dispersion of dots, in the process of differentiating the schizophrenic groups, might be associated with characteristics of the mosaic designs, the tapping test scored for dispersion was included as the fourth test of the battery.

The subjects were instructed to tap with a sharp pencil on a sheet of white paper 8 in. x 10 in. as fast as possible, for three 10 second trials. To aid in the calculation of dispersion a sheet of carbon paper, sensitive side uppermost,

was placed under the paper. Light dots which were not recorded on the upper surface were usually visible on the reverse side. Dispersion was calculated by placing a template of clear plastic ruled in ½ in. squares directly over the sheet and counting the number of squares entered by the dots. Dots directly under a dividing line were assigned to a previously occupied cell unless clearly discrete, in an attempt to keep the total a conservative but fair estimate of dispersion. The mean number of squares entered for the three trials was the estimate employed.

v) The Modified Mosaic Test.

The modified mosaic test was included as the fifth test of the battery.

vi) The Differential Diagnostic Technique.

The Differential Diagnostic Technique developed by Breen (9, 10) and North (126, 127) which was based on the ability to reproduce geometric line drawings, and which was thought to reflect the expression and direction of hostile or aggressive tendencies, was included as the sixth test of the battery. It was hoped that the two indices derived from the objective scoring of the drawings, one revealing any differential treatment of the angular and circular forms, the other an assessment of psychomotor efficiency or control shown in duplicating the figures, might be associated with characteristics of the mosaic designs.

The test materials consisted of fourteen 4 in. x 6¼ in.

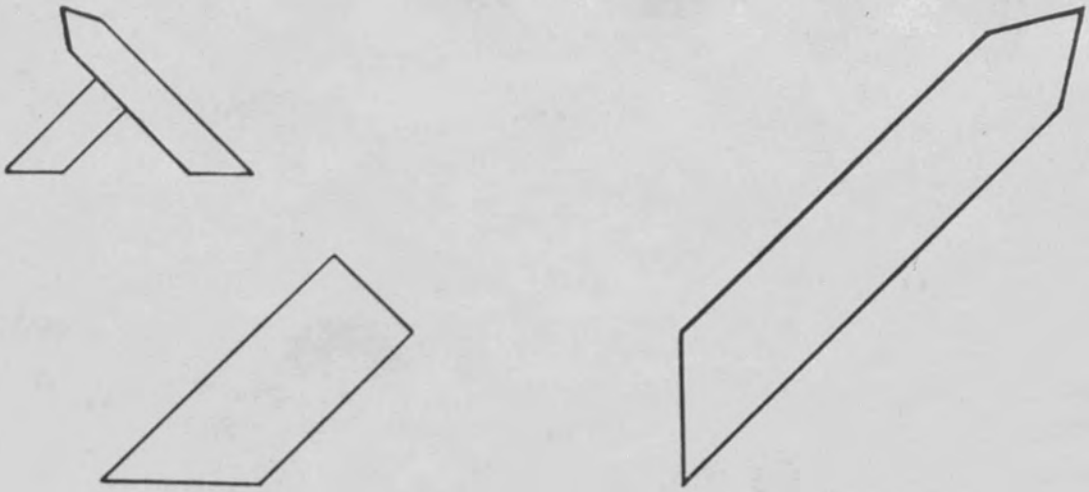
cards bound in booklet form upon each of which was printed a geometric line drawing. Four angular or straight-line figures, four circular or curvilinear, and four figures composed of both angular and circular elements were arranged in random order, and were preceded by two introductory or sample figures of the mixed type. Examples of the test cards are shown in Figure 6.

Figure 6.

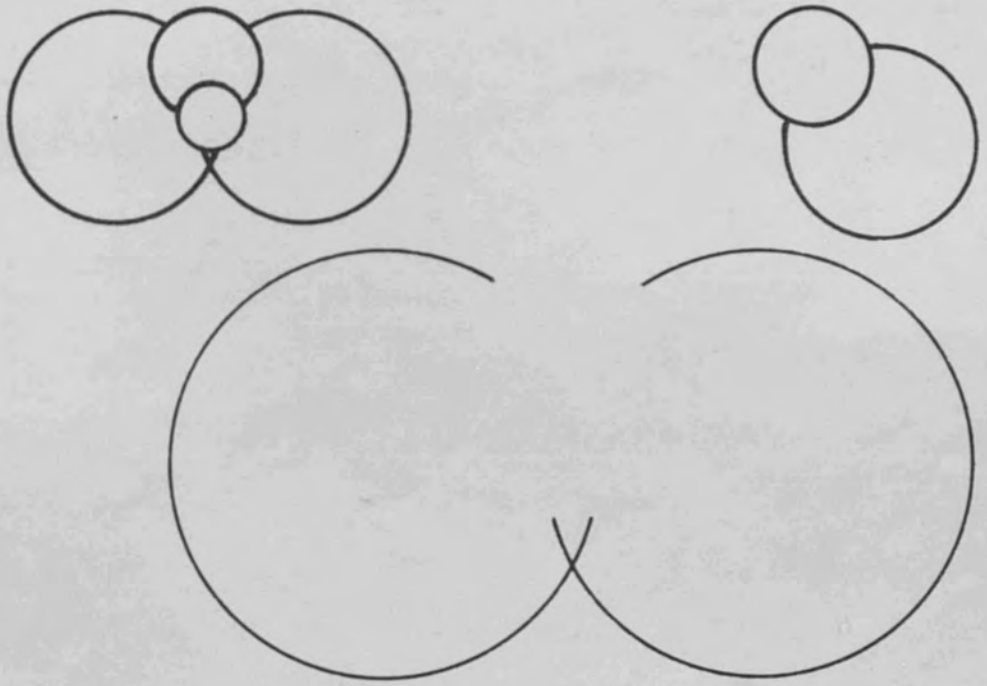
Since the task of copying seemed too simple and hence possibly afforded little opportunity for ego involvement, the level of abstract thinking required was increased. The small figure or model in the upper left section of each card (Figure 6) was employed to determine the relationships to be followed by the subject in duplicating and combining the larger figures on the cards, a process essentially similar to that involved in the Goldstein-Scheerer Cube Tests (62).

All drawings were entirely freehand, white 8 in. x 10 in. paper and sharp H.B. pencils being used without erasers. Subjects were not permitted to erase drawings or to make use of mechanical aids such as rulers, the edges of the test booklet, etc. With the test booklet open at the first sample figure, the following instructions were given (12):

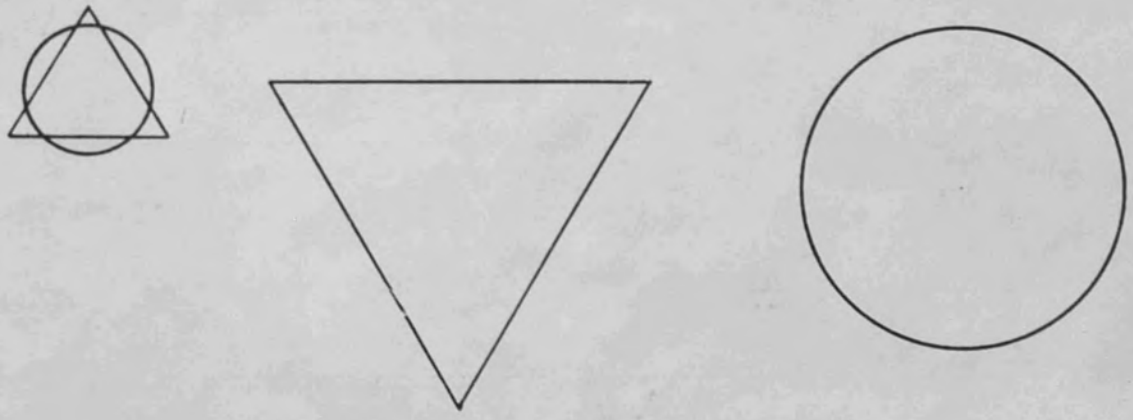
> "Look at this card carefully. Here is a small triangle and here is a small circle and they are put together in a certain way (Examiner



Angular



Circular



Mixed

Figure 6. Shapes Employed in the Differential Diagnostic Technique.
One Example of Each Type of Form

> points to the small figure at the top of the card). Here is a large triangle made of solid lines (E. points) and here is a large circle made of dots (E. points). I want you to copy the large triangle made of solid lines, and the large circle made of dots (E. points) putting them together in the same way that the small triangle and small circle are put together here (E.points). Try to make your drawings exactly the same size as these larger figures (E. points) and be sure to use solid lines for the triangle and dots for the circle as you see here (E. points). Do you understand? Go ahead." (p.3)

These instructions were repeated until the subject understood the task required. When the figure had been completed successfully, the second sample card was introduced with comparable instructions. The subject was not permitted to proceed with the test proper unless he had demonstrated a satisfactory performance on both sample cards. Satisfactory drawings were judged by the following:-

> "(1) the subject's drawings are easily recognizable as adequate reproductions and combinations of the large test figures; (2) the size of the drawings is obviously closer to that of the large than to the model figures; (3) the correct kind of lines, circles, dots, etc. are used; (4) no rotation (exceeding 14 degrees) of a major part of the drawing occurs (i.e. major part = one of the large test figures) relative to another major part; (5) no rotation (exceeding 14 degrees) of the entire drawing occurs relative to the side of the paper used by the subject as the top of the page." (p.4)

If this criterion had been met, the following instructions were employed:

> "Now I am going to give you some more figures to copy in the same general way as the ones you have just finished. Copy <u>only</u> the large figures.

> Use the same kind of lines, dots or little circles that you see in the large figures. Put your drawings of the large figures together in the same way shown in the model figures at the top of the cards. In cases where there is only one large figure to copy, the model figure will tell you how many copies to make. Remember, be sure to try to make your drawings the same size as the larger figures. There is no time limit for this test, but try to do them as well as you can. Do you understand? Go ahead." (p.5)

On commencement of the test proper, no further aid was given to the subject. Any questions were answered in a non-committal manner. No limitation was placed on the amount of paper used, or on the arrangement of the drawings on the sheets. On completion of the test, the booklet and drawings were removed and the subject was instructed to reproduce as many of the drawings as possible from memory. However, on account of the large number of subjects who either were unable or refused to complete the memory section, this part of the test was omitted from the data collected.

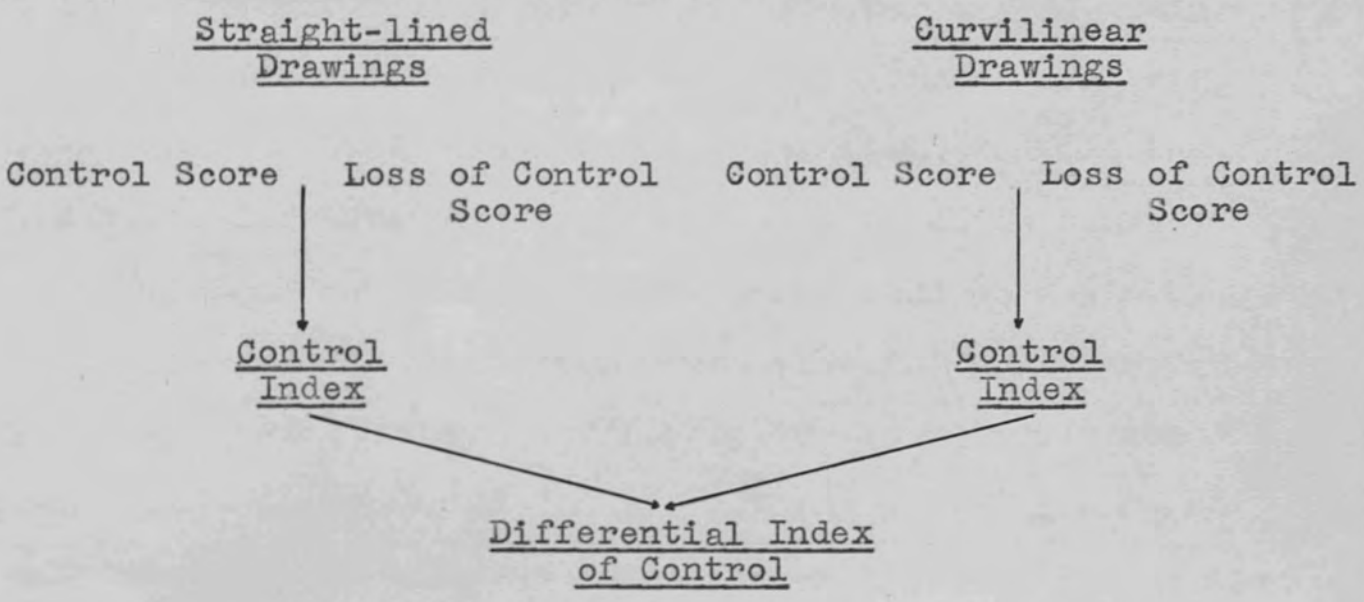
The drawings were scored for 38 factors by two examiners who had been trained in the administration and scoring by the originators of the technique. Each of the scoring categories was operationally defined in a manner similar to that already described (page 153) for judging the adequacy of the introductory figures. The list of categories employed is found in the form of the scoring charts contained in Appendix B.

Each of the three form types (angular, circular, mixed)

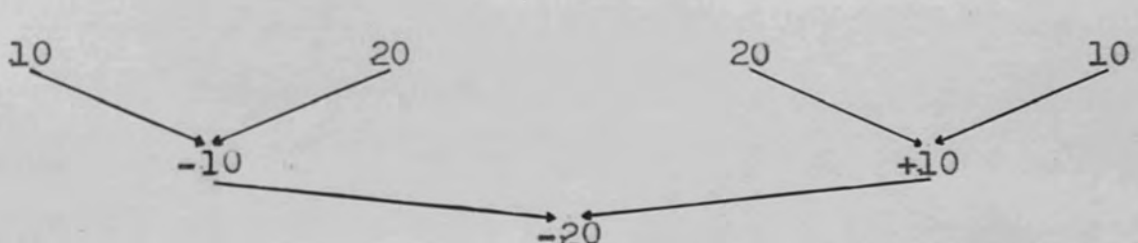
was examined separately for factors which were said to indicate either control or loss of control in executing the drawings. A control index for each type was obtained by subtracting its loss of control from control score (Appendix B). In order to evaluate any differential treatment of the angular and circular figures, the control indices of these two areas were compared, i.e. a differential index of control was obtained by subtracting the control index for the circular figures from the control index for the angular (Appendix B). Negative indices, characteristic of paranoid and psychopathic subjects, indicated the inadequacy of the angular drawings and relatively superior perceptual motor control in completing the circular whereas positive indices, characteristic of nonparanoid schizophrenics and the affective disorders, revealed control over the angular figures and inadequacy in executing the circular (Appendix B). The derivation of this differential index of control and examples of negative and positive indices (Appendix B) are shown in Figure 7.

Figure 7.

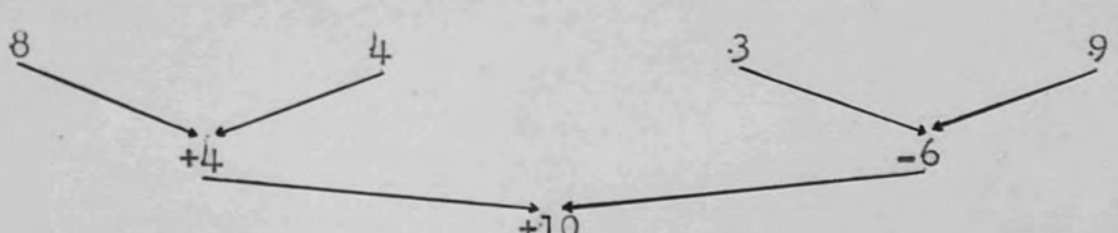
A sedond index, an estimate of adequacy shown in completing all figures, was derived by adding all control factors from the three form areas plus any factors scored for the performance as a whole (arrangement, style), and subtracting from this master control score the sum of all loss of control factors from the three areas plus any over-all scores (arrange-



Derivation of the Differential Index of Control



Negative Differential Index: Chronic Hostility Reaction



Positive Differential Index: Dysthymic or Episodic Reaction

Figure 7. Derivation and Examples of the Differential Index of Control for the Differential Diagnostic Technique

ment) (Appendix B). Breen (9, 10) and North (126, 127), using an essentially similar but possibly less sensitive total control index (Appendix B), hypothesized that the index was indicative of degree of adjustment in terms of "ego strength" or "mental health". Normals showed slight positive indices, neurotics revealed slight positive to slight negative scores, and psychotics showed definite negative indices, usually > -8. In other words, loss of control over the drawings was strongly associated with the severity of the disturbance, in a manner essentially similar to that of the Bender-Gestalt Z score developed by Pascal and Suttell (132). McCallum (113) reported Spearman rank correlation coefficients between these two control scores ranging from +.66 to +.71.

Since the drawing test was administered and scored by the same examiners with knowledge of the subject's diagnosis, an examination of the inter- and intra-examiner scoring consistency was made. Twenty records, ten scored by each examiner, were selected at random and were coded by a third psychologist. The records, devoid of identifying material, were then rescored by both examiners. Table XX summarizes the Spearman rank correlation coefficients for the inter-examiner and intra-examiner scoring of the differential and control indices. All coefficients were > .89, and all

TABLE XX.

TABLE XX. Inter-judge and Intra-judge Consistency of Scoring of the Differential Diagnostic Technique

Spearman Rank Correlation Coefficients

	Differential Index		Control Index	
	Judge A	Judge B	Judge A	Judge B
Judge A	+.91*	+.90*	+.92*	+.97*
Judge B	-----	+.90*	-----	+.93*

* = <.001

were significant at the .001 level of confidence. It seems reasonable to conclude, therefore, that the scoring of this test was highly consistent and reasonably unbiased by any diagnostic information.

vii) The Thematic Apperception Test.

Three new pictures* combined with four cards from the standard Thematic Apperception Test were selected for their potential for eliciting hostile or aggressive themes, and were included as the seventh test of the battery in the hope that ratings of the stories for hostility, guilt and organization might be associated with characteristics of the mosaic designs.

To the T.A.T. pictures: 4, 3BM, 13MF, and 18GF were added: (1) "Agony in the Garden", by Edmund Burra; (2) a photograph extracted from a French periodical; and, (3) a photograph composed by the investigators. Reproductions of these pictures are contained in Appendix C. These new additions were identical in size to the regular T.A.T. pictures, and were mounted on similar white cardboard.

The cards were presented in the order: 4, 3BM, A (composed photograph), 13MF, 18GF, B (Burra), and C (French), and the instructions followed those of Rapaport (136) and Foulds (41). All stories were recorded in longhand.

The protocols, devoid of identifying information, were

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* Selected by Foulds, G. A., McClelland, M. A. and McClelland, W. J.

scored independently for hostility and guilt by two psychologists not directly involved in the present investigations*, and for organization by one psychologist and a psychiatrically sophisticated lay person**. The following scoring system was employed.

Hostility: Each story was examined separately and the values 0, 1, 2 and 3 were awarded for mention of the following classifications of response:

3 - Murder

2 - Physical assault dangerous to life (Half-strangling, maiming, torturing, knifing, rape, etc.)

1 - Physical assault not normally dangerous to life (punching, spanking, etc.)

Verbal assault (quarrelling, strongly disagreeing, thwarting, persecutory ideas, slandering, anger, disregard of another's well-being - such as culpable neglect of an invalid, etc., suspiciousness, infidelity)

Jealousy

Deliberately scaring someone

0 - Complete absence of the above

Only one value, the highest possible, was scored for each story. The total hostility score, maximum 21, was obtained by adding the values awarded to each of the seven stories.

Guilt: Each story was examined separately and the values 0, 1, 2 and 3 were awarded for mention of the following

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* Dr. G. A. Foulds and Mr. T. M. Caine

** Dr. G. A. Foulds and Mrs. G. A. Foulds

classifications of response:

3 - Suicide (Where this is a reaction to something done to the person committing suicide 1 is scored on Hostility in addition to the 3 for Guilt.)

2 - Remorse with reparation, seeking forgiveness, etc.

1 - Remorse without reparation, etc.

0 - Complete absence of the above

Only one value, the highest possible, was scored for each story. The total guilt score, maximum 21, was obtained by adding the values awarded to each of the seven stories.

Organization: The protocol as a whole was scored by the two judges using three classes of response. The following combinations of their scores resulted in a five point rating scale:

Category		Judge A		Judge B
I	-	1	+	1
II	-	1	+	2
		2	+	1
III	-	2	+	2
IV	-	2	+	3
		3	+	2
V	-	3	+	3

Five was the maximum score awarded for a protocol. The following variables entered into the concept of organization:

(1) Are the questions: "What is the situation?"; "What might have led up to it?"; "What are they feeling?" "What is the outcome?" covered by the story?

(2) Are the sentences constructed in an intelligible way?

(3) Are words used correctly?

(4) Are percepts accurately related to the pictures?

(5) Is the story free from irrelevancies?

(6) Is adequate 'distance' maintained?

(7) Is the story free from bizarre notions?

Examination of the ratings for inter-judge scoring consistency revealed complete agreement in 93.8 percent of the hostility items and 96.2 percent of the guilt. Although agreement in the rating of organization was somewhat lower (61 percent), only one percent of the items differed by more than one grade. It seems reasonable to conclude, therefore, that the ratings of hostility, guilt and organization were strikingly similar for two independent judges.

viii) The Shakow Co-operation Scale

During the examination the subjects were rated for 'co-operation' on a slightly modified version of the scale used by Shakow (155) at the Worcester State Hospital. The actual scale employed is as follows:

A. The subject must show an active interest in the procedure itself, exert maximum effort in the examination and show interest in the results.

B. The subject gives willing co-operation and manifests real effort, but not because of primary interest in the tests themselves, but because of some other factor such as: (1) general friendliness: (2) desire to please the examiner; or (3) compulsive thoroughness.

C. The subject is docile and submissive, accepting the situation but showing no real interest. Effort is perfunctory or spasmodic and some urging is usually needed.

D. The subject considers the examination a disagreeable task or even an affront; he may be resentful, resistive or surly. It is only after considerable urging and repeated questioning that any results are obtained.

E. Absolute refusal to co-operate.

Only the first four categories were employed in the present investigation. Subjects awarded class E. were not included in the population. It was hoped that the rating of co-operation might be associated with characteristics of the mosaic designs.

ix) The Behaviour Rating Scale

In the hope that some of the mosaic characteristics might be associated with various aspects of overt behaviour, a behaviour rating scale and check-list was included as the ninth item of the battery. Although it was originally intended to have the rating scale completed by persons other than the examiners responsible for the administration of the test battery, circumstances confounded this intention, and it was necessary to rely on the examiner's rating at time of testing. It is possible that this defect may have influenced the final ratings, and have somewhat biased the examiner's perceptions. In an attempt to control this variable, the examiners made conscious efforts to be unbiased by their knowledge, and a rather stringent level of statistical significance required for rejection of the null hypothesis was adopted (significant = $<.001$, suggestive = $<.01$).

The rating scale and check-list employed was a gross

modification of the psychiatric rating scale devised by Malamud and Sands (107) with six of the items (appearance, motor activity, poise, speech, hostility or aggressiveness, defensiveness) in the form of five point scales similar to those used by King (84) in the Tulane Behaviour Scale. The remaining 25 items, many from the Malamud and Sands scale, were arranged in the form of a check-list. A copy of the scale is contained in Appendix D.

On completion of the study it was realized that some of the items were not of immediate relevance to the mosaic test and that several of the ratings incorporated behaviour noted on the check-list. It was decided to investigate the relationship between eight of the most valid mosaic scoring categories (number of designs, percent angular, percent circular, percent mixed, percent chromatic colour, completeness, and horizontal and vertical localization) and only six items from the scale (poise, hostility, defensiveness, scattered attention, distractibility, fragmented thought). However, since the information contained in the scale might be of value for descriptive purposes, an analysis of the ability of the items to differentiate the diagnosis x chronicity groups was carried out. Since several of the categories of the check-list revealed extremely small frequencies (somatic delusions, obsessive behaviour, euphoria) only 25 items entered into the analysis.

B. Results

i) Association Between Mosaic and Other Tests

The results of the tests of association, Spearman rank correlation coefficients and contingency coefficients based on chi square computations, are summarized in Tables XXI, XXIIa, XXIIb and XXIIc.

Table XXI.

Tables XXIIa, XXIIb, XXIIc.

Seventeen of the 54 coefficients computed for the continuous measures and 25 of the 75 contingency coefficients were significant at the .01 level of confidence. The chance probability of obtaining 42 coefficients significant at .01 from the 129 which were calculated was $<.001$. Another 19 coefficients were possibly significant. Once more, although most of the coefficients are somewhat low, it seems reasonable to conclude that the statistically significant coefficients demonstrate tendencies toward association that are psychologically meaningful for the groups employed.

Number of Designs: The number of designs constructed showed a significant negative association with: the Mill Hill Vocabulary raw score, the Progressive Matrices raw score, and the DDT total control index; and a significant positive association with the DDT differential index, i.e. a positive

TABLE XXI. Extent of Relation Between Continuous Mosaic Scoring Categories and Other Tests

Spearman Rank Correlation Coefficients

Category	No. of Designs	% Ang.	% Cir.	% Mix.	% Chro.	No. of Colours
Mill Hill Vocabulary	-.33***	+.13	-.01	-.04	+.10	-.06
Progress. Matrices	-.35***	+.15*	-.17*	-.07	+.14	-.12
Mazes Distract.	+.15*	-.28***	+.30***	+.10	-.17*	+.07
DDT Control	-.22**	+.21**	-.10	-.06	+.27***	-.09
DDT Differ.	+.21**	-.46***	+.46***	+.09	-.23**	+.23**
Mean Tapping	-.13	+.36***	-.31***	-.12	+.11	-.05
TAT Hostil.	-.07	+.32***	-.19**	-.12	+.08	-.05
TAT Guilt	-.03	+.16*	-.03	-.13	+.10	-.04
TAT Organiz.	-.13	+.24**	-.10	-.10	+.18*	-.15*

* = <.05
** = <.01
*** = <.001

Chance probability of obtaining 17 statistics significant at .01 from 54 calculated statistics = <.001

TABLE XXIIa. Extent of Relation Between Discrete Mosaic Scoring Categories and Other Tests

Contingency Coefficients and P Values

Category	Mazes Distract.	DDT Differen.	Mean Tapping	TAT Hostility	TAT Guilt
Shape Symmetry	(-).17* df=1	(-).29*** df=2	(+).09 df=2	(+).07 df=2	(+).01 df=1
Colour Symmetry	(-).18* df=1	(-).28*** df=2	(+).01 df=2	(+).13 df=2	(+).03 df=1
Concrete -ness	(-).29*** df=1	(-).37*** df=2	(+).30*** df=2	(+).25** df=2	(+).04 df=1
Complete -ness	(-).10 df=1	(-).32*** df=2	(+).08 df=2	(+).13 df=2	(+).01 df=1
Comple- xity	(-).06 df=1	(-).25** df=2	(+).14 df=2	(+).11 df=2	(+).10 df=1
Horizon. Localiz.	(-).24** df=2	(-).33*** df=4	(+).12 df=4	(+).24* df=4	(+).13 df=2
Vertical Localiz.	(-).25** df=2	(-).36*** df=4	(+).16 df=4	(+).24* df=4	(+).16 df=2

* = <.05
** = <.01
*** = <.001

Upper limit for the contingency coefficient for: 2 x 2 table = .707; 3 x 3 table = .816

Chance probability of obtaining 25 statistics (Tables XXIIa, XXIIb and XXIIc) significant at .01 from 75 calculated = <.001

TABLE XXIIb. Extent of Relation Between Discrete Mosaic Scoring Categories and Other Tests

Contingency Coefficients and P Values

Category	Mill Hill Vocabul.	Progress. Matrices	DDT Control	TAT Organizat.
Shape Symmetry	(+).25** df=2	(+).30*** df=2	(+).29*** df=2	(+).20** df=1
Colour Symmetry	(+).20* df=2	(+).21* df=2	(+).20* df=2	(+).16* df=1
Concrete -ness	(+).08 df=2	(+).12 df=2	(+).10 df=2	(+).02 df=1
Complete -ness	(+).26** df=2	(+).35*** df=2	(+).28*** df=2	(+).23** df=1
Comple- xity	(+).22** df=2	(+).37*** df=2	(+).27*** df=2	(+).18* df=1
Horizon. Localiz.	(+).16 df=4	(+).23* df=4	(+).15 df=4	(+).12 df=2
Vertical Localiz.	(+).15 df=4	(+).10 df=4	(+).18 df=4	(+).17 df=2

* = <.05
** = <.01
*** = <.001

Upper limit for the contingency coefficient for: 2 x 2 table = .707; 3 x 3 table = .816

Chance probability of obtaining 25 statistics (Tables XXIIa, XXIIb and XXIIc) significant at .01 from 75 calculated statistics = <.001

TABLE XXIIc. Extent of Relation Between Discrete Mosaic Scoring Categories and Other Tests

Contingency Coefficients and P Values

Tests	Mosaic Categories: Shape Liked	Shape Disliked
DDT Differential	(+).43*** df=4	(-).29** df=4
DDT Control	(+).06 df=2	(-).02 df=2
Mean Tapping	(+).24* df=4	(-).14 df=4
TAT Hostility	(+).13 df=2	(-).09 df=2
TAT Guilt	(+).10 df=1	(-).03 df=1
TAT Organization	(+).14 df=2	(-).19* df=2

* = <.05
** = <.01
*** = <.001

Upper limit for the contingency coefficient for:
2 x 2 table = .707; 3 x 3 table = .816

Chance probability of obtaining 25 statistics (Tables XXIIa, XXIIb and XXIIc) significant at .01 from 75 calculated statistics = <.001

index with more than one design. The positive relationship with the Mazes distraction effect was possibly significant.

Percent Angular: The percentage of angular form used revealed a significant positive association with: DDT total control index, the mean tapping score, the TAT hostility rating, and the TAT rating of organization; and a significant negative association with: the Mazes distraction effect and the DDT differential index, i.e. a negative index with a high percentage of angular form. The positive relationships with the Progressive Matrices and the TAT guilt rating were possibly significant.

Percent Circular: The percentage of circular form used showed a significant positive association with: the Mazes distraction effect and the DDT differential index; and a significant negative association with: the mean tapping score and the TAT rating of hostility. The negative relationship with the Progressive Matrices was possibly significant.

Percent Mixed: The percentage of mixed form used failed to show any significant association with the other tests, though the negative relationship with the mean tapping score and the TAT ratings of hostility and guilt approached significance ($P = >.05$).

Percent Chromatic Colour: The percentage of chromatic colour employed showed a significant positive association with the DDT total control index, and a significant negative association with the DDT differential index. The negative

relationship with the Mazes distraction effect and the positive relationship with the TAT rating of organization were possibly significant.

Number of Colours: The number of colours employed revealed a significant positive association with the DDT differential index, and a negative relationship with the TAT organization rating which was possibly significant.

Shape Symmetry: The level of shape symmetry attained showed a significant positive relationship with: Mill Hill Vocabulary, Progressive Matrices, DDT control index, and the TAT rating of organization; and, a significant negative relationship with the DDT differential index. The negative association with the Mazes distraction effect was possibly significant.

Colour Symmetry: The level of colour symmetry achieved showed association with the same variables, and in the same direction, as did the level of shape symmetry but at a reduced level of statistical significance. The negative association with the DDT differential index reached the .01 level, but the positive association with: Mill Hill Vocabulary, Progressive Matrices, DDT total control index, and TAT rating of organization was only $< .05$.

Concreteness: The construction of a concrete design correlated positively with the mean tapping score and the TAT rating of hostility, and negatively with the Mazes distraction effect and the DDT differential index.

Completeness: The level of completeness attained showed somewhat stronger association with: Mill Hill Vocabulary, Progressive Matrices, DDT total control, and TAT organization than had the level of shape symmetry. The significant negative association with the DDT differential index was also slightly stronger.

Complexity: The complexity of the Mosaic showed a significant positive relationship with: Mill Hill Vocabulary, Progressive Matrices, DDT total control index, and possibly the TAT organization. Complexity also correlated negatively with the DDT differential index.

Horizontal Localization: The tendency to place the design in either the right or left section of the tray showed a significant negative association with the Mazes distraction effect and the DDT differential index. The positive relationship with TAT hostility and Progressive Matrices was possibly significant.

Vertical Localization: The tendency to place the design in either the upper or lower section of the tray also showed a significant negative association with Mazes distraction effect and the DDT differential index. The positive relationship with TAT hostility was possibly significant.

Shape Preference: Owing to the low test - retest reliability of shape preference, the association between shape liked and disliked and only six other variables was investigated. Shape liked showed a significant positive

association, and shape disliked a significant negative association, with the DDT differential index, i.e. a positive index with a preference for circular or mixed shapes and a dislike of the angular. The positive relationship between shape liked and mean tapping score, and the negative relationship between shape disliked and TAT organization were possibly significant.

The two clusters of mosaic scoring categories, which were tentatively extracted by examination of the patterns of inter-relationship between the categories, appear to be supported by their patterns of association with the other tests. Comparison of the mosaic categories, possibly reflecting cognitive functioning (number of designs, number of colours, shape and colour symmetry, completeness, complexity and localization), with scores from the other tests which are supposedly related to the same variable (Mill Hill Vocabulary, Progressive Matrices, DDT total control index, TAT organization), revealed a moderate degree of interrelationship. Of the 32 coefficients, 65.6 percent showed a degree of association significant at the .05 level of confidence, 43.7 percent at the .01 level, and 25 percent at .001. These same mosaic categories, when compared with scores from the other tests which are supposedly indicative of the orectic aspects of personality (Mazes distraction effect, DDT differential index, mean tapping score, and TAT hostility and guilt), revealed considerably less rela-

tionship. Of the 40 coefficients, 37.5 percent showed a degree of association significant at the .05 level of confidence, 25 percent at the .01 level, and only 12.5 percent at .001.

In contrast, the mosaic categories possibly reflecting orectic aspects (percentage of form used, percent chromatic colour employed, and concreteness) showed a moderate degree of interrelationship with the more orectic tests, and considerably less with the cognitive. In comparison with the orectic tests, 60 percent of the 25 coefficients revealed a degree of association significant at the .05 level of confidence, 52 percent at the .01 level, and 40 percent at .001, whereas, in comparison with the cognitive tests, only 30 percent of the 20 coefficients showed a degree of association significant at the .05 level of confidence, 15 percent at the .01 level, and 5 percent at .001.

It was obvious that there was overlap between the two clusters of mosaic scoring categories, partially a function of their crude method of extraction and partially due to both cognitive and orectic variables being associated with diagnosis, e.g. percentage of form employed relating to both clusters. In an attempt to clarify the position of one of the most crucial mosaic categories, the percentage of angular form used, an investigation of the relationship between percentage angular and 10 cognitive categories, both from the mosaic and from the other tests, was made.

It was hoped that by controlling diagnosis and chronicity, this relationship could be clarified.

Table XXIII summarizes the comparisons of the 10 cognitive categories for the 15 highest and 15 lowest percentage angular in the acute paranoids.

Table XXIII.

Although the difference between the two groups in terms of the percentage of angular form used was highly significant ($P = < .001$), no significant differences were found for any of the 10 cognitive categories. From these results it would appear that the percentage of angular form used is much more closely related to the orectic variables than to factors relating to cognitive functioning.

ii) Association Between Mosaic and Shakow Ratings

On completion of the study it was realized that the Shakow ratings of co-operation were not differentiating the groups, and that the concept of co-operation probably entered into categories of the Behaviour Rating Scale. Not only were the classes of co-operation employed rather gross, the experimental population as a whole appeared reasonably homogeneous in terms of this variable. The distribution was badly skewed in the direction of minimal co-operation, for only 29.4 percent of the population were rated in classes A and B, whereas 70.6 percent fell

TABLE XXIII. Relationships Between Percent Angular (Orectic) and Control or Organization (Cognitive) Variables

Significance of Differences Between the 15 Higher and 15 Lower Percent Angular, Paranoid I

Category	Statistic
Percent Angular	U (0.5) **
No. of Designs	U (90) *
Shape Symmetry	Fisher exact probability *
Colour Symmetry	Fisher exact probability *
Concreteness	Fisher exact probability *
Completeness	Fisher exact probability *
Complexity	Fisher exact probability *
Mill Hill Vocabulary	U (95.5) *
Progressive Matrices	U (82.5) *
DDT Control Index	U (95) *
TAT Organization	Fisher exact probability *

* = >.10
** = <.001

in classes C and D. The results of the comparisons of the diagnostic x chronicity groups, summarized in Table XXIV,

Table XXIV

confirmed the inability of the scale to differentiate the groups. In the light of these findings, the association between the mosaic scoring categories and the Shakow ratings was not investigated.

iii) Associations Between Mosaic and Behaviour Ratings

The results of the tests of association between mosaic scoring categories and items from the Behaviour Rating Scale are summarized in Tables XXVa and XXVb.

Tables XXVa and XXVb

Fourteen of the 48 contingency coefficients computed were significant at the .001 level of confidence. The chance probability of obtaining these results was $< .001$. Another 5 coefficients were possibly significant ($P = < .01$). The significant coefficients were of the same magnitude as those between the mosaic and the other tests.

Number of Designs: The number of designs constructed showed significant positive relationships with scattered attention and possibly with distractibility and fragmented thought.

Percent Angular: The percentage of angular form used revealed a significant positive association with: poise,

TABLE XXIV. Comparisons of Shakow Ratings in Diagnostic x Chronicity Groups

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization, II=>3 years

Comparisons	X^2	df	P
PI vs PII	1.17	1	>.20
CI vs CII	1.31	1	>.20
HI vs HII	0.36	1	>.50
PI vs CI	2.77	1	>.05
PI vs HI	1.15	1	>.20
CI vs HI	0.36	1	>.50
PII vs CII	0.31	1	>.50
PII vs HII	0.09	1	>.70
CII vs HII	1.31	1	>.20

TABLE XXVa. Extent of Relation Between Mosaic Scoring Categories and Items from Behaviour Rating Scale

Contingency Coefficients and P Values

Category	Poise	Hostility	Defensiveness
No. of Designs	(-).15 df=2	(-).18 df=2	(-).22 df=2
Percent Angular	(+).35*** df=2	(+).37*** df=2	(+).32*** df=2
Percent Circular	(-).28*** df=2	(-).27** df=2	(-).33*** df=2
Percent Mixed	(-).12 df=2	(-).25** df=2	(-).06 df=2
Percent Chromatic	(+).18 df=2	(+).07 df=2	(+).09 df=2
Complete -ness	(+).12 df=1	(+).19 df=1	(+).23*** df=1
Horizontal Localization	(+).20 df=2	(+).18 df=2	(+).16 df=2
Vertical Localization	(+).29*** df=2	(+).18 df=2	(+).14 df=2

** = <.01
*** = <.001

Upper limits for the contingency coefficient for: 2 x 2 table = .707; 3 x 3 table = .816

Chance probability of obtaining 15 statistics (Tables XXVa and XXVb) significant at .001 from 48 calculated = <.001

TABLE XXVb. Extent of Relation Between Mosaic Scoring Categories and Items from Behaviour Rtaing Scale

Contingency Coefficients and P Values

Category	Scattered	Distract.	Fragment.
No. of Designs	(+).28*** df=2	(+).25** df=2	(+).27** df=2
Percent Angular	(-).24** df=2	(-).28*** df=2	(-).28*** df=2
Percent Circular	(+).14 df=2	(+).11 df=2	(+).20 df=2
Percent Mixed	(+).13 df=2	(+).21 df=2	(+).13 df=2
Percent Chromatic	(+).12 df=2	(+).27*** df=2	(+).14 df=2
Complete -ness	(-).17 df=1	(-).21** df=1	(-).25*** df=1
Horizontal Localization	(-).28*** df=2	(-).19 df=2	(-).14 df=2
Vertical Localization	(-).30*** df=2	(-).13 df=2	(-).09 df=2

** = <.01
*** = <.001

Upper limit for the contingency coefficient for: 2 x 2 table = .707; 3 x 3 table = .816

Chance probability of obtaining 15 statistics (Tables XXVa and XXVb) significant at .001 from the 48 calculated = <.001

Hostility and defensiveness; and significant negative assocation with: distractibility and fragmented thought. The negative relationship with scattered attention was possibly significant.

Percent Circular: The percentage of circular form employed showed a significant negative relationship with poise and defensiveness. The negative association with hostility was possibly significant.

Percent Mixed: The percentage of mixed form employed revealed a negative relationship with hostility which was possibly significant.

Percent Chromatic Colour: The percentage of chromatic colour employed showed a significant positive association with distractibility.

Completeness: The level of completeness achieved revealed a significant positive relationship with defensiveness, and a significant negative relationship with fragmented thought. The negative association with distractibility was possibly significant.

Horizontal Localization: The tendency to place the design in either the right or left section of the tray was correlated negatively with scattered attention.

Vertical Localization: The tendency to place the design in either the upper or lower section of the tray revealed a significant positive association with poise, and a significant negative association with scattered attention.

iv) Behaviour Rating Scale:
Diagnostic and Chronicity Comparisons.

k-Sample Analyses

The results of the chi square tests for k samples of the 25 categories which revealed frequencies large enough to be evaluated are presented in Tables XXVIa and XXVIb.

Tables XXVIa and XXVIb.

Although the sample values for each category were different, only 11 categories revealed significant ($P = < .001$) sample differences, and 4 were suggestive of significance ($P = < .01$). The differences in the remaining 10 categories appeared to represent merely chance variations. It seemed justifiable, therefore, to test the significance of the difference between any two of the samples for only the 15 categories which were acceptable statistically.

Chronicity

The results of the comparisons of the chronicity groups for each of the 15 Behaviour Rating Scale categories are summarized in Table XXVIIa.

Table XXVIIa

Of the 45 comparisons computed only one revealed a difference which was possibly significant ($P = < .01$). Since the chance probability of obtaining one comparison significant at the .01 level from the 45 computed is $> .30$, the null hypothesis of no significant differences between

TABLE XXVIa. k-Sample Chi Square Results of Behaviour Ratings and Check-List Frequencies

Category	df	X
Appearance	5	10.30
Motor Activity	5	9.03
Poise	5	63.47 **
Speech	5	18.99 *
Hostility	5	30.38 **
Defensiveness	5	32.83 **
Scattered Attention	5	21.15 **
Distractibility	5	16.91 *
Preoccupied	5	11.95
Inappropriate Affect	5	19.73 *
Spontaneous Outbursts	5	11.22
Explosively Reactive	5	9.32
Inadequate Affect	5	14.23
Flat or Bland	5	8.92

* = <.01
** = <.001

Chance probability of obtaining 11 statistics (Tables XXVIa and XXVIb) significant at .001 from 25 calculated statistics = <.001

TABLE XXVIb. k-Sample Chi Square Results of Behaviour Ratings and Check-List Frequencies

Category	df	X
Hallucinations	5	9.15
Delusions	5	31.29 **
Ideas of Reference	5	24.35 **
Fragmented Thought	5	18.80 *
Depressed	5	32.01 **
Tremor	5	13.64
Bizarre Behaviour	5	14.93
Criticism of Tests	5	37.86 **
Criticism of Examiner	5	21.94 **
Suspicion of Tests	5	64.01 **
Rationalizing Failures	5	40.12 **

* = <.01
** = <.001

Chance probability of obtaining 11 statistics (Tables XXVIa and XXVIb) significant at .001 from 25 calculated statistics = <.001

TABLE XXVIIa. Results from Comparisons of Chronicity Groups on Significant Items from the Behaviour Rating Scale (P Values and Direction of Differences)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization, II=>3 years

Category	PI vs PII	CI vs CII	HI vs HII
Poise			
Speech			
Hostility			
Defensiveness			
Scattered Attention			HI *
Distractibility			
Inappropriate Affect			
Delusions			
Ideas of Reference			
Fragmented Thought			
Depressed			
Criticism of Tests			
Criticism of Examiner			
Suspicion of Tests			
Rationalizing Failures			

* = <.01

Chance probability of obtaining 1 statistic significant at .01 from 45 calculated statistics = >.30

the chronicity groups was accepted.

Diagnosis

The results of the comparisons of the diagnostic groups for each of the categories are summarized in Table XXVIIb.

Table XXVIIb

Of the 90 comparisons computed 23 were significant at the .001 level of confidence, and another 15 were suggestive of significance (P = < .01). The chance probability of obtaining these results was <.001. Thirteen of the 15 categories showed definitely significant differences between the groups, and one was suggestive of significance. One category, ideas of reference, failed to differentiate between any of the groups at the level of significance adopted.

As was found in the diagnostic comparisons of the mosaic scoring categories, a paranoid - nonparanoid dichotomy in both acute and chronic groups was quite marked. Only one significant difference was found between acute and chronic catatonics and hebephrenic - simples.

In contrast to the acute nonparanoid subjects, the acute paranoids: were rated as being more poised and at ease; were rated as being more hostile, dominating, belligerent and assertive; were rated as being more defensive, evasive and untruthful; possibly demonstrated less scattered attention and less distractibility; made more criticisms of the tests; tended to criticize the examiner; and rationalized

TABLE XXVIIb. Results from Comparisons of Diagnostic Groups on Significant Items from the Behaviour Rating Scale (P Values and Direction of Differences)

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization, II=>3 years

Category	PI vs CI	PI vs HI	CI vs HI	PII vs CII	PII vs HII	CII vs HII
Poise	PI**	PI**		PII**	PII*	
Speech				PII*		
Hostility	PI**	PI**		PII**	PII**	
Defensiveness	PI**	PI**				
Scattered Atten.	CI*	HI*				
Distractibility	CI*	HI*				
Inapprop. Affect					HII*	
Delusions		PI*		PII**	PII*	
Ideas of Reference						
Frag. Thought	CI*	HI**				
Depressed	CI**		CI**			
Critic. Tests	PI**	PI**		PII**	PII**	
Critic. Examiner	PI*	PI*		PII**	PII**	
Suspic. Tests		PI*		PII**	PII**	
Ration. Failures	PI**	PI**		PII*	PII*	

* = <.01
** = <.001

Chance probability of obtaining 23 statistics significant at .001 from 90 calculated statistics = <.001

their failures by blaming lack of education, physical defects, etc. The paranoids exhibited less fragmented thought than the hebephrenic - simples, and possibly less than the catatonics. In addition, there was a suggestion that the paranoids related their delusions and were suspicious of the tests in comparison with the hebephrenic - simples. The acute catatonics were definitely more depressed than either the acute paranoids or the hebephrenic - simples.

In contrast to the chronic nonparanoid subjects, the chronic paranoids: were rated as being more poised; were rated as being more hostile; were suspicious of the tests, and criticized both them and the examiner; and tended to rationalize their failures. The paranoids related their delusions more than the catatonics, and possibly more than the hebephrenic - simples. In addition, the paranoids were possibly more talkative and fluent than the catatonics, and they exhibited more appropriate affect than the hebephrenic - simples. No differences were found between the chronic catatonics and hebephrenic - simples.

As was found in the mosaic scoring category comparisons, the Behaviour Rating Scale categories which possibly reflect orectic aspects of personality, especially the expression of hostility or aggressiveness, differentiated both the acute and chronic groups, whereas categories, possibly reflecting cognitive processes, which differentiated the acute groups (attention, thought) failed to differentiate among chronic

groups. In terms of cognitive functioning, as rated on the Behaviour Scale, there appears to have been little differentiation between the chronic diagnostic groups.

C. Discussion of Results.

i) Associations Between Mosaic and Other Tests.

The results of the correlation matrix of the mosaic scoring categories and the scores derived from the other tests lend strong support to the interpretive hypotheses presented previously. As was expected, there is a reasonably clear bifurcation in the categories; those scores which seem to reflect cognitive functioning, and those which appear to relate to affective aspects of personality.

Number of Designs: The relatively high negative correlation between the number of designs constructed and the Mill Hill Vocabulary and Progressive Matrices raw scores suggests that diminution of attention to external stimuli, which probably determines the construction of multiple designs, may also contribute to inferior performance on the intellectual measures. It seems quite conceivable that the inability to attend to the task and to plan ahead which apparently resulted in motor perseveration in terms of multiple, simple designs, could also seriously impair Vocabulary and Matrices behaviour. Indeed, it would appear profitable to analyze these tests on the basis of perseveration of response. In other words, it is argued that impair-

ment in intellectual processes is reflected, not only in the Vocabulary and Matrices raw scores but also in the construction of multiple designs.

It is interesting to note the suggestive positive association between the number of designs and the distraction effect on the Mazes. Foulds (39, 40, 44) has demonstrated that it is intropunitive subjects, i.e. dysthymics and melancholics who exhibit marked speeding up under distraction. He argued that this improved performance was due to "deflection of attention" from painful, self-depreciating preoccupation to the test situation. In other words, Foulds adapted the Porteus Mazes to test the hypothesis that retardation is due to divided attention, as has been argued in this thesis. It is maintained that the possible association between number of designs and the distraction effect is further evidence in support of this diminution of attention hypothesis.

The associations found between the number of designs and the differential and control indices of the Differential Diagnostic Technique are also consistent with the attention formulation. The negative relationship with the control index is another indication of the dependence of this mosaic scoring category on undivided attention to external reality. Breen (9, 10), North (126, 127), and McCallum (113) found a strong association between severity of emotional disturbance (i.e. ranging from normal contact with reality to the

dissociative behaviour of psychoneurotics and ultimately to the dereistic withdrawal of schizophrenics) and perceptual - motor adequacy as measured by the DDT control index. One might argue that disruption of attention to external stimuli and the retreat from object relationships is reflected in both the disorganization or loss of control in copying the line drawings and the construction of multiple designs.

The relationship between the number of designs and the DDT differential index, the score supposedly reflecting the expression of hostility, is also consistent with the attention hypothesis. As was mentioned previously, it is argued that the direction in which hostility is expressed, i.e. extrapunitively or intropunitively, determines, to some degree, the contact the subject maintains with external reality. Whereas it was found that a few designs were associated with a high percentage of angular form and multiple designs with a high percentage of circular form, the association between number of designs and the differential index suggests that few designs are related to difficulty in copying the angular figures and multiple designs to difficulty with the circular. This is entirely consistent with the previous arguments. It is interesting to note that the DDT differential index not only relates strongly with the percentages of angular and circular form used but also with the TAT hostility rating ($C = (-).26$; $df = 4$: $P = < .01$) and the behavioural ratings of hostility ($C = (-).43$;

df = 2; P = <.001) and defensiveness (C = (-).39; df = 2; P = <.001).

The Percentage of Angular and Circular Form Used: In terms of the arguments just discussed, and in the light of Foulds' (39, 40, 44) "deflection of attention" hypothesis, the associations found between the Mazes distraction effect, the TAT rating of organization and the percentages of angular and circular form employed are strong support for the hypothesis that there may be an intimate connection between the expression of hostility and the ability to maintain contact with reality. Since Foulds has demonstrated that retardation or impairment as measured by the Mazes is modifiable (i.e. by distraction), this whole question of the relationship between distractibility and psychopathology should be thoroughly investigated on the basis of its therapeutic possibilities.

The hypothesis that the angular and circular forms are related to the expression of hostility is indirectly supported by the associations found among these forms and the DDT differential index. On the basis of the findings of Breen (9, 10), North (126, 127), Breen et al. (11), and Weininger (170) which have been reviewed, and in the light of both the diagnostic and chronicity comparisons and the relationships demonstrated between the DDT differential index and the test and behavioural ratings of hostility, it seems reasonable to conclude that the angular shapes tend to

reflect or symbolize the projection or externalization of hostility. On the basis of this evidence, one might also postulate that the curvilinear forms are associated with the internalization or introjection of such affect. However, the substantiation of this contention must remain extremely indirect and tentative until evaluated by future research. As was argued on pages 128/9 of this thesis, it is conceivable that the curvilinear forms possess connotations of femininity in its most inclusive sense. Not only do the forms possibly suggest the anatomical structures of the female (e.g. breasts) but also many female qualities common in this culture, i.e. grace, beauty, softness, passivity, submissiveness, and possibly in the extreme, intropunitiveness. It is interesting to recollect that the percentage of angular form used revealed a positive association with the TAT hostility rating (r_s = +.32; P = < .001) whereas the percentage of circular form employed revealed a negative relationship with the same score (r_s = -.19; P = < .01). The relationship between the TAT hostility and the behavioural rating of hostility was also statistically significant (C = (+).43; df = 2; P = < .001).

The suggestive association between the percentage of angular form and the TAT guilt rating, if indeed more than just a spurious chance occurrence (chance probability of obtaining one statistic significant at the .05 level from 15 calculated statistics = > .50), is somewhat of an

anomaly in terms of the present argument. Other than merely a reflection of chance fluctuations in the data, it is possible that the ratings of hostility and guilt are dependent. If guilt is expressed (i.e. rather than suppressed) as a reaction to hostility, then the fact that hostility is much more common amongst paranoids would increase their chances of obtaining high guilt scores. A proposed analysis, by Dr. G. A. Foulds, of the guilt scores given independently of any hostility rating by the subjects used in the main study, may cast more light on the validity of this argument. Two further arguments should also be considered. One might explain the association on the basis that guilt must be expressed in the form of a sentiment (i.e. an emotional disposition, feeling), whereas hostility is used rather loosely as a description of feeling or behaviour (e.g. overt attack behaviour). It is argued that the expression of guilt, therefore, requires a level of self-and-other concept which possibly cannot be attained by the relatively disintegrated nonparanoids. In other words, it is contended that the expression of sentiment (i.e guilt) is positively related with the ability to form a concept of self and others. One might also explain the higher 'guilt' scores of paranoid subjects in terms of their greater contact with the behavioural environment. As Hadfield (66) has pointed out: "...we feel guilty when we have fallen short of the standard we ourselves adopted and therefore it presupposes

recognition of such a standard." (p. 311) It is conceivable that we attribute feelings of guilt to others - as in the TAT - when they have fallen short of the standard generally adopted by our cultural or sub-cultural group.. Paranoids in closer contact with the external environment might, therefore, have a clearer recognition of these standards and therefore express more guilt on the TAT. However, these hypotheses, and the data upon which they are based, cannot be substantiated without further experimental work.

The positive association between the tapping score and the percentage of angular form used, and the negative relationship between tapping and the percentage of circular form, suggest that the use of form and the dispersion of tapping may be facets of the same process, i.e. the expression of hostility*. The tapping score has been found to relate with: the DDT differential index (C = (-).34; df = 4; P = <.001); the TAT hostility rating (C = (+).34; df = 4; P = <.001); and the behavioural rating of hostility (C = (+).27; df = 2; P = <.001).

It is argued that the dispersion of tapping is a form of expressive motor behaviour - a form of displacement of hostility rather similar to the spacious versus circumscribed psychomotor traits isolated by Allport and Vernon (1). He reported that some subjects seem consistently to make

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*Arguments concerning the association of geometric form with the expression of hostility may be found in previous sections, pages 13-23, 98/9, 115/6, 120/1, 124-133, 178-181.

expansive, spacious movements in writing, walking or gesticulating; their actions are sweeping and free. Others are characteristically constrained and circumscribed in their actions. As Wolff and Precker (179) have stated: "A person's movements are not accidental or chance-determined, but are consistent under different environmental conditions and are related to the basic motivations of the organism." (p. 458) Machover (104) has argued that vigorous, aggressive scribbling used to cover most of the page in the figure drawing test is closely related to the discharge of hostility. It is interesting that this author also reports that paranoids tend to draw large figures, and that the only other nosological group which also exhibit this tendency towards largeness are aggressive psychopaths. This association between large figures and aggression has also been noted by Levy (94). Indirectly, the results of the tapping test support the findings of Penrose and Wilson (134), who found a small-large dispersion dichotomy in the tapping of schizophrenics, and are strikingly similar to Shuey's (160) investigation of the amplitude of response using a modified Luria technique. Using an apparatus which registered manual pressure both up and down the vertical plane, Shuey found that manics with paranoidal colouring and typical paranoids gave large tracings from 3 in. to 4¾ in. from very strong pressure, whereas typical manics, typical depressives, typical catatonics, and typical simple schizophrenics exhibited small

tracings from 5/16 in. to 2½ in., the result of weak pressure. It is conceivable that dispersion, pressure, and probably speed are only three of many possible modalities in which the discharge of affect (probably hostility) could be measured. King (84) has argued that personal tempo studies (speed of tapping) "would appear to make it clear that an altered rate of tapping speed is a characteristic phenomenon to be found among patients suffering from a behaviour disorder, one which manifests itself particularly in the performance of schizophrenics." (p.126)

The Percentage of Mixed Form Used: The failure of the percentage of mixed form used to relate significantly with any of the other measures supports the hypothesis that the choice of mixed shapes is a corollary of diminished attention to external stimuli, i.e. the pieces nearest to hand were used. It seems reasonable to conclude that the use of mixed form does not reflect orectic expression, but rather is a secondary outcome of impairment in intellectual functioning.

Number of Colours and Percentage of Chromatic Colour Used:

The failure of the number of colours used to relate to any of the other measures in any definite manner (chance probability of obtaining 2 coefficients significant at .05 from the 9 calculated = $> .05$) suggests, by exclusion, that the perseveration hypothesis discussed previously is

more tenable than the hypothesis that the use of many colours has affective significance. Nevertheless, it is somewhat surprising that a greater degree of association with the "cognitive" measures (only -.15 with TAT organization) was not demonstrated.

The results of the associations between the percentage of chromatic colour used and the other tests give strong support to the view that there is no direct evidence in this study of a relationship between use of colour and affectivity. On the basis of the colour - affectivity hypothesis one would expect a significant association between percentage of chromatic colour and tapping, and between percentage of chromatic colour and TAT hostility and guilt. However, these relationships were not demonstrated. Indeed, the associations found with the Mazes distraction effect, the DDT control index, and TAT organization suggest that the perseverative explanation already presented may possess considerable validity.

Shape Preference: Although it was expected that shape preference would show a greater degree of correspondence with the measures possibly reflecting orectic functioning than was in fact found, the significant association between the DDT differential index and shape liked, and between the index and shape disliked, and the relationship between tapping and shape liked illustrate the consistency between the preference for, and use of form. The other coefficients,

though not statistically significant, were in the predicted direction.

Concreteness: The results of the contingency computations between concreteness and the other measures tend to support the hypothesis that the construction of representational designs may reflect the displacement of hostile affect. It is particularly interesting that the construction of a concrete design was associated positively with the TAT rating of hostility; the significant correlations ($P = < .01$) between concreteness and the DDT differential index and the tapping score are also consistent with the displacement argument.

The failure to demonstrate any significant association between concreteness and the categories possibly reflecting cognitive functioning seems to support Flum's (36) finding that mosaic content and level of intellectual functioning are not related. However, the negative association of concreteness with the Mazes distraction effect suggests that the construction of a representational design may be partially related to the degree of contact with the behavioural environment. Foulds (39, 40, 44) found that dysthymics speeded up on the Maze test under distraction, and argued that the distraction temporarily broke up the pattern of affective disturbance. In other words, those subjects who exhibited limited awareness or contact with the behavioural environment revealed the distraction effect

when their attention was redirected, by means of a distracting stimulus, from morbid self-preoccupation back to the external situation, i.e. the task of maze-tracing while counting. The results of the present study demonstrated that those schizophrenics (nonparanoid) who exhibited withdrawal or retardation also revealed the Maze distraction effect and constructed abstract patterns; or conversely, the paranoids, who were in relatively good contact with reality, did not reveal the distraction effect but did construct representational designs. It is concluded, therefore, that the construction of concrete designs may be partially dependent on level of contact with the behavioural environment. In other words, in order to utilize environmental elements in the designs, one may have to be in relatively good contact with external reality.

Shape and Colour Symmetry, Completeness and Complexity: The associations found between shape and colour symmetry, completeness and complexity and the other tests suggest that these categories are related to level of cognitive functioning. The relatively high positive contingency coefficients between the categories and the Mill Hill Vocabulary score, the Progressive Matrices score, the DDT control index and the TAT organization score illustrate the strong cognitive component in these mosaic scores. Conversely, these mosaic scores revealed little association with scores such as the tapping score and the TAT ratings

which, it has been argued in previous sections, may have orectic significance. The present results are quite consistent with those of Robertson (144) who found that intellectual ability was a most important variable in the attainment of symmetrical and complex patterns, and with the findings of Robertson (145, 146) that general intellectual level is related to the complexity of the design. Following Robertson's formulation, it is argued that the nonparanoids' poor symmetry, completeness and complexity was a function of cognitive impairment. In other words, the relationship between maladjustment and poor scores on these categories is indirect, and is mediated by such impairment.

It should be noted that since complexity was found to be of limited diagnostic utility and since completeness is more inclusive than either of the symmetry scores (i.e. it takes into account asymmetrical representational designs), completeness may be found to be an extremely useful measurement in future studies of intellectual impairment. Further evidence concerning its association with cognitive functioning will be given in a following section concerned with the relationship between the mosaic characteristics and items from the behaviour rating scale.

Localization: The interpretation of the placement of the pattern on the tray is still somewhat confused. Although an association between the Mazes distraction effect and both

horizontal and vertical localization, and a possible relationship between placement and Progressive Matrices have been demonstrated, associations have also been found between both localizations and the DDT differential index and TAT hostility. It may be that both cognitive and orectic variables are involved in this scoring category (i.e. level of attention to the behavioural environment and the expression of hostility), especially in the vertical localization. However, no conclusions in this regard will be presented until the results of the associations between this category and the behaviour rating items are evaluated.

ii) Associations Between the Mosaic and Behaviour Ratings.

In general, the results of the associations between the mosaic scoring categories and the behaviour rating items support the interpretive hypotheses discussed previously. However, the qualitative nature of the ratings combined with the possible danger of examiner contamination limit the extent to which generalizations can be made. Even with the adoption of a stringent level of statistical significance, it must be stressed that the nature of the data makes it exceedingly difficult to appraise the incidence of Type I and II, errors, i.e. rejection of the null hypothesis when in fact it is true, and acceptance of the hypothesis when in fact it is false.

The categories which are judged to have the most

objective, operational basis are: scattered and fragmented thought, distractibility and hostility. In rating scattered and fragmented thought and hostility, criteria quite similar to those used in scoring TAT organization and hostility were kept in mind. Distractibility was based on concrete instances of visual or auditory distraction such as a disruption of conversation or test response due to visual stimuli (seen through a window) or auditory stimuli (usually the hospital call system). The criteria employed for the remaining ratings were far less objective and verbalized, and, as a result, probably far more variable between examiners. However, the apparent consistency in the results suggests that the inter-examiner reliability may be slightly higher than was expected.

Number of Designs: The positive associations between the number of designs constructed and the incidence of scattered and fragmented thought and distractibility are strong support for the diminution of attention - perseveration explanation offered previously. The relationship with distractibility suggests that the correlation ($P = <.05$) found between the construction of multiple designs and the Mazes distraction effect was not a chance association. These coefficients also corroborate, on a clinical level, the negative associations found with the Mill Hill Vocabulary and Progressive Matrices scores.

The Percentage of Angular and Circular Form Used: The

positive associations between the percentage of angular form used and the ratings of poise, hostility and defensiveness, and the negative associations between these ratings and the percentage of circular form employed, are further strong support for the hostility hypothesis already presented. Not only do the percentages of angular and circular form used relate to measures of hostility such as the DDT differential index, the tapping score, and the TAT rating of hostility, but they also are associated with the behavioural (usually verbal) expression of such affect during the examination. In terms of the postulated relationship between the expression of hostility and the diminution of attention to external stimuli, the negative associations between the percentage of angular form used and the incidence of scattered and fragmented thought and distractibility, are most interesting. Although the contingency coefficients between these behavioural items and the percentage of circular form used were not statistically significant, all were consistently in the predicted direction. These results are extraordinarily consistent with the findings previously presented.

Percentage of Mixed Form Used; Although a significant association was demonstrated between the percentage of mixed form used and the rating of hostility, this result may merely represent chance fluctuations in the data since the probability of obtaining one coefficient significant

at the .01 level from the six which were computed is >.05. In general, the failure to demonstrate significant associations between the percentage of mixed form used and the behavioural items is consistent with the previous findings, and suggests that the use of this form is not significant diagnostically or meaningful psychologically.

Percentage of Chromatic Colour Employed: The positive relationship found between the percentage of chromatic colour used and distractibility, and the failure to demonstrate any significant association between this scoring category and any of the other behaviour scale items, are strong support for the perseveration hypothesis and further evidence against the colour - affectivity hypothesis, at least as it applies to schizophrenia. The results of this investigation suggest that the interpretation of colour in psychodiagnostic tests (e.g. the Rorschach Technique) used with schizophrenics should be reviewed and critically examined on the basis of further careful experimentation.

Completeness: The negative relationships between completeness and fragmented thought and distractibility are quite consistent with findings previously discussed.* It is most interesting that a positive association was

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*A discussion on the interpretation of completeness can be found on pages 186-187; arguments concerning distractibility are included in the section on concreteness, pages 185-186.

found between completeness and defensiveness, a result which appears to underline the truism that the defensiveness and evasive behaviour of paranoids, which is so striking clinically, is partly dependent on their relatively close contact with the behavioural environment, i.e. their relative lack of intellectual impairment.

Localization: Although not statistically significant, the contingency coefficients between localization (horizontal and vertical) and hostility and defensiveness are positive, and therefore the hypothesis* that this category may reflect orectic aspects cannot be ruled invalid entirely. However, the associations found between horizontal and vertical placement and scattered attention support the view that localization reflects impaired cognitive functioning and, therefore, casts further doubt upon the validity of any orectic explanation. In general, the results of the present study afford more support to the former hypothesis than to any explanation relating localization to affectivity. However, in the light of the somewhat inconclusive evidence, no definite conclusion can be drawn.

iii) Behaviour Rating Scale: Diagnostic and Chronicity Comparisons.

The results of the chronicity comparisons are not surprising when one considers the nature of the observations, and compares them with the mosaic test chronicity data.

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*Discussions of localization: pages 137-140; 141; 187-188.

The mosaic comparisons indicated that the main chronicity differentiation was in terms of variables apparently related to orectic functioning. Since these factors were somewhat more difficult to evaluate clinically than those reflecting cognitive functioning, it seems reasonable to conclude that clinical observations did not include the fine judgments of orectic functioning required. In this respect, the modified mosaic test was considerably more efficient. However, the judgments made, both of affective and cognitive expression, were adequate to differentiate the rather gross behaviour of the diagnostic groups.

The comparisons of the diagnostic groups not only strongly support the interpretive hypotheses presented in this investigation but, perhaps more importantly, also demonstrate the futility of pessimism concerning the diagnosis of the schizophrenias. If we employ observation which may be termed casual in comparison with a systematic psychiatric interview and using ratings of overt behaviour, the diagnostic groups, both acute and chronic, can be dichotomized into the paranoid and nonparanoid types. Had the observations been more systematic and objective, and the rating scale been more carefully standardized, the chronicity and diagnostic differentiation might have approached the same level of efficiency as the psychological measures. In other words, it is argued that the traditional descriptive nosology of schizophrenia has considerable validity, both

clinically and psychometrically, and that psychological medicine must set its taxonomic house in order by returning to the high standards of astute and perspicacious clinical observation exemplified by the Kraepelinian tradition. In such a quest, psychiatry could do no better than to marry clinical observation with the psychodiagnostic devices provided by modern clinical psychology. The fruit of such a union might throw some light into the still dark room of schizophrenia.

In terms of the specific diagnostic comparisons, it is interesting to note that the paranoids were rated as being the better integrated and organized, less distractible, and far more hostile. As was noticed in the mosaic test comparisons the items which appear to reflect cognitive processes failed in differentiating the chronic groups.

The contact which the paranoids have with external stimuli is well illustrated in their criticism of the tests and examiner, their suspicion of the tests, their relatively greater poise and defensiveness, and their tendency to rationalize their failures. The extrapunitive element in such contact is also obvious. The paranoids remain in somewhat closer contact with the external environment but at the cost of projecting their hostile affect upon it - behaviour which severely disturbs all interpersonal relationships and often necessitates removal from them. The converse intropunitive dereistic withdrawal of the non-

paranoids results in a like disturbance. In terms of the hypothesis that catatonics are probably the most intropunitive and retarded when in the acute phase, it is interesting to note that the acute catatonics were rated as being more depressed than either the acute paranoids or hebephrenic - simples.

iv) Summary of Conclusions.

The main conclusions from the comparisons among the modified mosaic test and the other psychological tests and behaviour ratings are that in a schizophrenic population:-

1. The mosaic scoring categories; number of designs, number of colours, shape and colour symmetry, completeness and complexity are strongly associated with the level of intellectual functioning.

2. The mosaic scoring categories: percentage of mixed form used and localization are probably not significant diagnostically, and the scores may be a function of cognitive impairment.

3. There is no evidence to support the hypothesis relating colour with affectivity, but rather the choice of colour may be greatly determined by the level of cognitive functioning. This latter relationship may be an artefact of the organization of pieces in the mosaic container.

4. The degree of intellectual impairment revealed by the mosaic categories may be partly a function of

diminution of attention to external stimuli.

5. The use of angular form appears to be strongly associated with the projection or externalization of hostility, i.e. an extrapunitive expression of hostility.

6. The use of curvilinear form has strong affective connotations which may be related to concepts such as passivity and intropunitiveness, though not necessarily expressed verbally in the form of guilt. Such expression may be confounded by cognitive disintegration.

7. The construction of representational designs appears to have an affective component and may represent a displacement of hostility. However, there is a strong suggestion that this category is also associated with level of attention to the behavioural environment.

8. The expression of hostility (extrapunitive or intropunitive) may greatly determine the degree of contact with external reality.

9. Characteristics of the mosaic designs appeared to possess qualities of cognitive or orectic functioning tended to have similar behavioural components.

V. The Form Association Test.

A. Introduction.

The differential selection of the geometric forms in the modified mosaic test, and the moderate degree of association found between the percentages of angular and circular form employed and measures such as the DDT differential index, the TAT hostility rating, and the behavioural ratings of hostility and defensiveness suggested that the use of the mosaic forms, in a schizophrenic population, is somehow related to the expression of hostile or aggressive affect. Although the results of the present investigation appear to give partial support to the hypotheses that the angular shapes reflect the chronic externalization of hostility, either in the form of overt aggressive, belligerent, dominating behaviour or projected in the form of persecutory delusions; and that the circular shapes reflect the lack of such outwardly directed hostile affect, possibly to the extent of internalizing such feelings in the form of stupors, depression or other self-depreciating, intropunitive tendencies, the essence of this relationship between geometric form and affective expression is far from understood. On the basis of the principle of symbolic parallelism one might postulate that the differential use of form, in a schizophrenic population, symbolizes repressed emotional reactions. In such a formulation the particular geometric shape is a

symbol essentially similar to the psychosexual symbols described by Freud (49), although possibly more inclusive so as to incorporate the concept of over-reaction or over-compensation (i.e. hostility) to passive dependency needs. However, the level of awareness at which geometric form functions as a symbol of affective expression need not be unconscious. The introspective studies of Lundholm (102) and Scheerer and Lyons (150), and various speculations concerning emotional expression in the Arts, suggest the possibility of cultural stereotypes concerning the symbolic qualities of form which do not necessarily reflect the dominant emotional needs of the holder. Various physiognomic models are also possible. An early theory of aesthetic contemplation as involving empathic kinaesthetic changes was devised by Lipps (96). He argued that flowing, graceful, uninterrupted movements give rise to judgments of pleasantness and beauty, whereas movements that are sharp, jerky or asymmetrical are disagreeable and ugly. One might postulate a developmental fusion of feeling states with aspects of the environment, i.e. specific phenomena (words, sounds, colours, geometric forms, etc.) might acquire or be associated with specific emotional states, possibly at a stage when self and not-self are not clearly differentiated. Stern (165) has argued that a person on exposing himself to an emotionally charged situation sets up a correspondence with elements of the situation and

then projects it overtly as his own expression.

Since Lundholm (102), Scheerer and Lyons (150), and Block (7) have demonstrated the usefulness of a direct, phenomenological approach to the affective connotations possessed by various aspects of the environment, a technique was developed in which subjects described what feelings, if any, were elicited by the forms of the modified mosaic test. It was postulated that, in addition to possibly symbolizing unconscious emotional reactions, the mosaic forms reflect experiential qualities that can be communicated verbally. It was hoped that such introspections might help in clarifying the processes involved in the selection of form in the modified mosaic test.

B. The Test.

The pencil and paper form association test consisted of four 8 in. x 10 in. mimeographed sheets stapled in booklet form. The booklet was divided into four sections:

(1) General instructions, including tracings of the 12 mosaic shapes grouped together according to their predominant geometric shape (i.e. angular, circular, mixed).

(2) Part One. An attempt was made, in this section, to elicit the subject's initial reactions to the forms free from any set introduced by the examiner. The subject was asked to record any feelings or impressions concerning the three groups of forms or any individual shape.

(3) Part Two. The subject was provided with a list of 30 adjectives which could be used to describe the forms. The words, most of which were used by Lundholm's (102) subjects in their descriptions of line drawings, ranged from those suggesting hostility and violence to those connoting weakness, passivity and intropunitiveness. The subjects were asked to match as many adjectives as possible with the three types of form.

(4) Part Three. Since the tracings of the mosaic forms were roughly similar to the line drawings used by Levy (93), Glatter and Hauck (58, 59), Starer (163), and Winter and Prescott (175, 176) in their investigations of sexual symbolism, the task of matching male or female Christian names to the drawings was adopted. The subjects were given six male and six female first names, and were asked to match a name with each of the 12 forms.

A copy of the form association test is included in Appendix E.

C. Scoring.

Because of the pilot nature of this investigation no elaborate scoring system was developed. The free responses in Part One were sorted independently by two judges into the three categories: concrete objects; feelings or emotions; and frank statements of aggression and passivity. The items within each of the first two categories, on which both judges agreed, were then reclassified indepen-

dently by the two judges as reflecting hostility or extrapunitiveness; intropunitiveness or passivity; or impartiality. Only items on which both judges agreed were used.

The adjectives used in Part Two were sorted independently by two judges into the three categories; hostile - aggressive - dominating - violent - strong - masculine; depressing - passive - weak - sad - gay - feminine; and neutral. Only items on which both judges agreed were employed. The scoring of Part Three consisted of a simple matching of the name with the type of form, postulating that the masculine names would be associated with the angular shapes, the feminine names with the circular, and both masculine and feminine names with the mixed.

D. The Subjects.

Unfortunately the form association test was devised on completion of the major investigation at which time it was found that the great majority of the acute subjects used in the study had been discharged. Since the task required in the form association test proved to be beyond the capabilities of the chronic patients (it also appeared to be too difficult for the few acute subjects included) the hope of using a schizophrenic population was abandoned.

Although it was realized that the use of a heterogeneous population would severely limit the interpretation of the results, circumstances prevented the systematic collection of a representative psychoneurotic or non-psychiatric

sample. In the hope that trends for future investigation could even be demonstrated in an impure sample, 30 subjects, 14 men and 16 women, consisting of 4 non-psychiatric subjects (occupational therapists); 15 psychoneurotics (2 anxiety states, 4 hysterics, 2 hypochondriacal, 3 neurotic depression, 4 unclassified); and 11 psychotics (9 paranoids, 2 manic-depressive) were used. It was impossible to match the various categories for age, sex or level of intellectual functioning.

E. General Procedure.

The subjects were examined individually by the investigator and three undergraduate women students from Bedford College, University of London. The 26 cases examined by the students were collected in the course of routine clinical testing.

F. Results.

Part One; The most frequently named concrete objects were: planets, machines, clothes, furniture, food, toys, baby equipment such as prams, cots, etc., and weapons. The contingency coefficient between the three types of form and the threefold classification of objects as extrapunitive, intropunitive and neutral was (+).40 (X^2 = 21.38, df = 4, P = < .001). In general, the angular shapes were associated with machines, toys, and weapons such as spear heads and guns, whereas the circular shapes elicited

responses such as food, clothes, toys and planets. The mixed shapes were often classified as "funny shapes" except for shape number 10 which was consistently called a baby pram.

The contingency coefficient between the three types of form and the classification of feelings was (+).66 (X^2 = 80.00, df = 4, P = <.001). A surprising number of responses were extremely indicative of aggression or passivity. The angular shapes were termed "hostile" or "violent" in five instances, whereas none of the circular shapes was so classified. The circular shapes were described as "gay", "gentle", or "passive" in 13 instances, whereas these adjectives were never applied to the angular forms. The mixed shapes were stated to be incomplete in 11 instances, and puzzling in seven. Twenty-two subjects stated a preference for the circular shapes, seven for the angular, and none for the mixed. Of those subjects stating a definite dislike of any of the shapes, 17 disliked the angular, 12 disliked the mixed, and no one disliked the circular.

Part Two: The contingency coefficient between the three types of form and the threefold classification of the adjectives was (+).48 (X^2 = 79.65, df = 4, P = <.001). In general, the angular shapes were described as neat, masculine, harsh, vigorous, powerful, abrupt, tense, ambitious and aggressive; whereas the circular shapes

were termed graceful, neat, kind, feminine, peaceful, placid, gay, gentle and quiet. The mixed shapes were associated with irregular, neat, neutral, abrupt and aggressive.

Part Three: The contingency coefficient between the three types of form and the sex of the matched Christian name was (+).29 (X^2 = 27.42, df = 2, P = <.001). The angular shapes tended to be matched with the male names, the circular with the female names, and the mixed with the male. The results of the angular and circular matchings are essentially similar to those of Starer (163) and Winter and Prescott (175, 176) who found that subjects correctly matched sex symbols (angular and circular line drawings) with the same-sex Christian names at a level significantly greater than chance.

It is possible that the results of the name-figure matchings were contaminated by the set established in the previous sections of the test, especially Part Two (i.e. the adjectives masculine and feminine were included in the list provided). However, the comparison of the chi square value found in this investigation (X^2 = 27.42) with those reported by Starer, and Winter and Prescott (111.13, 71.25; 113.17, 75.78) suggests that contamination, if present, tended to reduce the degree of contingency found. In all likelihood this reduction was a function of variables such as the heterogeneity of the sample used.

G. Discussion and Conclusions.

Although the heterogeneity of the population employed and the failure to control several possibly relevant variables introduced considerable variability into the data and limit the generalizations which can be made, the results seem to provide partial support for the thesis that geometric figures often possess connotations that are phenomenologically relevant. Confirmation of this thesis rests mainly on the following findings:

a) the subjects spontaneously and consistently matched the angular shapes with objects and feelings classified as extrapunitive or hostile, the circular shapes with objects and feelings classified as intropunitive or passive, and the mixed shapes with objects and feelings classified as impartial or neutral;

b) using a provided list of adjectives, the subjects matched the angular shapes with words classified as extrapunitive, the circular shapes with words classified as intropunitive, and the mixed shapes with words classified as either neutral or extrapunitive;

c) the subjects tended to match the angular shapes with masculine Christian names, the circular with feminine names, and the mixed with masculine. The trend in matching under the three different conditions was remarkably consistent.

It has been argued (163, 175, 176) that geometric

figures are psychosexual symbols, and that the correct matching of the symbols with same-sex names is an indirect confirmation of the existence of a culturally accepted sexual symbolism. However, the results of the spontaneous and structured associations to the forms used in this investigation suggest that the processes reflected by the forms are more inclusive than those involved in the physical expression of sexuality. It appears that the hypothesis that geometric shapes reflect the expression of hostility or aggression (i.e. extrapunitive or intropunitive) is more tenable. If the sexual role is considered as possessing elements of dominance and submission, aggression and passivity, etc. in addition to intimate physical contact, the matching of Christian name with geometric shape could be interpreted as reflecting hostile or aggressive tendencies as well as physiological sexuality. This thesis is partially supported by an examination of the most frequently given associations to each of the ten figures used by Winter and Prescott (175, 176). The angular figures elicited responses such as: pencil, bullet, gun stock, rifle, shoe and cigarette; whereas the circular shapes suggested: lips, mouth, canoe, bean, banana, hat, bowl, cup, doughnut and tire. Although these results were interpreted as giving "masculine" associations to masculine designs, and "feminine" associations to feminine designs, the hostility explanation is

equally tenable, especially concerning the associations to the angular forms. Bender (5) has argued that young children interpret angular, elongated objects as symbols of aggression rather than as phallic symbols, and that any later phallic connotations are concomitants of psychosexual development.

The results found in this investigation are strikingly similar to those found by Lundholm (102) and Scheerer and Lyons (150). Lundholm's finding that angular lines were associated with: violence, anger, pain, vigour, strength, etc. and curved lines with: slowness, grace, beauty, weakness, etc.; and Scheerer and Lyons' finding that angular lines were related to forever, massacre and stolid, whereas curved lines were matched with happy, delicate and melancholy, appear to strengthen the thesis of a relationship between geometric forms and the expression of hostility which is culturally accepted. Klein (85), in a study of active and passive physiognomic experience requiring subjects to draw lines that were angry and loving, found that anger was represented by a heavy, angular, broken line resembling a conventionalized lightning flash, whereas loving was pictured as a uniform, rounded line, often a circle or two rounded lines which touch.

The question still remains as to how the results found in the present investigation are linked to the use of form in the modified mosaic test in a schizophrenic

population. It is obvious that, because of the various methodological problems encountered in this pilot study, no definite conclusions in this respect can be offered. On the basis of the use of form by the diagnostic groups, and the association found between the angular and circular shapes and other measures which appear to reflect hostility, it seems reasonable to postulate that the schizophrenics, whether or not they can communicate their reaction verbally, share the cultural stereotype concerning the affective connotations of geometric shapes. It is possible that the use of form in the mosaic test is a reflection both of specific personality factors and of an individual in 20th Century Western society. However, owing to the disturbances in cognitive functioning and reality testing which appear to prevent the schizophrenic subjects from comprehending the task involved in the form association test, this thesis cannot be substantiated with the methods available in this pilot study.

VI. Summary and Outlook.

Since specific, subsidiary conclusions have been recorded in their appropriate sections, only the broader conclusions, and their implications for future research, will be discussed.

It is argued that the purpose of this investigation has been achieved, in that reasonably stable, objective, diagnostic "signs" have been provided which are not only highly efficient in the differentiation of the schizophrenias but are also meaningful in terms of theories of intellectual retardation and affective expression. On the basis of: the chronicity differentiation within each diagnostic group; the paranoid - nonparanoid dichotomy in both acutes and chronics; and the less precise division within the nonparanoids, there is no justification for treating schizophrenia, either clinically or experimentally, as a homogeneous disease entity. Both therapeutic and research programmes must take account of the fact that every schizophrenic is both similar to and different from other schizophrenics. The present study has made a beginning at the impartial demonstration of the similarities and differences among schizophrenics; a procedure which is the necessary and logical precursor to any more detailed investigation of the disorder.

It was shown that the mosaics of paranoid schizophrenics

Table XXVIII

tended to be better organized, and were usually constructed predominantly from angular forms, whereas the designs by the nonparanoids revealed less integration and a considerable use of circular and mixed forms. Other characteristics of the mosaics, such as the number of designs constructed, and the tendency to make representational patterns, also possessed considerable diagnostic validity. The consistency of the scoring and the retest reliability of the characteristics utilized, was found to be satisfactory for the analysis of group tendencies.

The results of the correlations among the mosaic scoring categories and the other tests and rating scales demonstrated that both cognitive and orectic aspects of personality were reflected in the mosaics. It was argued that scoring categories such as the number of designs constructed, the level of symmetry, and the degree of completeness are sensitive to intellectual impairment, and that this impairment is largely a function of a diminution of attention to external stimuli. These hypotheses should be pursued in further experimentation for there are indications that this retardation can be modified psychologically. The correlation matrices also gave strong support to the hypothesis that the choice of the forms

TABLE XXVIII. Final Descriptive Summary: Mosaic Scoring Categories for the Diagnostic x Chronicity Groups

Legend: P=Paranoid, C=Catatonic, H=Hebephrenic-Simple; I=<3 years hospitalization, II=>3 years; An=Angular, Ci=Circular, Mi=Mixed, Pe=Perfect, Ru=Rudiments, NS=No Symmetry, Co=Complete, NP=No Pattern, RS=Relatively Simple, VS=Very Simple, Le=Left, Up=Upper, NL=No Localization

Category and Statistic	PI	PII	CI	CII	HI	HII
% One Design	90	60	43	53	30	57
Mdn % Angular	71	55	28	22	27	13
Mdn % Circular	11	14	51	42	30	50
Mdn % Mixed	1	31	22	20	33	25
Mode Shape Liked	An	An	Ci	Ci	Ci	Ci
Mode Shape Disliked	Mi	Mi	An	An	An	An
Mode Shape Symmetry	Pe	Pe	Ru	NS	Ru	Ru
Mdn % Chromatic	88	88	66	76	70	77
Mdn No. Colours	3	4	5	5	5	5
Mode Colour Symmetry	Pe	Pe	Ru	Ru	Ru	NS
% Concrete	43	40	3	7	7	7
Mode Completeness	Co	Co	NP	NP	NP	NP
Mode Complexity	RS	RS	VS	VS	VS	VS
Mode Horiz. Local.	Le	Le	NL	NL	NL	NL
Mode Vert. Local.	Up	Up	NL	NL	NL	NL

used in the mosaic test is related to the expression of hostility. Considerable evidence was presented, both from the present investigation and from other studies, that the use of angular shapes reflected the externalization or projection of hostility (i.e. extrapunitive); and that the use of the circular forms was associated with some process akin to the internalization of hostility (i.e. intropunitive passivity, submission, guilt, etc.). A form association test administered to a small sample of non-psychiatric and psychiatric subjects suggested that this relationship between hostility and geometric form may be a cultural stereotype which is shared by subjects other than schizophrenics. An attempt was made to relate the expression of hostility in schizophrenia with the level of cognitive functioning, and diagnostic anomalies were tentatively explained on the basis of fluctuations in the expression of hostility and associated intellectual impairment. However, the nature of the extrapunitive - intropunitive dichotomy is still far from clear, especially the concept of intropunitiveness, and will require considerable further investigation. A combination of visual-motor and verbal techniques, especially extensions of the modified mosaic test, Differential Diagnostic Technique, TAT, and form association test, would be valuable in such experimentation.

No attempt was made in the present study to generalize

beyond the schizophrenic population used. However, the diagnostic potentialities demonstrated in this investigation, combined with the simplicity, objectivity and engaging nature of the task, suggest that the differential diagnostic efficiency of the modified mosaic test should be appraised. Further studies involving nonpsychiatric, psychoneurotic, manic depressive, and organic subjects, and longitudinal investigations of children are immediate possibilities. Owing to the negligible effect of previous test experience on mosaic performance, the technique would be especially useful in experimental designs involving retesting. However, until the instrument can be standardized on a representative normal - psychopathological population, no claim that the test is useful in clinical practice can be made.

In conclusion, it is argued that the present investigation fully corroborates the well-established observation that psychomotor behaviour is fundamentally disturbed in schizophrenia; and has demonstrated that the types of schizophrenia can be objectively identified by their characteristic psychomotor responses on the modified mosaic test. Although almost purely descriptive and classificatory in nature, such a study is a necessity if psychiatric nosology is to be clarified. Such classificatory research can act as the foundation for studies designed to determine the functions and mechanisms underlying not only the

phenomena presented in this research but, more importantly, the schizophrenias.

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APPENDIX A.

PLATE 1

Modified Mosaic Test: Complete Set in Container

Order of Colours Within each Slot (Top to Bottom):
(Shapes Numbered as in Figure 1.)

Shape 2: White, Green, Black, Red, Blue, Yellow;
1: Black, White, Blue, Red, Yellow, Green;
3: Green, Blue, White, Black, Yellow, Red;
4: White, Black, Yellow, Green, Red, Blue;

10: Red, White, Green, Black, Yellow, Blue;
11: Black, Yellow, Blue, Red, White, Green;
12: Yellow, Red, Black, Green, Blue, White;
9: Green, Blue, Yellow, Black, White, Red;

7: Green, White, Blue, Red, Black, Yellow;
5: Blue, Yellow, White, Black, Red, Green;
8: White, Blue, Yellow, Black, Green, Red;
6: Yellow, Green, Blue, White, Red, Black.

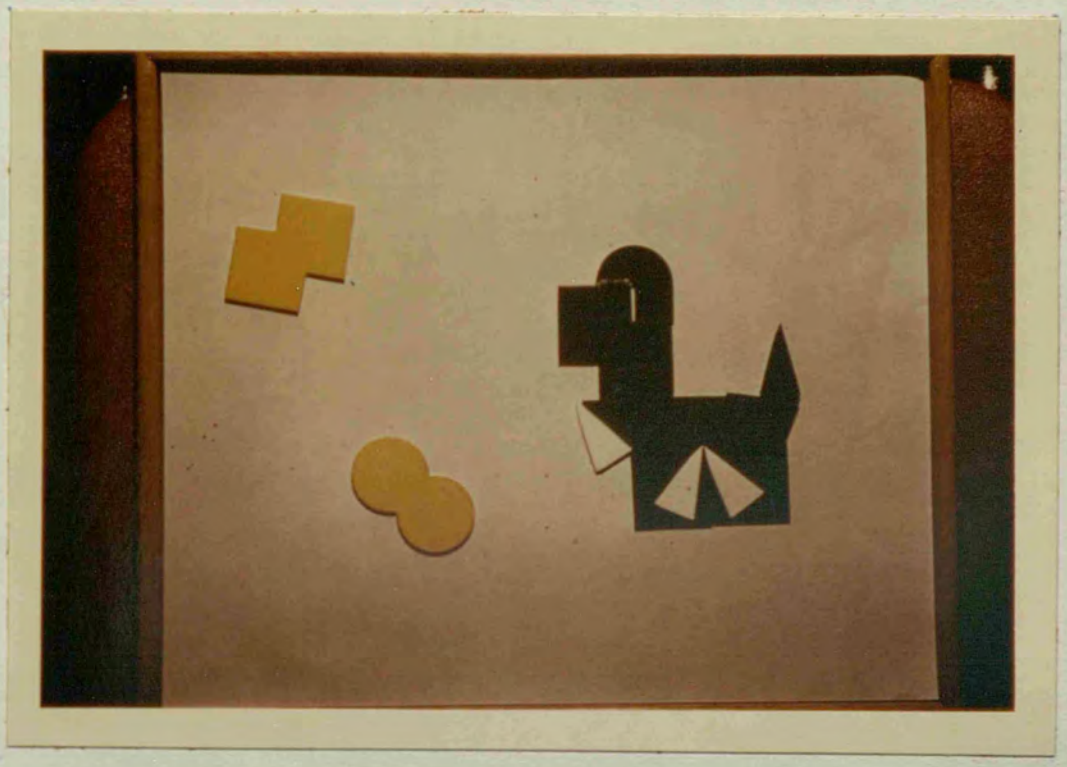


PLATE 2

Acute Paranoid Schizophrenic; Female; Age 47

Number of Designs	1
Percentage Angular Form	84
Percentage Circular Form	8
Percentage Mixed Form	8
Shape Liked	Angular
Shape Disliked	Circular
Number of Colours	3
Percentage Chromatic Colour	16
Concrete - Abstract	Dog and Bones
Shape Symmetry	Rudiments
Colour Symmetry	Rudiments
Completeness	Complete
Complexity	Complex
Horizontal Localization	Right
Vertical Localization	Lower

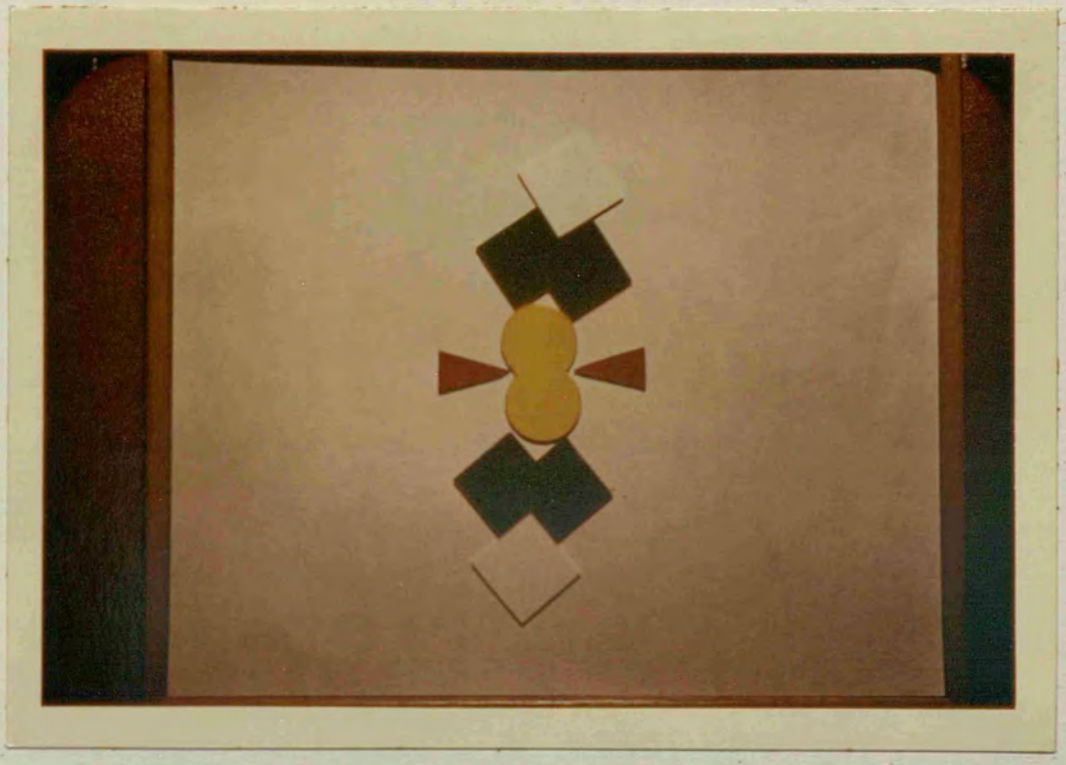


PLATE 3

Acute Paranoid Schizophrenic; Male; Age 37

Number of Designs	1
Percentage Angular Form	86
Percentage Circular Form	14
Percentage Mixed Form	0
Shape Liked	Angular
Shape Disliked	Circular
Number of Colours	4
Percentage Chromatic Colour	71
Concrete - Abstract	Window Display
Shape Symmetry	Perfect
Colour Symmetry	Perfect
Completeness	Markedly Defective
Complexity	Relatively Simple
Horizontal Localization	Left
Vertical Localization	Upper

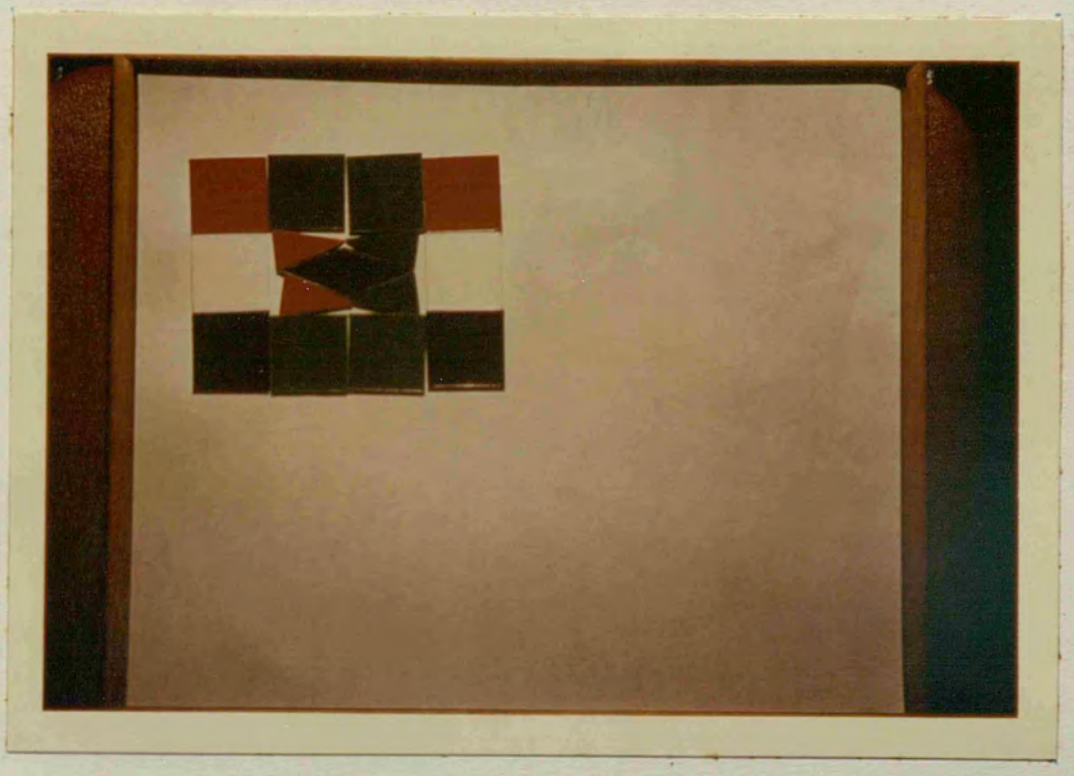


PLATE 4

Acute Paranoid Schizophrenic; Female; Age 32

Number of Designs	1
Percentage Angular Form	100
Percentage Circular Form	0
Percentage Mixed Form	0
Shape Liked	Angular
Shape Disliked	Mixed
Number of Colours	4
Percentage Chromatic Colour	87
Concrete - Abstract	Abstract
Shape Symmetry	Perfect
Colour Symmetry	Near Perfect
Completeness	Complete
Complexity	Relatively Simple
Horizontal Localization	Left
Vertical Localization	Upper

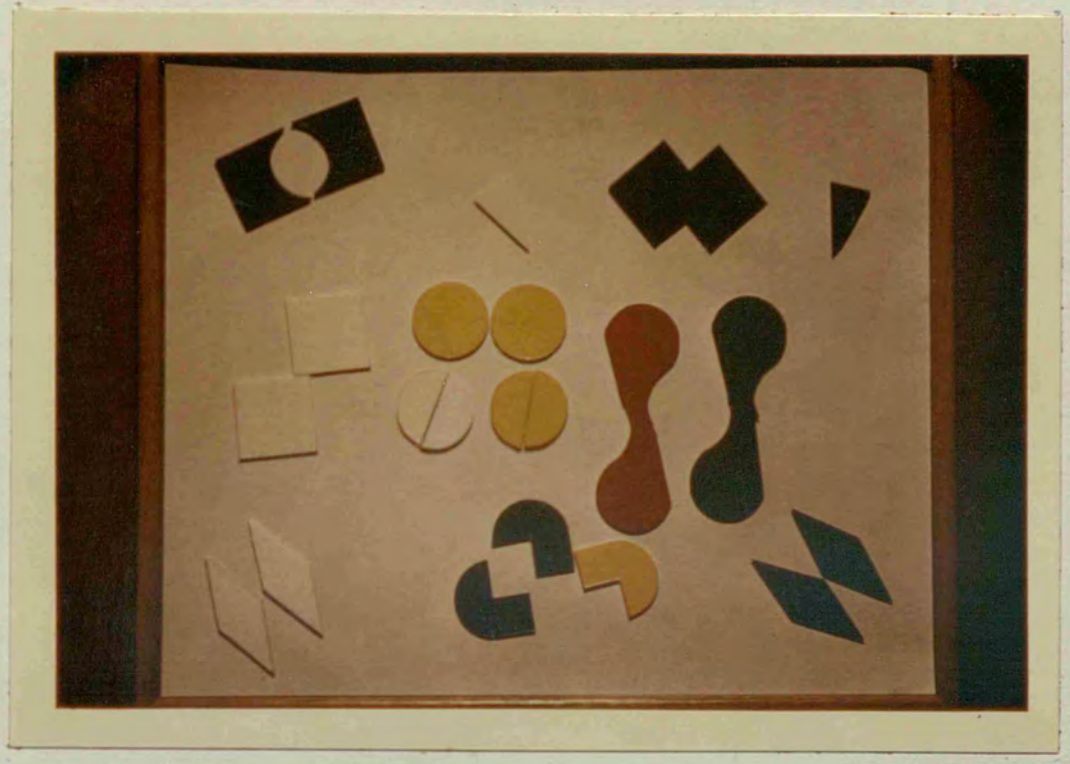


PLATE 5

Acute Paranoid Schizophrenic; Female; Age 52

Number of Designs	8
Percentage Angular Form	38
Percentage Circular Form	8
Percentage Mixed Form	54
Shape Liked	Angular
Shape Disliked	Refused
Number of Colours	6
Percentage Chromatic Colour	58
Concrete - Abstract	Toilet Articles
Shape Symmetry	Rudiments
Colour Symmetry	Rudiments
Completeness	No Discernable Pattern
Complexity	Very Simple
Horizontal Localization	No Localization
Vertical Localization	No Localization

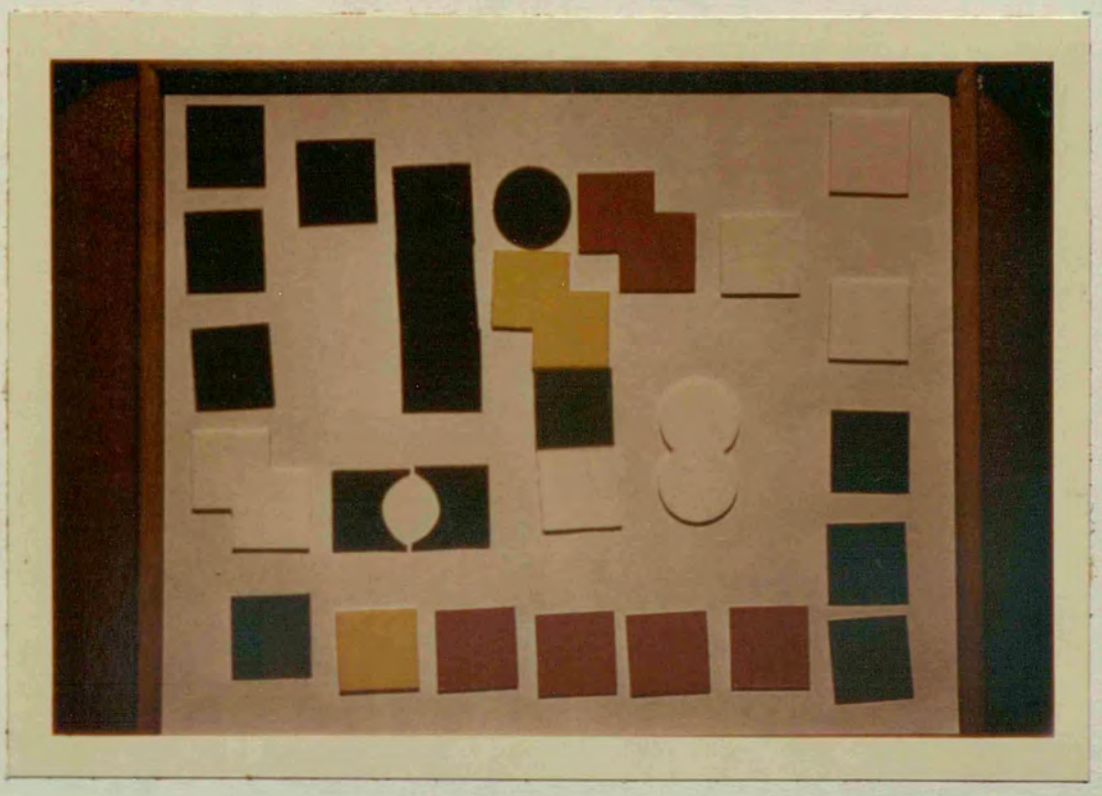


PLATE 7

Chronic Paranoid Schizophrenic; Female; Age 49

Number of Designs	1
Percentage Angular Form	86
Percentage Circular Form	7
Percentage Mixed Form	7
Shape Liked	Angular
Shape Disliked	Refused
Number of Colours	6
Percentage Chromatic Colour	61
Concrete - Abstract	Abstract
Shape Symmetry	No Symmetry
Colour Symmetry	No Symmetry
Completeness	No Discernable Pattern
Complexity	Very Simple
Horizontal Localization	Left
Vertical Localization	No Localization

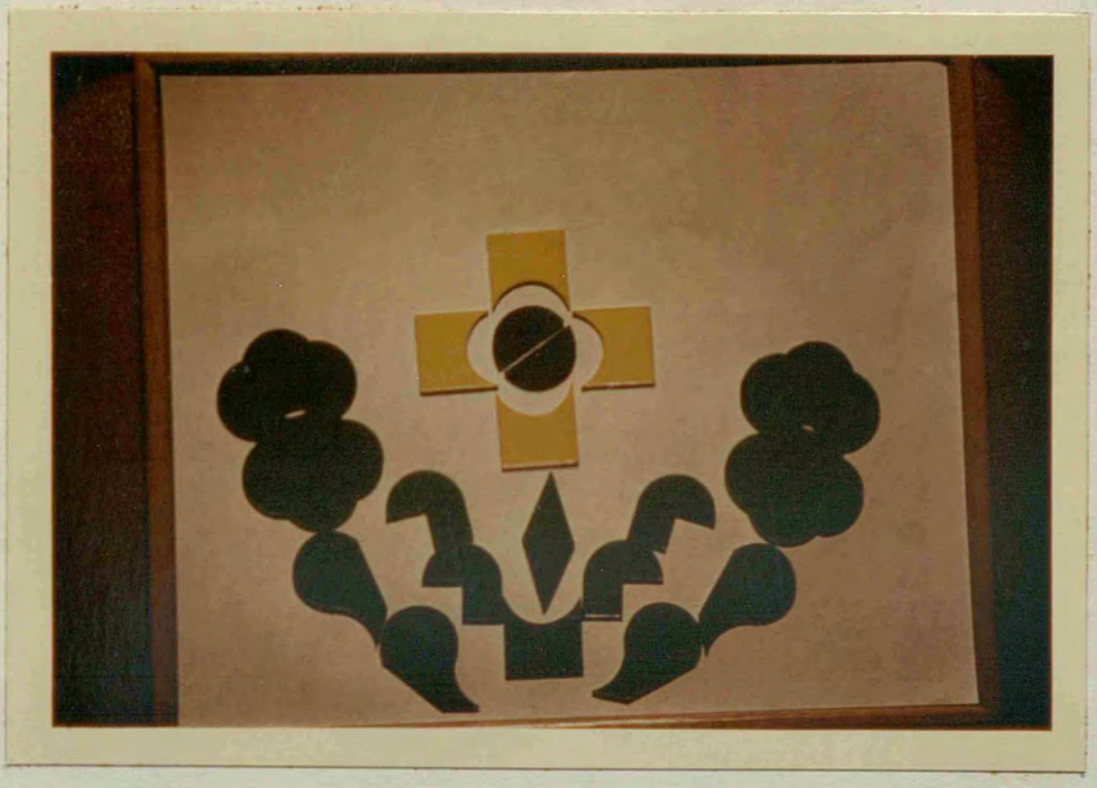


PLATE 8

Chronic Paranoid Schizophrenic; Female; Age 39

Number of Designs	1
Percentage Angular Form	5
Percentage Circular Form	27
Percentage Mixed Form	68
Shape Liked	Refused
Shape Disliked	Refused
Number of Colours	4
Percentage Chromatic Colour	91
Concrete - Abstract	Spray of Flowers
Shape Symmetry	Perfect
Colour Symmetry	Perfect
Completeness	Complete
Complexity	Complex
Horizontal Localization	No Localization
Vertical Localization	Lower

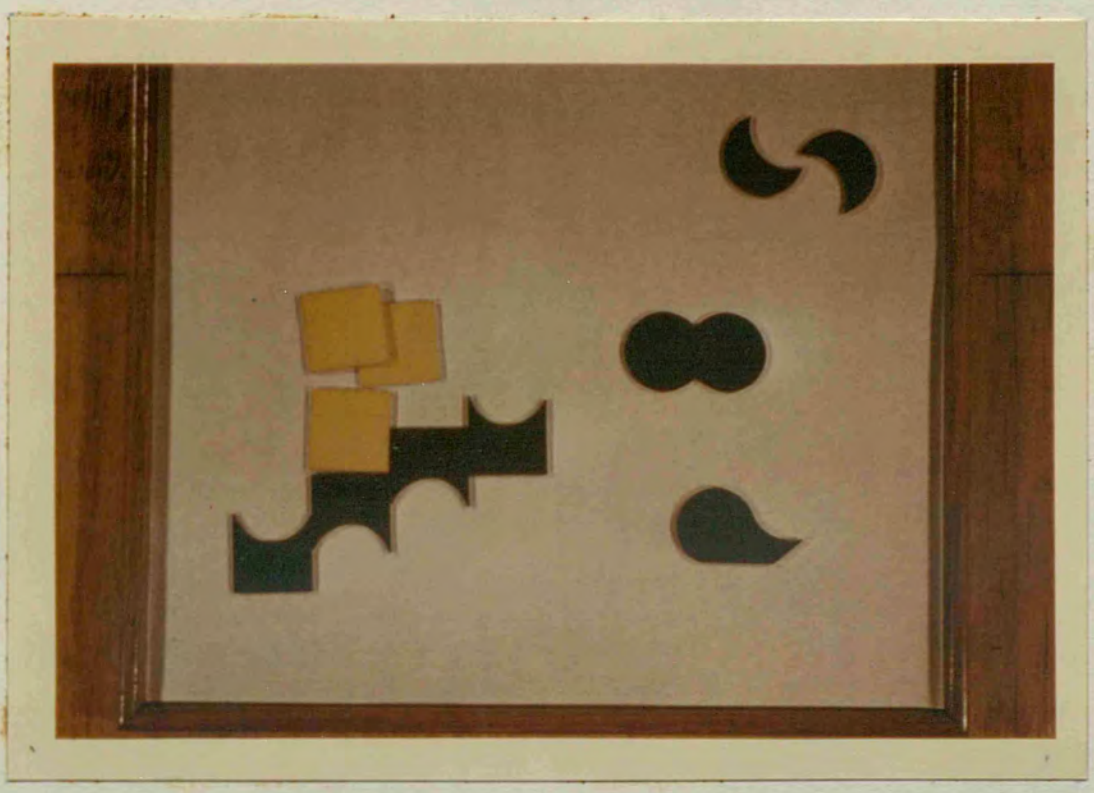


PLATE 9

Acute Catatonic Schizophrenic; Male; Age 22

Number of Designs	1
Percentage Angular Form	27
Percentage Circular Form	27
Percentage Mixed Form	46
Shape Liked	Mixed
Shape Disliked	Angular
Number of Colours	4
Percentage Chromatic Colour	54
Concrete - Abstract	Abstract
Shape Symmetry	No Symmetry
Colour Symmetry	No Symmetry
Completeness	No Discernable Pattern
Complexity	Very Simple
Horizontal Localization	Left
Vertical Localization	No Localization

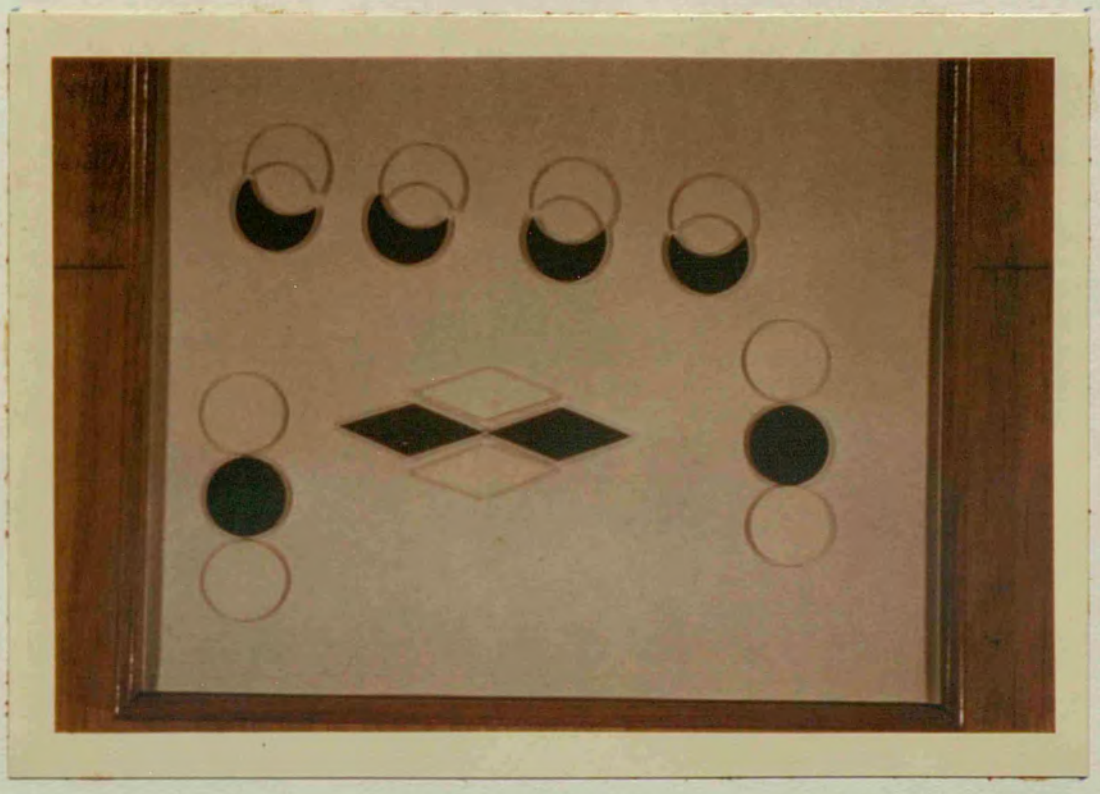


PLATE 10

Acute Catatonic Schizophrenic; Male; Age 31

Number of Designs	2
Percentage Angular Form	22
Percentage Circular Form	78
Percentage Mixed Form	0
Shape Liked	Refused
Shape Disliked	Refused
Number of Colours	2
Percentage Chromatic Colour	44
Concrete - Abstract	Abstract
Shape Symmetry	Near Perfect
Colour Symmetry	Near Perfect
Completeness	Slightly Defective
Complexity	Relatively Simple
Horizontal Localization	Left
Vertical Localization	Lower

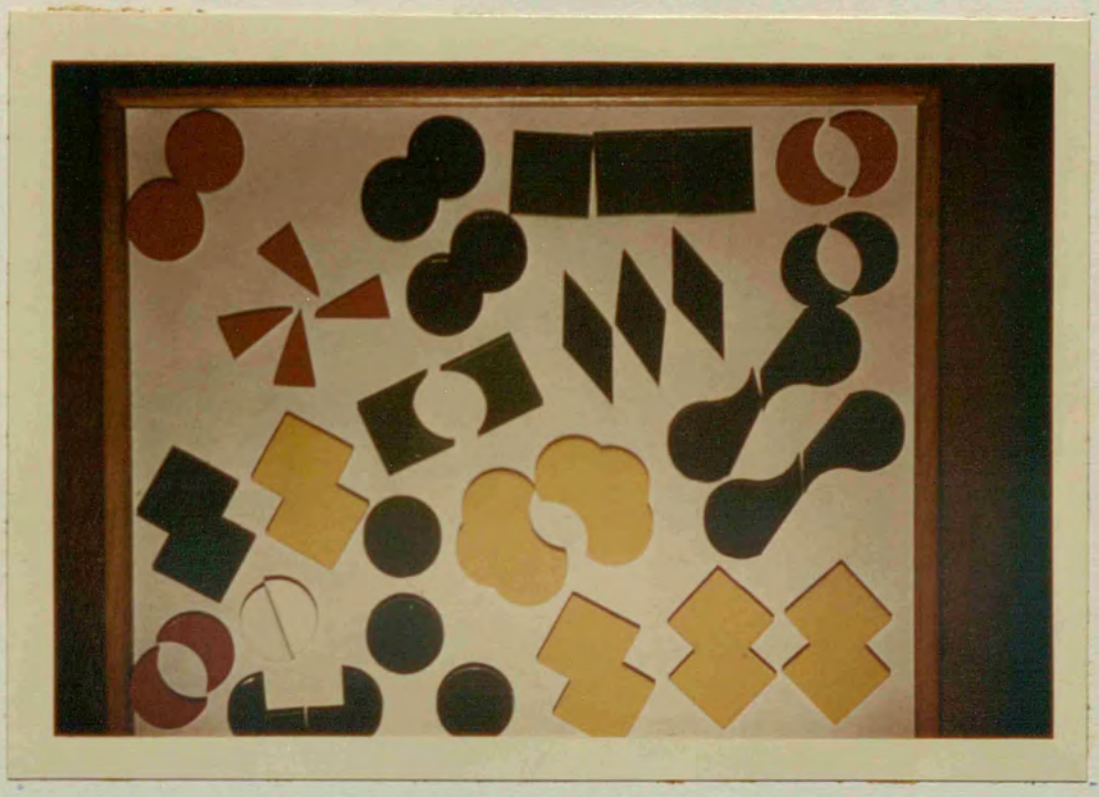


PLATE 11

Acute Catatonic Schizophrenic; Female; Age 33

Number of Designs	16
Percentage Angular Form	35
Percentage Circular Form	42
Percentage Mixed Form	23
Shape Liked	Circular
Shape Disliked	Circular
Number of Colours	6
Percentage Chromatic Colour	91
Concrete - Abstract	Abstract
Shape Symmetry	Rudiments
Colour Symmetry	Rudiments
Completeness	Markedly Defective
Complexity	Relatively Simple
Horizontal Localization	No Localization
Vertical Localization	No Localization

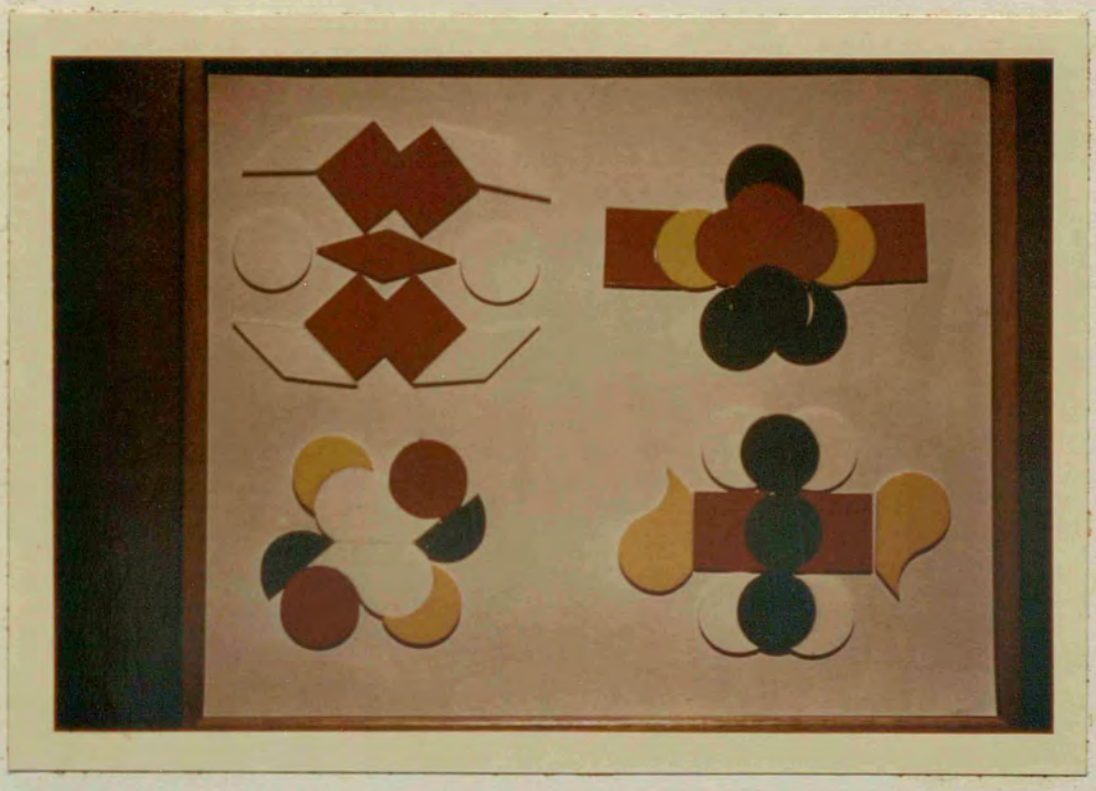


PLATE 12

Acute Catatonic Schizophrenic; Female; Age 23

Number of Designs	4
Percentage Angular Form	19
Percentage Circular Form	51
Percentage Mixed Form	30
Shape Liked	Circular
Shape Disliked	Mixed
Number of Colours	6
Percentage Chromatic Colour	62
Concrete - Abstract	Abstract
Shape Symmetry	Rudiments
Colour Symmetry	Rudiments
Completeness	Markedly Defective
Complexity	Complex
Horizontal Localization	No Localization
Vertical Localization	No Localization

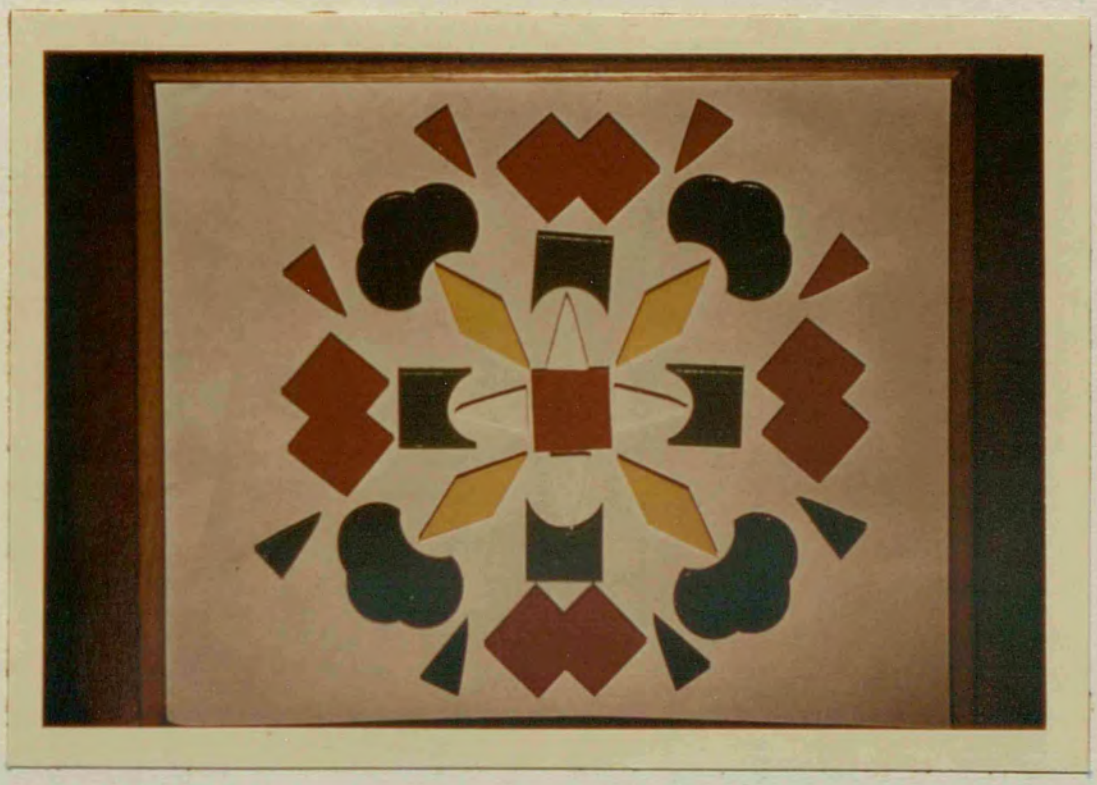


PLATE 13

Chronic Catatonic Schizophrenic; Male; Age 28

Number of Designs	1
Percentage Angular Form	72
Percentage Circular Form	14
Percentage Mixed Form	14
Shape Liked	Circular
Shape Disliked	Angular
Number of Colours	5
Percentage Chromatic Colour	86
Concrete - Abstract	Abstract
Shape Symmetry	Perfect
Colour Symmetry	Perfect
Completeness	Complete
Complexity	Complex
Horizontal Localization	No Localization
Vertical Localization	Lower

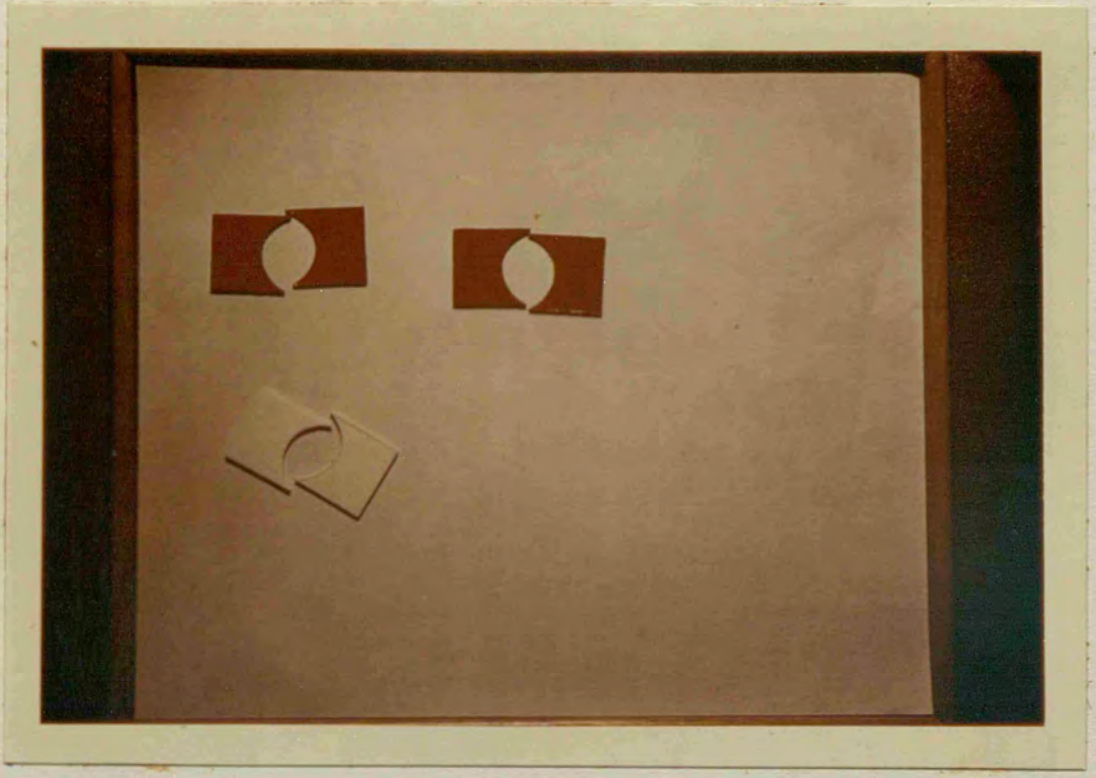


PLATE 14

Chronic Catatonic Schizophrenic; Female; Age 60

Number of Designs	3
Percentage Angular Form	0
Percentage Circular Form	0
Percentage Mixed Form	100
Shape Liked	Circular
Shape Disliked	Angular
Number of Colours	2
Percentage Chromatic Colour	67
Concrete - Abstract	Abstract
Shape Symmetry	Rudiments
Colour Symmetry	Rudiments
Completeness	Markedly Defective
Complexity	Very Simple
Horizontal Localization	Left
Vertical Localization	Upper

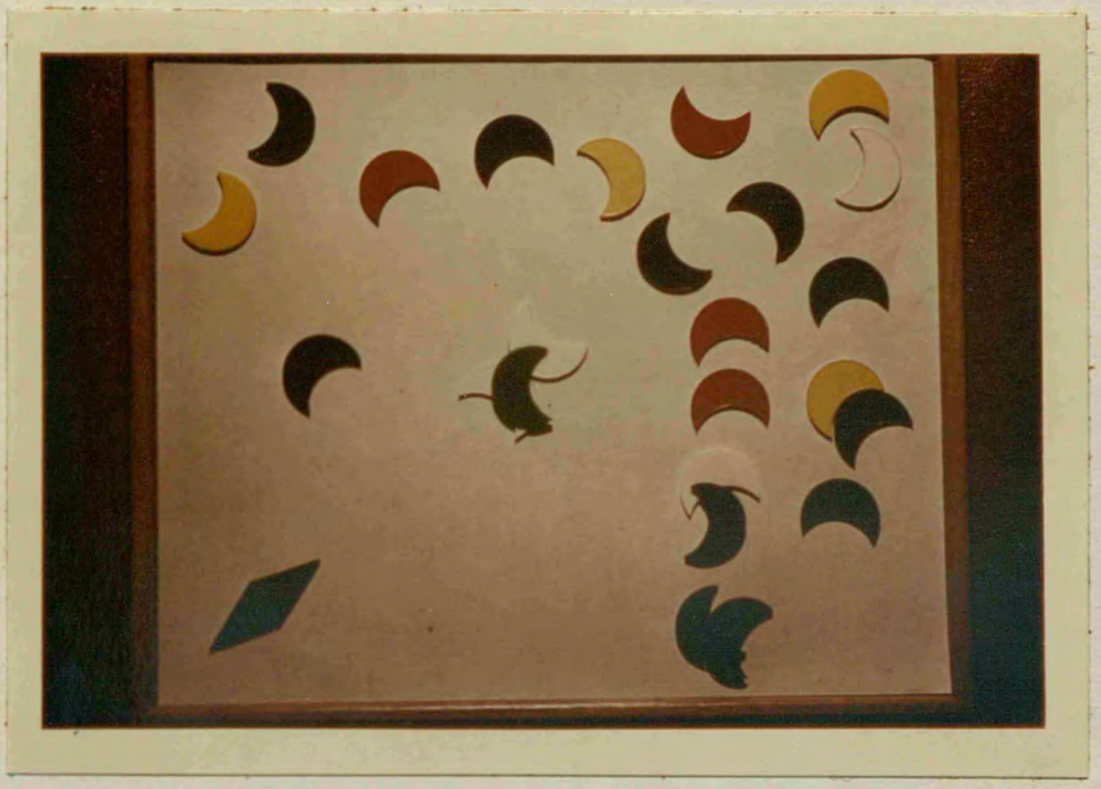


PLATE 15

Chronic Catatonic Schizophrenic; Female; Age 47

Number of Designs	1
Percentage Angular Form	4
Percentage Circular Form	96
Percentage Mixed Form	0
Shape Liked	Circular
Shape Disliked	Angular
Number of Colours	6
Percentage Chromatic Colour	68
Concrete - Abstract	Abstract
Shape Symmetry	No Symmetry
Colour Symmetry	No Symmetry
Completeness	No Discernable Pattern
Complexity	Very Simple
Horizontal Localization	Right
Vertical Localization	Upper

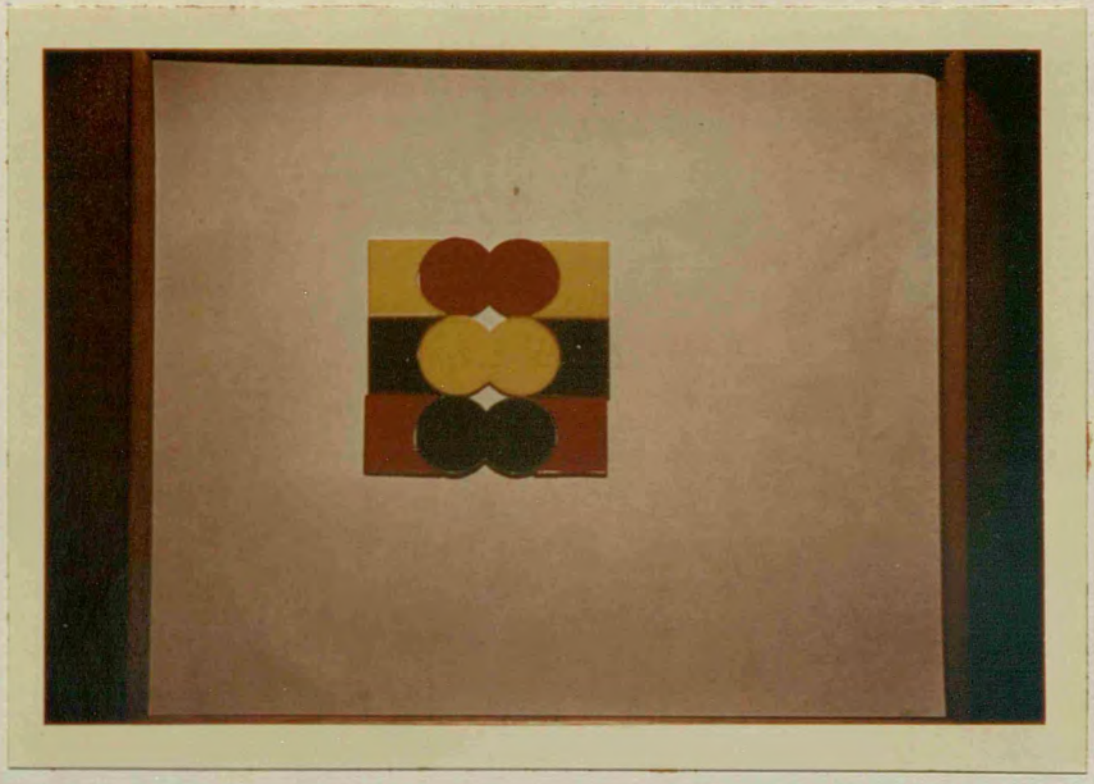


PLATE 16

Acute Simple Schizophrenic; Male; 26

Number of Designs	1
Percentage Angular Form	0
Percentage Circular Form	50
Percentage Mixed Form	50
Shape Liked	Circular
Shape Disliked	Refused
Number of Colours	3
Percentage Chromatic Colour	100
Concrete - Abstract	Lights
Shape Symmetry	Perfect
Colour Symmetry	Perfect
Completeness	Markedly Defective
Complexity	Relatively Simple
Horizontal Localization	Left
Vertical Localization	Upper

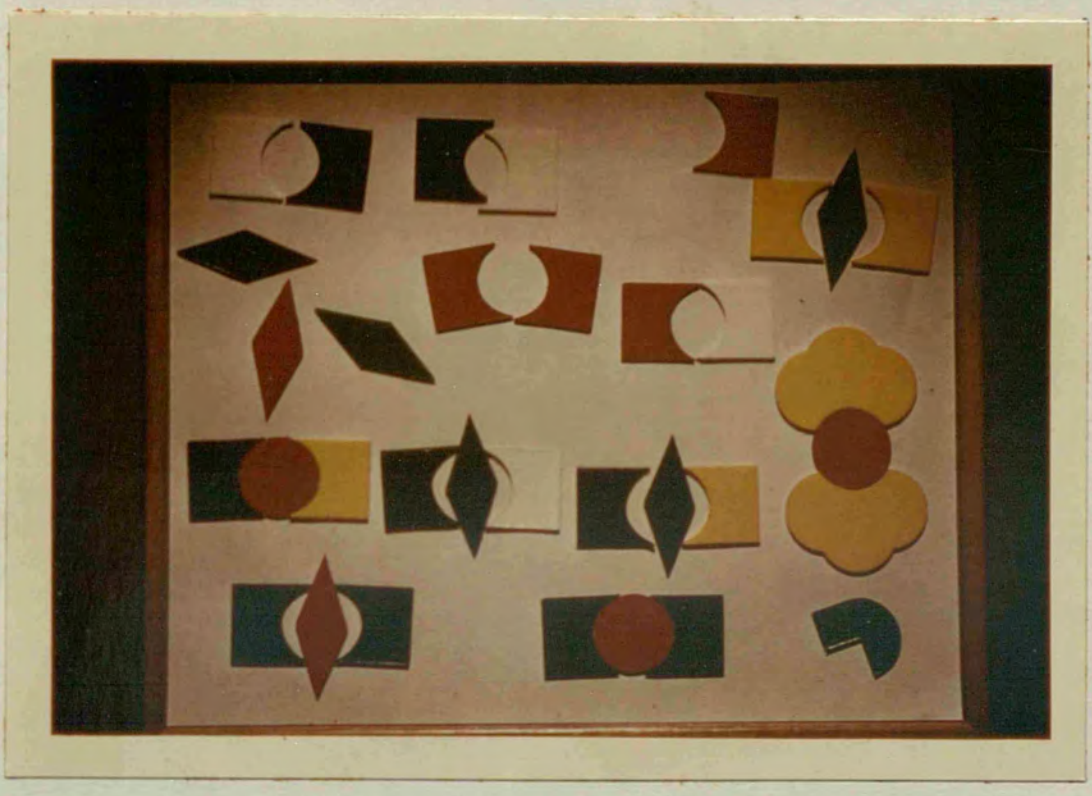


PLATE 17

Acute Hebephrenic Schizophrenic; Male; Age 17

Number of Designs	12
Percentage Angular Form	21
Percentage Circular Form	15
Percentage Mixed Form	64
Shape Liked	Mixed
Shape Disliked	Angular
Number of Colours	6
Percentage Chromatic Colour	76
Concrete - Abstract	Abstract
Shape Symmetry	Rudiments
Colour Symmetry	Rudiments
Completeness	Markedly Defective
Complexity	Relatively Simple
Horizontal Localization	No Localization
Vertical Localization	No Localization

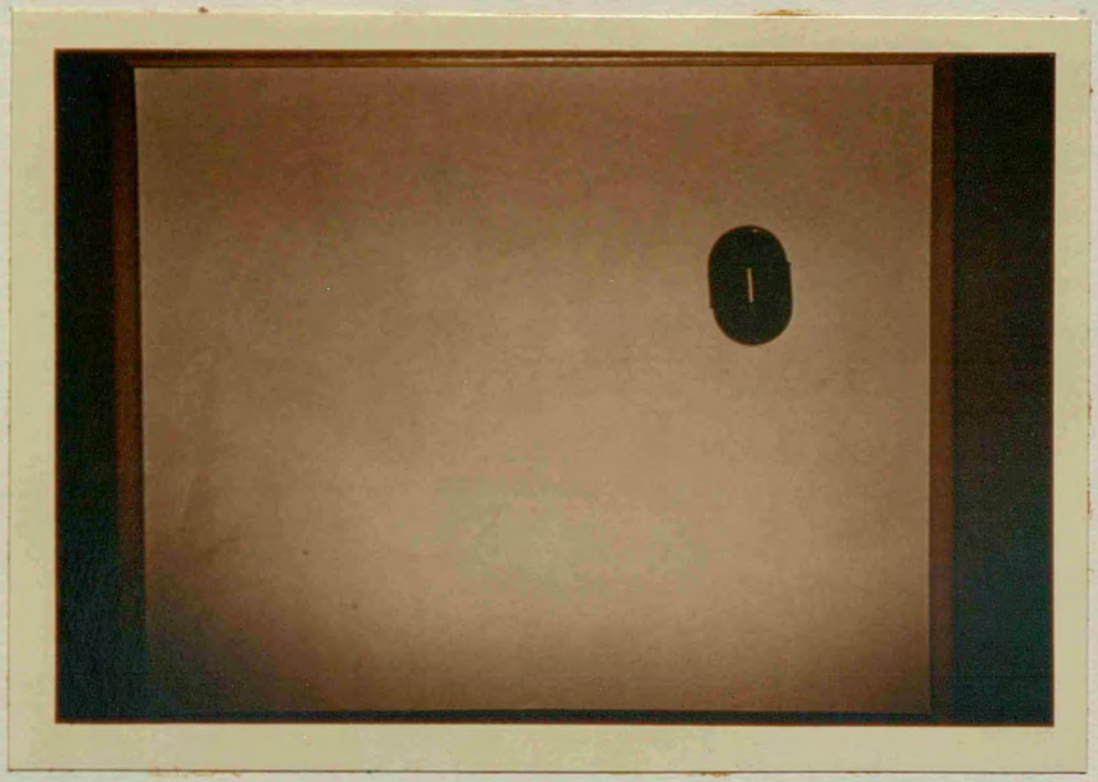


PLATE 18

Acute Hebephrenic Schizophrenic; Male; Age 17

Number of Designs	1
Percentage Angular Form	0
Percentage Circular Form	0
Percentage Mixed Form	100
Shape Liked	Circular
Shape Disliked	Angular
Number of Colours	1
Percentage Chromatic Colour	100
Concrete - Abstract	Abstract
Shape Symmetry	No Symmetry
Colour Symmetry	Perfect
Completeness	No Discernable Pattern
Complexity	Very Simple
Horizontal Localization	Right
Vertical Localization	Upper

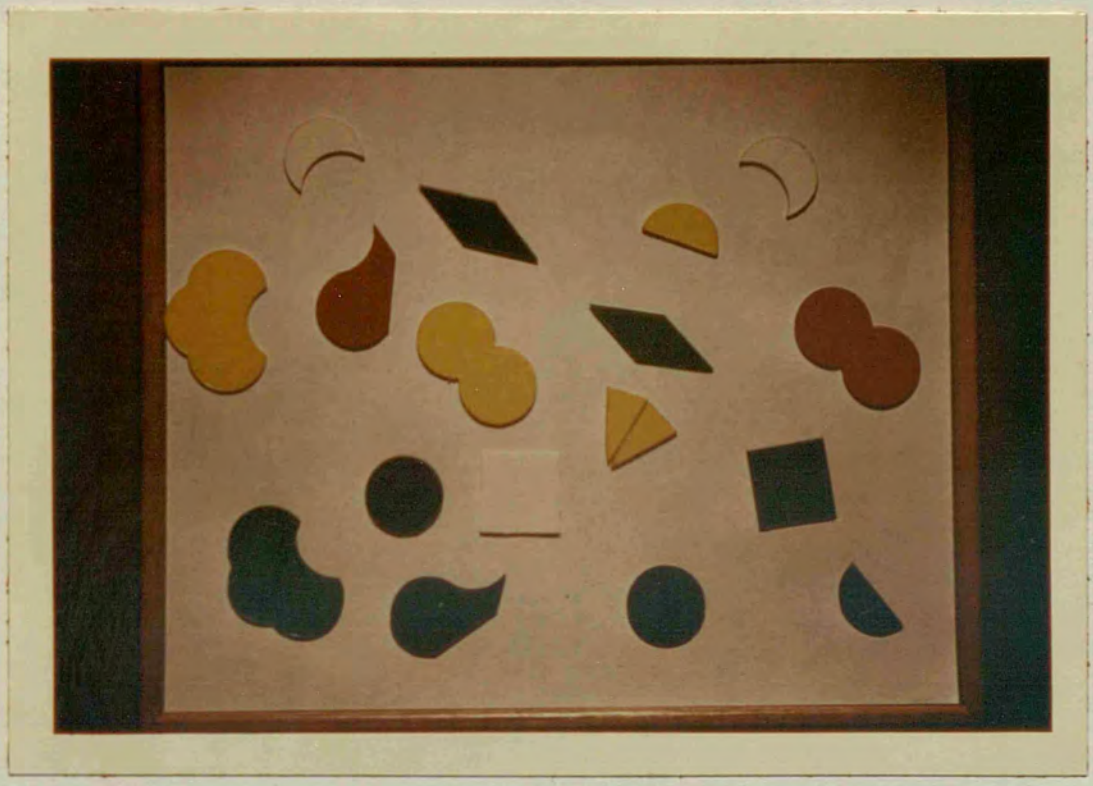


PLATE 19

Chronic Simple Schizophrenic; Male; Age 58

Number of Designs	1
Percentage Angular Form	33
Percentage Circular Form	44
Percentage Mixed Form	23
Shape Liked	Circular
Shape Disliked	Mixed
Number of Colours	5
Percentage Chromatic Colour	83
Concrete - Abstract	Abstract
Shape Symmetry	No Symmetry
Colour Symmetry	No Symmetry
Completeness	No Discernable Pattern
Complexity	Very Simple
Horizontal Localization	No Localization
Vertical Localization	No Localization

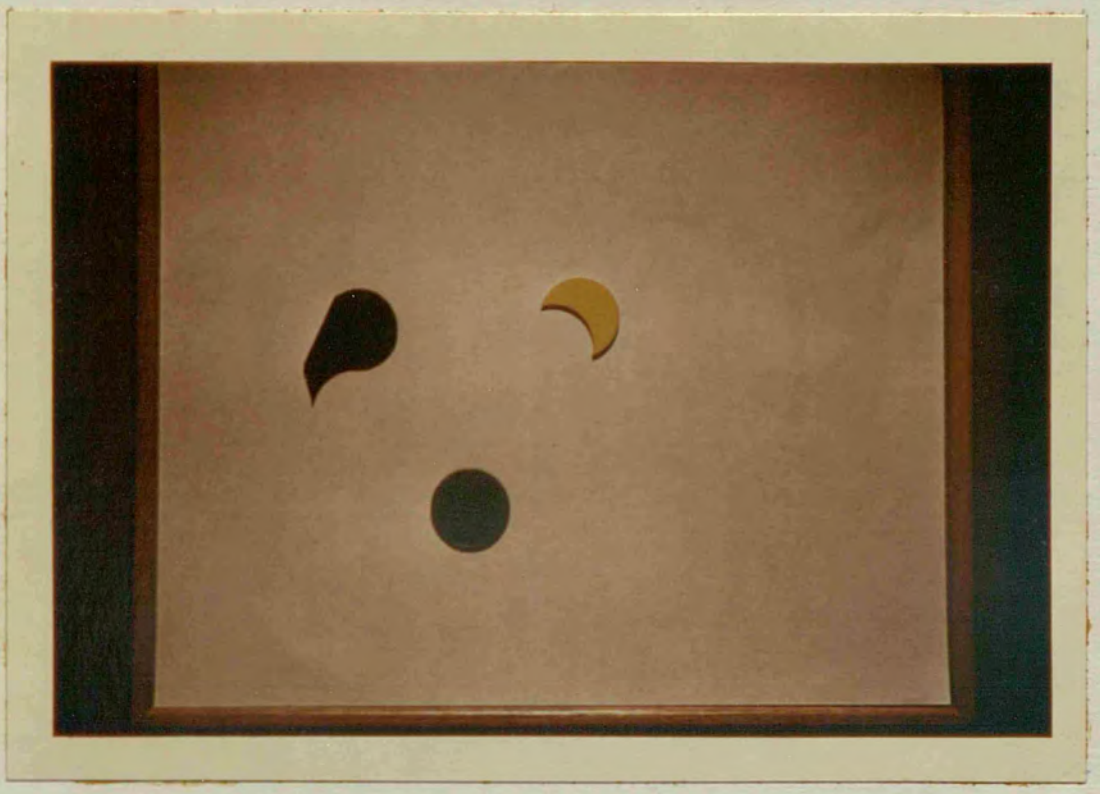


PLATE 20

Chronic Simple Schizophrenic; Female; Age 61

Number of Designs	1
Percentage Angular Form	0
Percentage Circular Form	66
Percentage Mixed Form	34
Shape Liked	Circular
Shape Disliked	Refused
Number of Colours	3
Percentage Chromatic Colour	66
Concrete - Abstract	Abstract
Shape Symmetry	No Symmetry
Colour Symmetry	No Symmetry
Completeness	No Discernable Pattern
Complexity	Very Simple
Horizontal Localization	Left
Vertical Localization	Upper

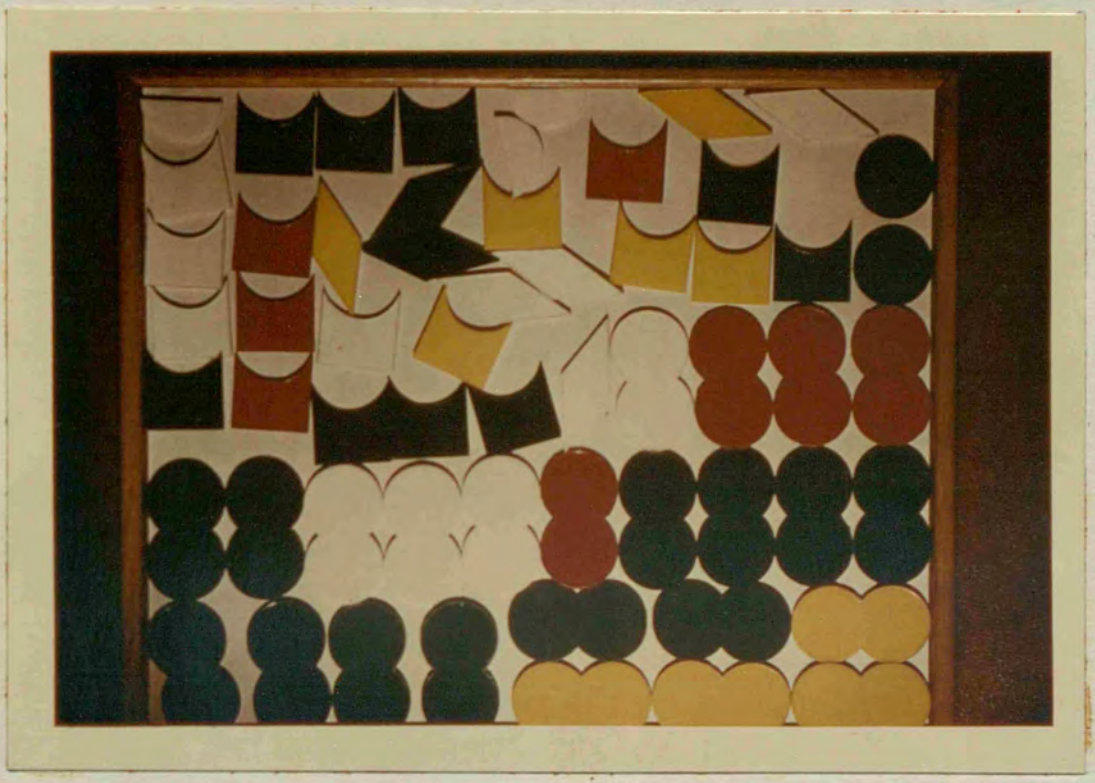


PLATE 21

Chronic Hebephrenic Schizophrenic; Female; Age 58

Number of Designs	1
Percentage Angular Form	12
Percentage Circular Form	44
Percentage Mixed Form	44
Shape Liked	Circular
Shape Disliked	Angular
Number of Colours	6
Percentage Chromatic Colour	58
Concrete - Abstract	Abstract
Shape Symmetry	Rudiments
Colour Symmetry	No Symmetry
Completeness	Markedly Defective
Complexity	Relatively Simple
Horizontal Localization	No Localization
Vertical Localization	No Localization

APPENDIX B.

DIFFERENTIAL DIAGNOSTIC TECHNIQUE SCORING CHART

H. J. Breen — S. L. North

1948

CHRONIC HOSTILITY REACTION

			T	H	P	HP	MEM
PERSONALITY RIGIDITY	Arrangement—Methodical	2					
	Constriction—Av 2 Cons 4		2	2	4	2	
	Counting	2	2	2			
	Guides	2	2		2		
	No. Rotation	1					
	No. Shift	1					
	Perseveration	2	2	2	2	2	
	Repetition	2	2		2	2	
	Retracing—Av 1 Cons 2		1		1	1	
	Style—Constricted	2					
	PR Total 42		11	6	11	7	
INTELLECTUAL CONTROL	Arrangement—Spat 3 Logical	6	3				
	Clarity	2		2	2		
	Completion	3			3		
	Harmony	3					
	Line Quality—Good	2	2	2	2	2	
	No serious Rotation	2			2		
	No Shift	2					
	IC Total		5	4	9	2	
ENERGY OUTPUT	Expansion—Av 3 Cons 6						
	Line Quality—Inconsistent	2					
	Rotation—Slight	2	2	2	2	2	
	Squeezing	4	4	4			
	Style—Expansive	6					
	EO Total		6	6	2	2	
IMPULSIVENESS	Arrangement—Confused	3					
	Destruction—Partial	3	3	3	3	3	
	Elaboration	3	3	3			
	Line Destruction	2	2	2	2	2	
	Line Quality—Poor	2					
	Overlapping	2					
	Shift	3	3	3	3	3	
	Splitting	2	2		2	2	
	IM Total 47		13	11	10	10	
DISSOCIATION	Collision	3					
	Condensation	3					
	Copying Model	3	3	3		3	
	Destruction—Total	2					
	Line Change	2	2	2			
	Reversal	3					
	Rotation—Serious—Partial	2	2	2		2	
	Rotation—Serious—Total	2	2	2		2	
	DIS Total		9	9		7	
	Control Score Total		16	10	20	9	
	Loss of Control Score Total [-5]		22	20	10	17	
	CONTROL INDEX		-6	-10	+10	-8	
	DIFFERENTIAL INDEX OF CONTROL		-20				

DIFFERENTIAL DIAGNOSTIC TECHNIQUE SCORING CHART

H. J. Breen — S. L. North

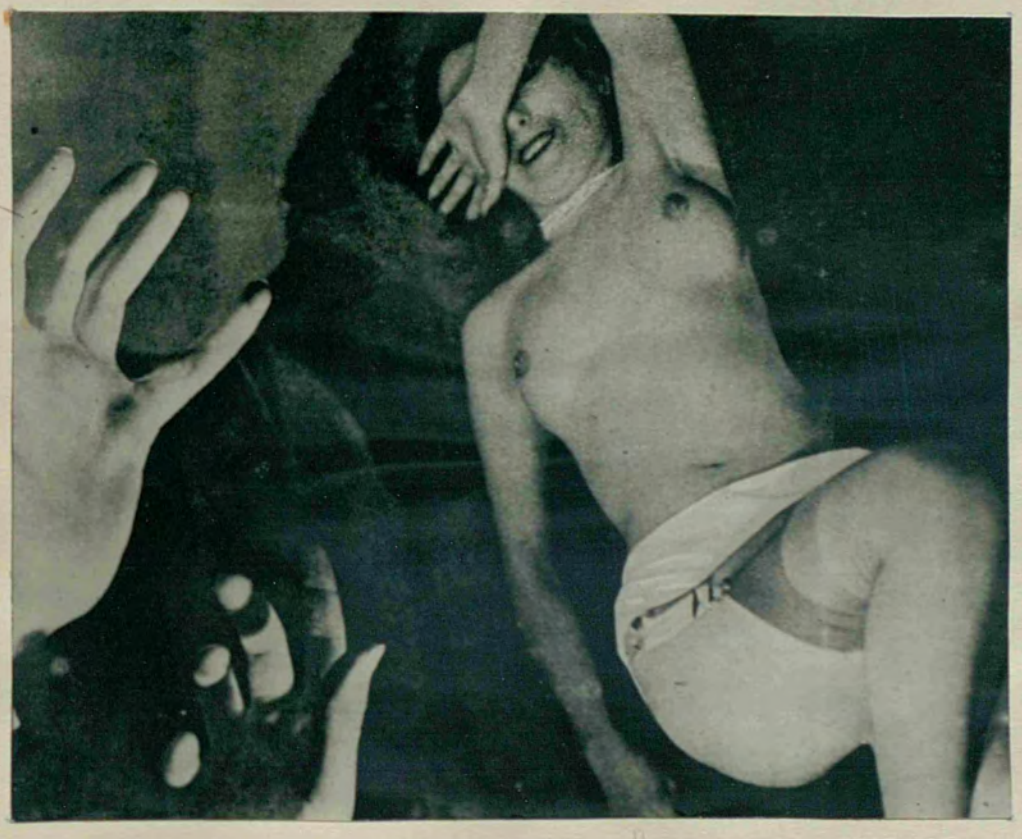
DYSTHYMIC OR EPISODIC REACTION — 1948

			T	H	P	HP	MEM
PERSONALITY RIGIDITY	Arrangement—Methodical	2					
	Constriction—Av 2 Cons 4					4	2
	Counting	2					
	Guides	2					
	No. Rotation	1					
	No. Shift	1					
	Perseveration	2	2	2	2	2	2
	Repetition	2					2
	Retracing—Av 1 Cons 2		1	2	1	1	1
	Style—Constricted	2					
	PR Total	18	3	4	3	7	7
INTELLECTUAL CONTROL	Arrangement—Spat 3 Logical	6					
	Clarity	2					
	Completion	3					
	Harmony	3					
	Line Quality—Good	2		2			
	No serious Rotation	2					
	No Shift	2		2			
	IC Total			4			
ENERGY OUTPUT	Expansion—Av 3 Cons 6			3			
	Line Quality—Inconsistent	2	2		2		2
	Rotation—Slight	2	2	2	2	2	2
	Squeezing	4					4
	Style—Expansive	6	6				
	EO Total		10	5	4	2	8
IMPULSIVENESS	Arrangement—Confused	3	3				
	Destruction—Partial	3	3			3	3
	Elaboration	3					3
	Line Destruction	2	2		2	2	2
	Line Quality—Poor	2	2			2	
	Overlapping	2	2			2	2
	Shift	3	3		3	3	3
	Splitting	2	2	2			2
	IM Total	37	17	2	5	12	15
DISSOCIATION	Collision	3					
	Condensation	3	3			3	3
	Copying Model	3					3
	Destruction—Total	2	2			2	2
	Line Change	2					2
	Reversal	3					
	Rotation—Serious—Partial	2	2	2	2	2	2
	Rotation—Serious—Total	2	2		2	2	2
	DIS Total		9	2	4	9	14
	Control Score Total		3	8	3	7	7
	Loss of Control Score Total	-19	26	4	9	21	29
	CONTROL INDEX		-23	+4	-6	-14	-22
	DIFFERENTIAL INDEX OF CONTROL			+10			

APPENDIX C.

TAT A.

TAT B.



TAT C.

APPENDIX D.

NAME: DATE:

APPEARANCE:

Unkempt. Slovenly	Rather untidy & negligent	Average tidiness	Neat. shows care	Very neat Fastidious

MOTOR ACTIVITY

Excited Agitated	Restless	Average activity	Underactive	Stuporous. Retarded.

POISE

Self-conscious Ill-at-ease	Rather self-conscious	Average manner	Fairly poised Seldom flustered	Poised At ease

SPEECH

Fluent Pours out	Spontaneous Talkative	Average fluency	Meagre. Must be prompted	Taciturn. Must be pumped.

HOSTILITY - AGGRESSIVENESS:

Hostile Aggressive. Dominating.	Very Belligerent Rather aggressive Assertive	Neutral	Rather passive Self-effacing. Tends to yield.	Very passive Very self-effacing.

DEFENSIVENESS:

Evasive Untruthful	Rather evasive Defensive	Average frankness	Rather open and frank.	Extremely frank. Little restraint.

ATTENTION:
__ Scattered
__ Easily distracted
__ Preoccupied
__ Completely withdrawn

MOOD:
__ Euphoric
__ Depressed
__ Pessimistic
__ Over optimistic

AFFECT:
__ Inappropriate (laughing, crying, grimacing, etc)
__ Spontaneous outbursts
__ Explosively reactive
__ Inadequate
__ Flat or bland

CONTENT:
__ Hallucinated
__ Relates delusions
__ Ideas of reference
__ Fragmented thought
__ Somatic delusions
__ Obsessive behaviour

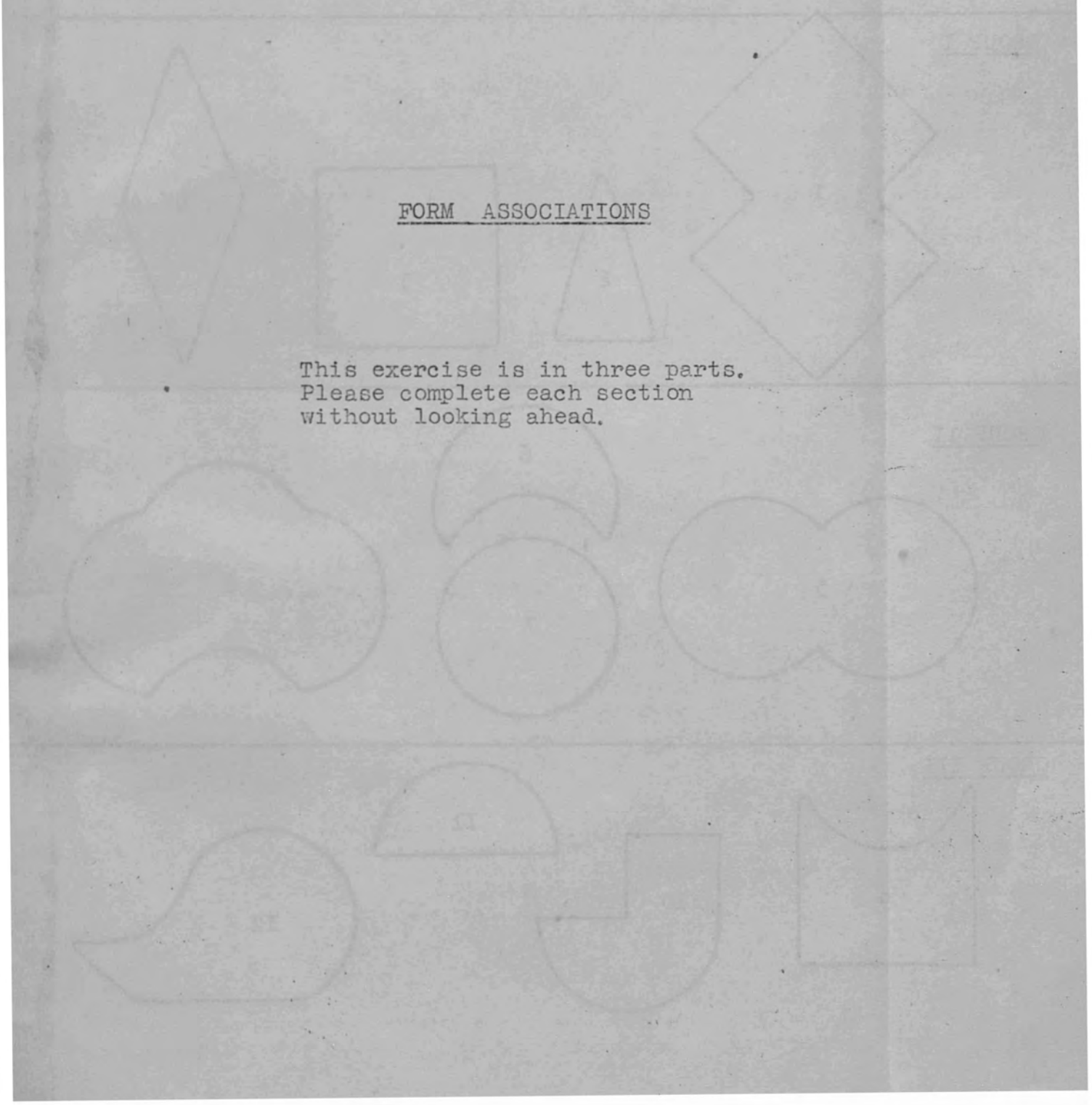
MISCELLANEOUS:
__ Noticeable tremor
__ Bizarre behaviour
__ Criticism of tests
__ Criticism of examiner, or staff.
__ Suspicion of tests (trick, etc)
__ Rationalizing failures, (education, physical defect, etc).

APPENDIX E.

Name:_____ Date:_____

FORM ASSOCIATIONS

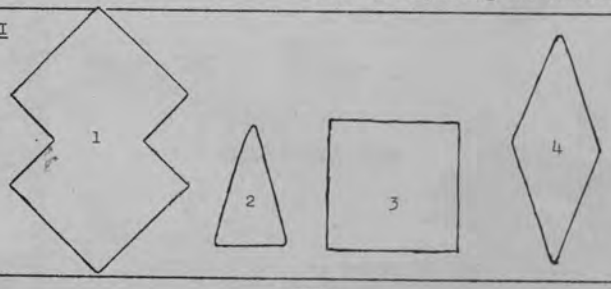
This exercise is in three parts.
Please complete each section
without looking ahead.



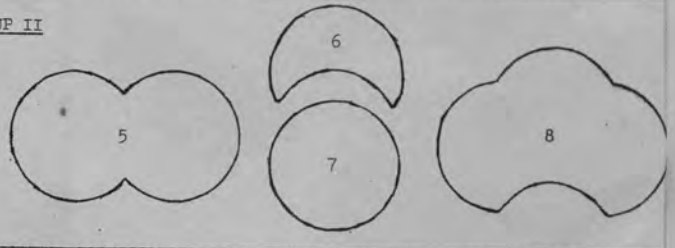
SHAPES

These are the twelve shapes with which you will be concerned in this exercise. Please notice that there are three main types: Group I angular; Group II circular; and Group III a combination of angular and circular forms. Also notice that each shape is numbered. Please refer to these numbers in completing the exercise.

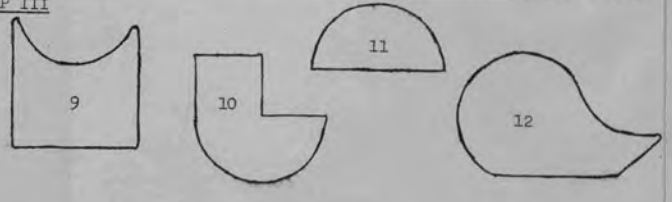
GROUP I



GROUP II



GROUP III



Part One

Instructions:

Geometric forms or shapes are not only suggestive of familiar objects but they often also symbolize or are associated with feelings or emotions. This exercise is an attempt to discover what meaning people give to various shapes.

On the opposite page are the three main types of forms: Group I, the pointed or angular; Group II, the round or circular; and Group III, a combination of circular and angular forms. Look at each group carefully and try to imagine what feelings and emotions would probably be associated with it. In general, what type of objects might each group represent? Which shape or shapes appeal to you and which do not? Why? Try to examine your feelings in regards to each of the three groups as carefully as possible, and write your answers in the space provided below.

Group I	
Group II	
Group III	

Part Two

Instructions:

Below are words descriptive of feelings and emotions. Examine the three groups of shapes again, then chose some of the words which you feel could symbolize or represent the group and write them in the space provided.

Descriptive Words:

Graceful, irregular, angry, neat, kind, hostile, sad, feminine, violent, neutral, peaceful, impatient, cruel, placid, depressing, masculine, gay, furious, passive, harsh, weak, gentle, painful, vigorous, quiet, powerful, abrupt, tense, ambitious, aggressive.

Group I	
Group II	
Group III	

Part Three

Instructions:

Often people feel that a particular name suits a shape. Please examine the twelve shapes individually and then assign one of the Christian or first names found below to each of the shapes. The same name may be used for more than one shape if necessary, but do not leave any blanks. If you feel that any of the shapes particularly represents a name not included, please write this name in the third column.

Names:

Mary, Henry, James, Elizabeth, Ruth, Paul, Monica, William, Harold, Jane, Anne, Richard.

Shape Number	First Name	Other
8		
10		
4		
1		
6		
12		
9		
2		
7		
5		
11		
3		

Ph.D. 1958. W.J. McLELLAND.

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DIFFERENTIAL HANDLING AND WEIGHT GAIN IN THE ALBINO RAT[1]

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In recent studies by Weininger (1, 2, 3), and Weininger, McClelland, and Arima (4) concerning the effects of gentling on weight gain, it was argued that the tactile stimulation which the handled animals received during gentling was the crucial variable. If such stimulation in the form of gentling leads to increased body weight, other forms of handling albino rats, employing various degrees of such stimulation, should lead to different amounts of weight gain. The present investigation is concerned with the effects of different methods of handling albino rats during early life on their later body weight.

Procedure

Animals

Fifty male albino rats (Wistar strain), 21 days old were obtained from Carworth Farms, New York. Each animal was assigned to one of five groups of ten animals each, which were matched as closely as possible for mean weight (range 33.3 to 34.0 gm.) and housed in individual 12″ × 12″ × 12″ metal living cages. All cages were located in a well-lighted room with constant temperature and free from auditory or visual disturbance.

The animals were provided *ad libitum* with a diet of Purina Fox Chow cubes and water. In addition, each animal was fed small pieces of fresh green vegetable once a week.

Apparatus

The apparatus used was a 10″ × 5″ × 3″ wooden restraining box with a wire-mesh floor one inch from the bottom and a removable tray beneath to facilitate cleaning. Five removable galvanized iron partitions, each 1″ × ½″ larger than the

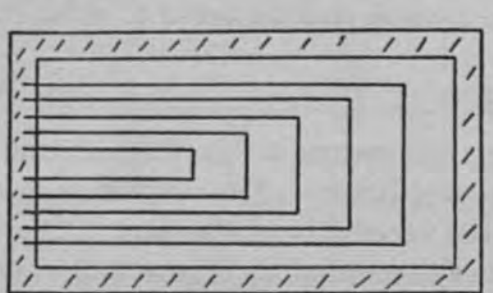

FIGURE 1. Interior of restraining box showing the five alternative compartments.

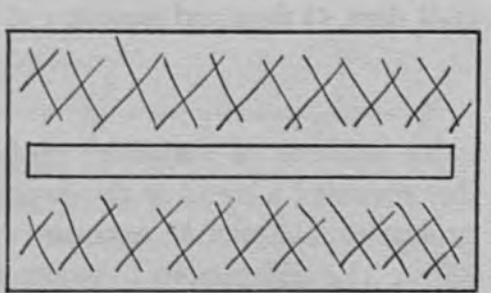

FIGURE 2. Lid of restraining box showing opening for stroking.

[1]This article is based on a thesis submitted in partial fulfilment of the requirements for the degree of Master of Arts at the University of Toronto, March 1955.

previous one, allowed the size of the restraining compartment to vary from 3″ × 1″ to 7″ × 3″ (Figure 1). The box was covered with a wire-mesh lid with an opening 8¾″ long and having a width variable from ¼″ to 1″ (Figure 2). This opening was in the middle of the lid, centred directly above the restraining compartment whatever its size.

The size of the restraining compartment was selected to correspond with the size of the animal, leaving enough room for the animal to change direction. For those animals who received stroking while being restrained, a Windsor and Newton long-handled artist's brush (No. 10) with a ¾″ bristle was employed.

Experimental Conditions

All experimental treatments employed were carried out by a single experimenter in complete isolation. Since the differential handling of four experimental groups required 400 minutes each day, half of each group was treated at the same time each morning, and half at the same time each night. Each of the treated animals was subjected to one type of treatment for 10 minutes a day during 21 consecutive days, i.e., from 21 to 42 days of age.

Group A. Animals in this group were gentled using the procedure developed by Weininger (1). The animal was held in the left hand with the hand placed against the chest. The right thumb stroked the back of the animal from the head to the base of the tail, at the rate of approximately fifty strokes a minute. The animal was not held tightly and was allowed to move about in the hand.

Group B. Animals in this group were held in the restraining box and stroked from the head to the base of the tail at the rate of approximately fifty strokes a minute with the artist's brush. The animal was not restrained tightly and was allowed to change direction in the compartment.

Group C. Animals in this group were held in the experimenter's left hand in gentling position but received no stroking. The animal was not held tightly and was allowed to move about in the hand.

Group D. Animals in this group were held in the restraining box without receiving brush stroking.

Group E. Animals in this group served as controls. They were not handled in any way during the 21-day experimental period, but in all other respects were treated exactly like the other groups.

All animals received a minimum of unsystematic handling. They were weighed at 21 days, 42 days, and thereafter at three-day intervals until the age of 57 days.

Results

An analysis of variance[2] performed on the means at the forty-second day revealed a trend in the overall differences between the weights of the groups that cannot be accounted for by the variability of the data ($P =< .001$). The differences between groups are illustrated in Figure 3, and it appears that these weight curves increase in linear fashion, diverging constantly with the increasing age of the animals. Since this study was primarily concerned with the effects of differential handling on weight

[2]Details of the statistical operations are contained in the original thesis at the University of Toronto.

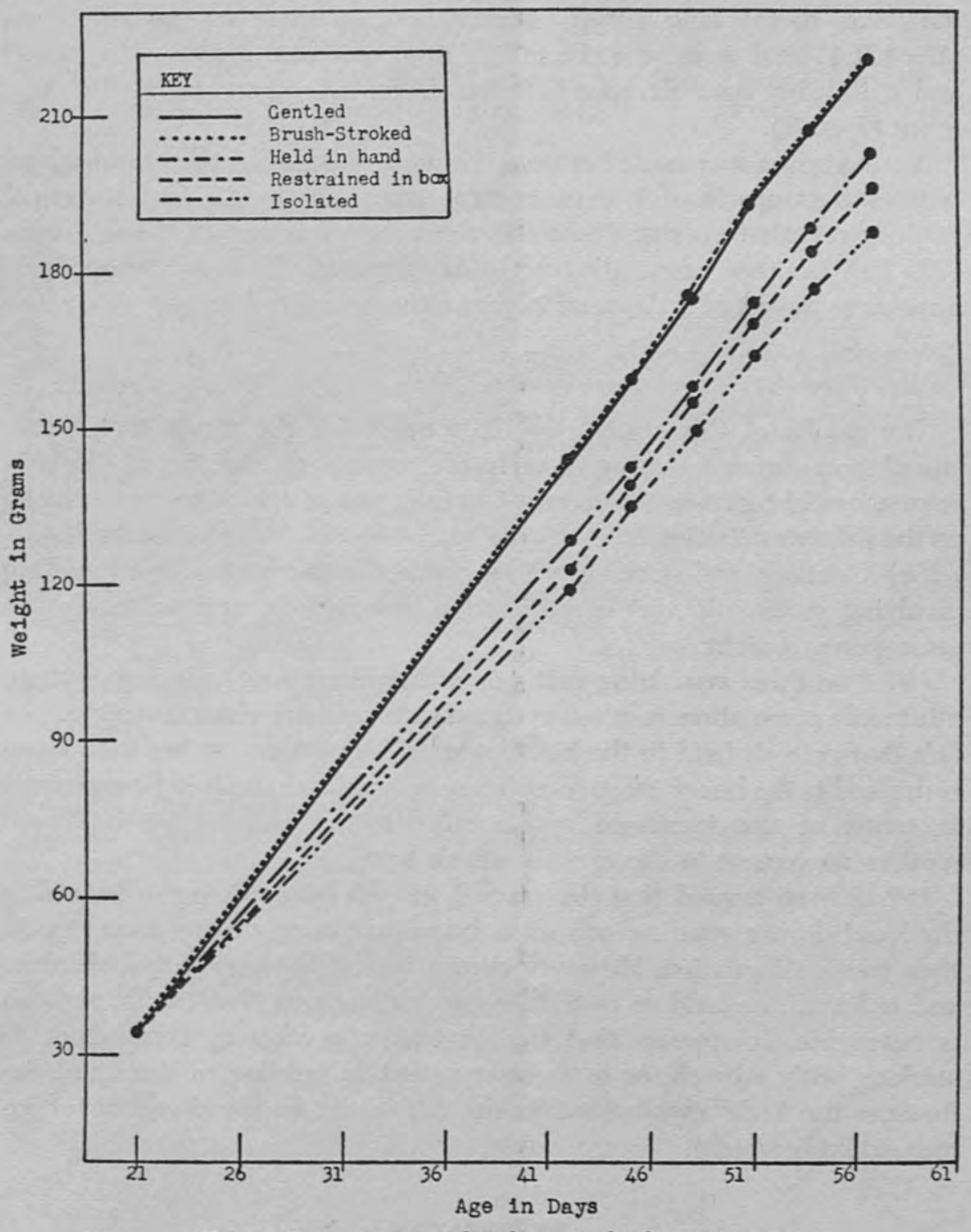

FIGURE 3. Average weight of rats in the five groups.

gain after termination of handling, formal statistical analysis was confined to the forty-second day of age.

The difference in mean weight between the gentled ($M = 142.9$) and brush-stroked ($M = 143.0$) groups is not statistically significant ($P > .80$). However, the difference between each of these groups and all other groups (C, D, E) is highly significant ($P < .001$). The difference between

the mean of the held group (M=127.0) and those of the restrained (M=121.4) and isolated (M=117.2) groups is also significant ($P<.05$ and $<.01$), but the difference between the restrained and isolated groups is not ($P<.20$).

A comparison was made between the mean weights of the morning and night sub-groups in each experimental group at day 42, and statistical analysis revealed no significant difference between any of these groups ($P>.20$). In other words, the time of day at which the handling occurred appears to have had little or no effect on the amount of weight gained.

Discussion

The results of this study provide support for the thesis that tactile stimulation during handling in early life contributes significantly to subsequent weight gain in albino rats. Confirmation of the thesis rests mainly on the following findings:

(a) Gentling, and stroking with a brush, the two methods of handling involving systematic tactile stimulation, resulted in approximately the same gain in weight.

(b) The three remaining methods of handling, involving less systematic tactile stimulation, resulted in significantly smaller gains in weight. The fact that animals held in the hand weighed significantly more than those restrained in the box or those completely isolated can possibly be explained in terms of the increased tactile stimulation received by increased random movement in the experimenter's hand.

It had been argued that the warmth caused by holding the animal in the hand during gentling was more important in producing weight gain than tactile stimulation. However, comparison of the brush-stroked group and either of the held or restrained groups suggests that this hypothesis is untenable. It appears that the systematic contact in gentling or in stroking with a brush, or to a lesser extent in holding in the hand, influences the body metabolism of the albino rat in the direction of increased body weight.

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