IS THERE A SCHIZOPHRENIC PATTERN ON THE P.M.A.?

by Muriel Faye Wilkins

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CURRICULUM STUDIORUM

Muriel Faye Wilkins was born on July 16, 1930 in Campbellton, New Brunswick. She received the Bachelor of Arts degree from Queen's University, Kingston, Ontario, in 1955.

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INTRODUCTION

Much work has been reported on the psychodiagnostic implications of various intelligence tests, but nothing has been found in the literature regarding the use of pattern analysis with factor-analyzed tests of intelligence. In an attempt to modify this apparent gap, this study was undertaken.

The factorized test of intelligence test chosen for this study was the Primary Mental Abilities Test, Form AH. The test was described and its reliability and validity discussed.

Having a need to investigate the diagnostic concomitants of scores on a factorized test of intelligence, and having chosen a representative factorized test, the area of investigation was delimited to schizophrenia.

It was hypothesized that there is no pattern characteristic of schizophrenia, on the P.M.A. because

1° no common pattern exists, or

2° if a common pattern does exist it is not characteristic of schizophrenia, or

3° the different subgroups perform differently.

The P.M.A. was administered to an experimental group of one hundred hospitalized schizophrenics, including those of the paranoid, catatonic, hebephrenic and simple type, and a control group of one hundred firemen. The

experimental and control groups were described and compared to the standardizing population and to each other for every factor of the P.M.A.

The profiles of the subtest scores obtained by each subject in the study were organized in terms of Barnett psychograms. The schizophrenic profiles were examined for a common pattern and the obtained pattern was applied to each individual's profile to determine its efficiency. The relative efficiency of the pattern in picking up the various subgroups was also investigated.

The performance of the different types of schizophrenia were also compared for every factor of the P.M.A. A discussion of the obtained results led to the development of new research hypotheses. Further work could help not only to validate the P.M.A. as a diagnostic tool but also to clarify the influence of emotional disorders in intellectual performance.

CHAPTER I

PSYCHODIAGNOSTICS AND THE P.M.A.

In the area of psychodiagnostics, some research has been devoted to the meaning of variation in an individual's performance on the various subtests of intelligence tests. It has been assumed that performance on the various types of cognitive tasks is a sample not only of intellectual behaviour but also of global behaviour, and that therefore discrepancies in the various scores may reflect emotional or behavioural as well as intellectual functions.

The configuration or pattern of two or more subtest scores is known as scatter[1]. Scatter may be graphically represented by a profile graph called a scattergram. The analysis of scatter is also referred to as pattern analysis, which is defined by Cohen as

> the study of the nature of the variability of the intelligence subtest scores of an individual or mean scores of a group of individuals. Variability in scores of subtests of differing content implies differing levels of attainment in the various aspects of intellectual functioning measured by the subtests. It is the patterns of these relative deficiencies and proficiencies which are studied in regard to their diagnostic concomitants[2].

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1 David Rapaport, Diagnostic Psychological Testing, Vol. 1, Chicago, The Year Book Publishers, Inc., 1946, p. 48.

2 Jacob Cohen, A Comparative Analysis of Factors Underlying Intelligence Test Performance of Different Neuropsychiatric Groups, Microfilm Ph.D. Thesis, University of New York, 1950, p. 5.

Underlying pattern analysis are the assumptions that the subtests measure validly present intellectual functions in a variety of areas, and that psychopathology is selective in nature.

Rapaport points out

> that the deviation of some of an individual's subtest scores from his central tendency of weighted scores - that is to say from his general position relative to the total population - reveals some characteristic of his intellectual functioning and personality organization, whether this characteristic be an impairment or an uneven development of function[3].

1.- Review of the Literature

Scatter analysis of intelligence tests was first proposed by Binet[4]. In 1912, Wallin[5] presented the first scatter pattern study on the Binet Simon Scale. He took into account the range of scatter and by comparing the number of credits received above the basal age he tried to distinguish between the individual functioning within the average range and the deficient.

From 1912 to 1940, approximately sixty studies involving scatter analysis were reported in British and

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3 David Rapaport, op. cit., p. 49.

4 J. McVey Hunt, ed., Personality and the Behaviour Disorders, Vol. II, New York, The Ronald Press Co., 1944, p. 984.

5 J. McVey Hunt, op. cit. p. 983.

American literature. Until 1930, the majority of these studies involved comparisons of the normal and the retarded. After this date there was an increase in the studies completed on the intellectual functioning of the psychotic, the delinquent and the psychopath.

Harris and Shakow[6] reported on nine different methods of analysis that were used in pattern analysis studies on the Binet test up to 1937. These were of three main kinds:

1° Range of scatter: number of age levels from the basal level to the level where all items are failed;

2° Area of scatter: the number of items passed or failed between the basal level and the level where all items are failed;

3° Range and Area of Scatter: weighting of the number of successes and failures on each level by the distance of that level from the mental age.

The limitations of each of these measures is discussed and the conclusion drawn that "research up to now has failed to demonstrate clearly any valid clinical use for numerical measures of scatter."

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6 A.J. Harris and D. Shakow, "The Clinical Significance of Numerical Measures of Scatter on the Stanford-Binet", in the Psychological Bulletin, Vol. 34, issue of 1937, p. 134-150.

When mental age was held constant, significantly greater scatter was found with schizophrenics and organic pathology than with groups of subnormal intelligence. This study was completed in 1938 by Malamud and Palmer[7].

In 1940, Kendig and Richmond[8] again with mental age held constant, found that schizophrenics appeared to obtain a greater scatter than defectives or normal controls. However, this trend was not found to be clinically significant.

The performance of schizophrenics on the Binet was also investigated by Harris and Shakow[9], who used four different scatter measures. Of the various factors studied, psychotic condition, delinquency, chronological age, education, length of hospitalization, attitude and mental age, only mental age was found to be related in any considerable degree to the amount of scatter. When mental age was held constant, any differences which existed disappeared. The Pressey measure of scatter was found

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7 W. Malamud and F.H. Palmer, "Intellectual Deterioration in the Psychoses", in the Archives of Neurology and Psychiatry, Vol. 39, issue of 1938, p. 60-81.

8 I. Kendig and W.V. Richmond, Psychological Studies in Dementia Praecox, Ann Arbor, Michigan, Edwards Brothers, 1940, 211 p.

9 Albert J. Harris and David Shakow, "Scatter on the Stanford-Binet in Schizophrenic, Normal and Delinquent Adults", in the Journal of Abnormal and Social Psychology, Vol. 33, No. 1, issue of January 1938, p. 100-111.

to be superior to the other measures used.

In 1944, Hunt and Cofer[10] presented a brief review of the literature of scatter analysis with the Stanford-Binet, and concluded that "the scatter approach appears now to be a blind alley".

While the numerical measures of scatter on the Stanford-Binet were not proven to be too useful as aids in clinical diagnosis, the clinical impression that extent and quality of scatter may be indicative of maladjustment persisted.

One of the reasons why results with the Stanford-Binet were rather spurious was pointed out by Hunt[11] who indicated that the nature of the test itself might lead to conflicting conclusions for "such pseudo-units as months of the year have no clear equality".

With the publication of the Wechsler-Bellevue Test there was a renewed interest in pattern analysis. Unlike the age scales of the Stanford-Binet, the Wechsler items are grouped into eleven subtests, which measure relatively different functions.

Various approaches were also used in analyzing scatter on the Wechsler-Bellevue which include:

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10 J. McVey Hunt, op. cit., p. 984.

11 J. McVey Hunt, op. cit., p. 983.

(a) Verbal-Performance Scatter, advocated by Wechsler[12] and also by Bijou[13].

(b) Scatter expressed in profile (1) around a mean, which measures the relationship of a single achievement of a subject to the central tendency of all his achievements, as advocated by Brown and Rapaport[14], and (2) around a modified mean, which measures the relationship of the score on one subtest to the mean score of his other achievements, in which the subtest achievement in question is excluded, proposed by Rapaport[15].

(c) Scatter on subtests - e.g. (1) the vocabulary scatter of Rapaport[16] which measures the drop of efficiency of one or more functions below the hypothetical original level of the individual and (2) the information scatter of Allen.

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12 David Wechsler, The Measurement of Adult Intelligence, Third Edition, Baltimore, The Williams and Wilkins Company, 1944, p. 147.

13 Sidney Bijou, "The Psychometric Pattern Approach as an Aid to Clinical Analysis - A Review", in the American Journal of Mental Deficiency, Vol. 46, No. 3, issue of January 1942, p. 354-362.

14 David Rapaport, op. cit., p. 553.

15 David Rapaport, op. cit., p. 54.

16 David Rapaport, op. cit., p. 53.

(d) Scatter expressed in scores, e.g., Rabin's Ratio[17] and Hewson's Ratios[18]. Rabin's Schizophrenic Index is the ratio of Information plus Comprehension plus Block Design to Digit Symbol plus Object Assembly plus Similarities. Hewson devised a series of ratios in an attempt to differentiate normals, neurotics and organics.

(e) Holzberg and Dean[19] proposed still another manner of investigating the diagnostic significance of the Wechsler-Bellevue in their analysis of intra-test scatter.

The performance of schizophrenics on the Wechsler-Bellevue in terms of possible group psychometric patterns has been investigated by several authors.

Wechsler[20] recognized that schizophrenia is not a single disease entity and the classical divisions into the four types, catatonic, paranoid, hebephrenic and simple is

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17 A.I. Rabin, "Test-Score Patterns in Schizophrenics and Non-Psychotic States", in the Journal of Psychology, Vol. 12, No. 2, issue of July, 1941, p. 91-100.

18 Louise R. Hewson, "The Wechsler-Bellevue and the Substitution Test as Aids in Psychiatric Diagnosis", in the Journal of Nervous and Mental Disease, Vol. 109, No. 2, issue of February 1949, p. 158-183.

19 Jules Holzberg and Maurice A. Dean, "The Diagnostic Significance of an Objective Measure of Intra-Test Scatter on the Wechsler-Bellevue Intelligence Scale", in the Journal of Consulting Psychology, Vol. 14, No. 3, issue of June 1950, p. 180-188.

20 David Wechsler, The Measurement of Adult Intelligence, Third Edition, Baltimore, The Williams and Wilkins Company, 1944, p. 154.

more theoretical than factual, and suggested that schizophrenics may vary widely among themselves both as to symptomatology and general picture.

Wechsler further noted that

> intellectually the most general effect of the schizophrenic process is the impairment of the subject's mental efficiency. This loss is evidenced by the low scores which he makes on most tests calling immediate and direct effort. ... Supplementing the impairment in mental efficiency, the schizophrenic is further characterized by a marked slowing up of his thinking, a loss in mental shift and a tendency toward perseveration. As often noted he does much better on verbal tests. ... Another characteristic of the schizophrenic is his inability to deal with concrete and specific situations. He is oblivious to details and does not perceive ordinary likeness and differences, difficulties which are often reflected by the poor scores he attains on either the Similarities or Picture Completion tests or both. Last but not least is the schizophrenic's unpredictability, so that now and again one finds patients who do well on one or several of the tests, failure on which we have listed as characteristic of schizophrenics[21].

Ann Magaret[22] compared the mean standard scores on each of the eleven tests for each of the three groups, viz., schizophrenics, paretics and pre-senile non-psychotics.

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21 David Wechsler, op. cit., p. 154.

22 Ann Magaret, "Parallels in the Behaviour of Schizophrenics, Paretics, and Pre-Senile Non-Psychotics," in the Journal of Abnormal and Social Psychology, Vol. 37, No. 4, Issue of October 1942, p. 511-528.

She found that the psychotic groups fell below the non-psychotic group on every test, with the paretics being consistently lower than the schizophrenic.

Rabin's[23] mean deviation scores revealed a pattern similar to Magaret's. This was especially true for patients who were retested after a year's residence in hospital.

Rapaport[24] and Garfield[25] found that schizophrenics show typically low scores on the Comprehension subtest, while Rabin[26] refers to Comprehension as a test which remains high in schizophrenia.

Rapaport's research failed to take age and education into consideration. This may offer one possible explanation for the above opposing results, for Balinsky found that the same subtest may not be measuring the same abilities in people of different ages.

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23 A.I. Rabin, "Fluctuations in the Mental Level of Schizophrenic Patients", in the Psychiatric Quarterly, Vol. 18, No. 1, p. 78-91.

24 David Rapaport, op. cit., p. 301.

25 Sol Garfield, "A Preliminary Appraisal of Wechsler-Bellevue Scatter Patterns in Schizophrenia", in the Journal of Consulting Psychology, issue of January-February 1948, Vol. 12, p. 22-36.

26 Albert I. Rabin, "Test-Score Patterns in Schizophrenia and Non-Psychotic States", in the Journal of Psychology, Vol. 12, No. 2, issue of July 1941, p. 91-100.

Rabin[27] found that Verbal-Performance Scatter, while exhibiting a trend, did not significantly differentiate schizophrenics from manics and normal controls. Heyer[28] found that Rapaport's vocabulary scatter was not justified. Garfield[29] reported that there was no clear-cut pattern of schizophrenia on the Wechsler-Bellevue.

Considerations that were neglected in some of the studies were lack of control of the types of schizophrenia tested, size of groups, comparability of groups tested, and lack of order of administration of subtests. For example, in Rapaport's[30] study, not all of the subtypes of schizophrenia were used. Also the frequencies in some of his groups were extremely small.

Other authors who investigated the validity of Wechsler's pattern included A. Magaret and C. Wright[31]

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27 A.I. Rabin, op. cit., p. 100.

28 Albert I. Heyer, "Scatter Analysis Techniques Applied to Anxiety Neurotics from a Restricted Cultural, Educational Environment", in the Journal of General Psychology, Vol. 40, issue of April 1949, p. 165.

29 Sol Garfield, op. cit., p. 36.

30 David Rapaport, op. cit., p. 301.

31 A. Magaret and C. Wright, "Limitations in the Use of Test Performance to Detect Mental Disturbance", in the Journal of Applied Psychology, Vol. 27, No. 5, issue of October 1943, p. 387-398.

and Jastak[32]. Magaret and Wright found that contrary to some of the earlier studies, high scores on verbal tests and low scores on Block Design are not characteristic of schizophrenics. They also found that greater variability will not differentiate morons or schizophrenics, but both schizophrenics and morons are more variable than controls.

Jastak concluded that the diagnostic signs held up only when raw score means are used for purposes of comparison and that the signs were more applicable to females than to males. He suggested re-checking of the signs for each diagnostic category.

Klugman[33] found that order of administration has an effect on some results. He found significant differences between the mean scores of three groups to whom the Digit Span Test had been given as the first, middle or last subtest. It is possible that similar differences might occur on other tests, thus confusing any obtained scatter unless the order of administration were held constant.

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32 Joseph Jastak, "Ranking Bellevue Subtest Scores for Diagnostic Purposes", in the Journal of Consulting Psychology, Vol. 17, No. 6, issue of December 1953, p. 403-410.

33 S.F. Klugman, "The Effect of Placement of the Digit Test in the Wechsler-Bellevue Intelligence Scale", in the Journal of Consulting Psychology, Vol. 12, No. 5, issue of September-October, 1948, p. 345-348.

In evaluating scatter expressed in scores, we note Rapaport's[34] report that while Rabin's Index can be used as a diagnostic aid, it is not precise enough to differentiate schizophrenia from an undiagnosed group.

Daunais[35] found that Hewson's ratios could not differentiate between functional and organic psychoses. Schloser and Kantor[36] reported that the Mental Deterioration Index could not distinguish between psychoneurosis and schizophrenia.

Harper[37] found that the Wechsler-Bellevue could not discriminate between the different types of schizophrenia and concluded that the Wechsler-Bellevue is not a highly adequate tool for psychiatric diagnosis.

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34 David Rapaport, op. cit., p. 553.

35 Jean Paul Daunais, Essai de differentiation entre les psychoses organiques et les psychoses fonctionnelles sur le Wechsler-Bellevue Intelligence Scale, unpublished Master's Thesis presented to the School of Psychology of the University of Ottawa, Ontario, 1958, 54 p.

36 John H. Schloser and Robert E. Kantor, "A Comparison of Wechsler's Deterioration Ratio on Psychoneurosis and Schizophrenia", in the Journal of Consulting Psychology, Vol. 13, No. 2, issue of April, 1949, p. 108-110.

37 A. Harper, "Discrimination of the Types of Schizophrenia by the Wechsler-Bellevue Scale", in the Journal of Consulting Psychology, Vol. 14, No. 4, issue of August 1950, p. 290-292.

While the studies indicate that there is some impairment of functioning in schizophrenics that appears to be selective, there is no agreement as to the tests on which the specific impairment is shown.

The variables of age and intellectual capacity have not been controlled in all of the studies, and these may account for some of the incompatibility of results, but even when these variables are controlled, as in Mararet's study, there is still some question as to the specific tests showing impairment.

One area to be investigated as a possible factor in the above results is the nature of the Wechsler-Bellevue subtests. It is noted that there are very high inter-correlations between the subtests as reported by Wechsler[38].

Such high intertest correlations would indicate that there is overlapping among the tests, and that each test could measure a variety of factors. Cohen[39] attempted to show that the Wechsler-Bellevue measured only three factors.

It would appear that there is a need to attempt pattern analysis with a point scale in which the subtests measure independent factors, i.e. with a factor analyzed test of intelligence.

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38 David Wechsler, op. cit., p. 223-224.

39 Jacob Cohen, op. cit., p. 137.

While the study of the nature of the variability of intelligence subtest scores has been undertaken on various intelligence tests, it appears that point scales are more suitable for this type of investigation. However, some of the existing point scales are not completely satisfactory because of (1) overlapping and (2) each subtest may measure more than one thing.

It is felt that these criticisms would be to some degree modified by the use of a factorized test of intelligence in such a study. The factorized intelligence test that was chosen for this investigation is the SRA Primary Mental Abilities Test, Form AH, for ages eleven to seventeen and over.

In the next section, we shall attempt to describe the Primary Mental Abilities Test, and discuss its reliability and validity.

2.- The Primary Mental Abilities Test, Form AH

The PMA was the first factorized test of intelligence to be devised. It was chosen for this study because it was representative of the factorized tests of intelligence, and because nothing was found in the literature reporting diagnostic use of this test. While there are some inter-test correlations among the PMA factors, these are lower than correlations reported in any other

point scales.

Another asset of the PMA is its group standardization, permitting its use in the simultaneous examination of several individuals. Another time saving facet of the test is that its scoring is highly automatic. hile there is a version that may be machine scored, the form adopted for this study was of the hand scoring type.

In the PMA for ages 11 to 17 and over there is one test per factor, and the required testing time is approximately forty-five minutes. The factors measured by this version of the PMA are Verbal, Space, Reasoning, Number and ord-Fluency.

Verbal-Meaning is measured by a multiple-choice vocabulary test. Space is measured by items where every figure that is the same as the first figure is marked. Mirror-images are not to be marked while simple rotations are included. In the Reasoning test, there are a number of items in which the letters in a row form a series based on a rule. The problem is to mark the letter that should come next in the series. In the Number test, the answers to a series of addition items are given, and are to be marked by the candidate as right or wrong. Word-Fluency is measured by a test requiring the writing of as many words as possible beginning with a certain letter.

The authors[40] of the PMA claim that the reliabilities for the various factors were computed by the Spearman-Brown method for five hundred students in Grade Ten. The reliability for each test is as follows:

Verbal	.92
Reasoning	.93
Space	.96
Number	.89
Word Fluency	.90

Anastasi[41] questioned the meaning of the reliabilities of the PMA and she conducted a study on 104 male high school students to show the reliability coefficients as found by the single-trial split half method and also by separately timed halves. The reliabilities that she computed by the split half method were found to be quite close to those given in the Manual. However, in the second method, the reliability coefficients of the Space test is .75, and Reasoning drops to .87. Number goes down to .83. Verbal Meaning shows a negligible difference in .90. The Word-Fluency Test coefficient was not computed as it was felt it would be completely meaningless.

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40 Thurstone, L.L. and Thurstone Thelma G., Examiner Manual for the SRA Primary Mental Abilities Test, Form AH, Intermediate, Chicago, Science Research Associates, 1949, p. 19.

41 Anastasi, Anne, Psychological Testing, New York, The MacMillan Company, 1955, p. 114.

Vernon[42] feels that the PMA reliabilities are good for the older levels. Traxler[43] ascertained that the reliabilities of the original Primary Mental Abilities were high, judging by both the split half and the test-retest techniques, but attributed this to the importance of speed in all of the tests.

Anastasi[44] points out that test reliabilities have implications for the evaluation of individual profiles. As many deviations may fall within the error of measurement, she feels that some attempt should have been made by the authors to indicate how large a deviation from the norm is required for a meaningful interpretation, and criticizes the failure of the authors to do so in their profile sheets.

As one of the most important considerations in the evaluation of any measure of scatter concerns the reliability of the subtests, reliabilities were worked out on both the experimental and control groups used in this study.

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42 Buros, O.K., Editor, The Fourth Mental Measurements Yearbook, High Park, N.J., Gryphon Press, 1953, p. 716.

43 Traxler, Arthur E., "Stability of Scores on the Primary Mental Abilities Test", in School and Society, Vol. 53, issue of 1941, p. 255-256.

44 Anne Anastasi, op. cit., p. 367.

The formula used was that of Rulon[45] and the results are to be found in Table I.

It will be noted that the reliabilities run from .967 to .981 in the experimental group of one hundred schizophrenics, and from .935 to .987 in the control group of one hundred firemen. The means for the experimental group was .974 and for the control group .949. Such reliabilities appeared to be in agreement with the majority of the previous studies on the reliability of the test.

Data on empirical validity includes correlations with a few group tests of intelligence, individual intelligence tests, special aptitudes and some educational achievement tests. No factorial validities have been reported at any age level.

Multiple correlations[46] were computed between the Otis Self Administering Test of Mental Ability, Form B, and the Separate PMA abilities by means of the Wherry-Doolittle technique. A multiple correlation of .71 was obtained between the Otis IQ and Verbal Meaning.

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45 J.P. Guilford, Fundamental Statistics in Psychology and Education, New York, McGraw-Hill Book Co. Inc., 1956, p. 442.

46 L.L. Thurstone and T.G. Thurstone, op. cit., p. 14.

Table I.- Reliabilities of Four Subtests of the P.M.A., Computed by the Rulon Method.

Factors	Experimental Group	Control Group
Verbal	.981	.956
Space	.967	.935
Number	.979	.987
Reasoning	.969	.919

Verbal Meaning and Reasoning gave a multiple correlation of .63 with the Kuhlmann-Anderson Intelligence Test[47]. The data for this work was obtained from one hundred and forty-two high school students who received the Kuhlman Anderson test in the eighth grade and the PMA in the tenth grade. The longer interval between the testing may account for the relatively lower correlations.

Correlations between PMA and Scores on the American Council on Education Psychological Examination[48] for ninety-seven pupils in the tenth grade were reported as follows:

Verbal Meaning	.674
Reasoning	.575
Word Fluency	.435
Number	.390
Space	.322

Mrs. Thurstone interprets these results as a substantiation of the observation that the usual types of intelligence tests measure only a few abilities, and primarily V and R. However, it could also be suggested that the V and R factors play a predominant role in school achievement.

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47 L.L. Thurstone and T.C. Thurstone, op. cit., p. 14.

48 Ibid., p. 14.

This was borne out in some of the studies of the relationship between PMA's and specific school subjects. In studies done with the Stanford Achievement Tests[49], a multiple correlation of .68 was obtained between the Arithmetic Tests and the tests of Reasoning, Number, Verbal-meaning and Space.

A multiple correlation of .81 was obtained between Verbal Meaning and Reasoning and the composite score on the Iowa Tests of Mental Development[50].

During the 1958 Revision of the PMA, Mrs. Thurstone reported on the predictive value of the PMA with respect to Scholastic Achievement thus:

> The V (Verbal Meaning) test and the R (Reasoning) test have proven to be the best predictors of success in high school work. These two scores have consistently shown satisfactory reliabilities and have proven to yield substantial correlations with teach grades, standard measures of educational development, and several tests of 'general intelligence[51]'.

The S (Space) test and the N (Number) test have shown useful although lower, validities in terms of high school success.

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49 L.L. Thurstone and T.G. Thurstone, op. cit., p. 14.

50 Ibid., p. 15.

51 Thelma Gwinn Thurstone, Manual for the SRA Primary Mental Abilities, Third Edition, Chicago, Science Research Associates, 1958, p. 1.

The W (Word-Fluency) test has not to date produced positive evidence of predictive value in research dealing with scholastic and vocational predictions. The Word-Fluency score does, however, continue to show good differential power, that is, it provides evidence of mental functioning beyond that provided by the other four scores.

During this Revision of the test, a scholastic aptitude formula was devised, consisting of: 2V plus N. This index is very similar to the usual IQ, and studies have reported correlations of .70 with both the Otis and Khulman norms.

3.- Research Hypothesis

In attempting to investigate the possibly psychometric patterns of schizophrenics in a factor-analyzed test of intelligence, the PMA Test, Form AH, was chosen for the purpose of the investigation, and the following hypothesis was formulated.

There is no diagnostic pattern for schizophrenics on the Primary Mental Abilities Test, Form AH, because

1° there is no pattern that is common to schizophrenics or

2° if there is a common pattern it is not specific to schizophrenics alone or

3° the different subgroups perform differently on the PMA, thus obliterating a pattern that might be common to the group.

In the next chapter we shall see the experimental procedure that was set up to test the hypothesis.

CHAPTER II

EXPERIMENTAL PROCEDURE

It has been hypothesized that the performance of schizophrenics on the Primary Mental Abilities Test, Form AH, does not show a diagnostic scatter pattern of the subtest results.

In order to test this hypothesis, it was necessary

1° to obtain an experimental group of schizophrenics in which the various subgroups were included, and a control group;

2° to administer the Primary Mental Abilities Test, Form AH, to all of the subjects in each group, and

3° to choose a method of analyzing the results.

This chapter will discuss the principles of selection of both the experimental and control groups, and describe the groups, discuss the method of administration of the Primary Mental Abilities Test, and elaborate on the procedure to be followed in the obtaining and statistical analysis of patterns.

1.- The Subjects of the Experiment

The experiment was conducted with an experimental group of one hundred hospitalized schizophrenic patients including those of the simple, catatonic, paranoid, and

hebephrenic types, and a control group of one hundred members of the Ottawa Fire Department.

The experimental group was to be made up of one hundred schizophrenics, of which fifty were to be males and fifty females. The first criterion of selection of the experimental group required that all subjects had been diagnosed schizophrenics by three psychiatrists working independently of each other.

The schizophrenic syndromes[1] on which the psychiatrists based their selections were those described in the Mental Statistics Handbook, in use in the Ontario Hospitals. The detailed descriptions follow:

> 300 Schizophrenic Disorders.
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> This term is synonymous with the formerly used term dementia praecox. In this group of psychotic reactions there is disturbance in reality relationships and concept formations with affective, behavioural and intelectual disturbances in varying degrees and mixtures. The disorders are marked by strong tendency to retreat from reality by emotional disharmony, unpredictable disturbances in stream of thought, aggressive behaviour and, in some, by a tendency to deterioration.
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> This group of psychoses is further subdivided because of the prominence of the various symptoms in individual cases. The distinctions are only relative and transitions from one subgroup to another are common.

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1 Canada, Department of Health, Mental Statistics Handbook, Second Edition, Ottawa, Queen's Printer, 1954, p. 34-35.

300.0 Simple Type

Under this heading will be shown those reactions which display some defective interest with gradual development of an apathetic state and indifference but without other strikingly peculiar behaviour and without expression of delusions or hallucination. It manifests a type of reaction with an increasing severity of symptoms over a long period of time with some apparent mental deterioration.

300.1 Hebephrenic Type (apathetic type)

These reactions are characterized by a shallow effect, unpredictable, silly behaviour which appears inconsistent with the ideas expressed; neologism; bizarre ideas; and coining of words or phrases are common. Hallucinations and delusions are quite common in this type of reaction and the regressive type of behaviour is fairly rapid.

300.2 Catatonic Type

These reactions are characterized by usually a conspicuous alternating state with either marked generalized inhibition (stupor, mutism, negativism and waxy flexibility) or excessive motor activity and excitement. The latter shows marked impulsiveness and belligerence. In retrospect it is usually found that the sensorium has remained clear. Regression to a vegetative state may occur.

300.3 Paranoid Type

> This group is characterized by prominence of delusional ideas generally of a persecutory or grandiose nature. A consistent emotional reaction of aggressiveness due to persecutory delusions is most frequent. The hallucinations occur in various fields to which the patient frequently responds. Excessive religiosity or expansive delusional system of omnipotence, genius or special ability are also found here. The systematized paranoid hypochondriacal states are included in this group.

All of the experimental subjects were patients in provincial mental hospitals in Eastern Ontario, and had been institutionalized for a period of one month or less at the time of testing. The testing was carried on routinely on all patients admitted to each of three hospitals who met the requirements of selection until the required data was collected.

No patients were included who, as far as was known, suffered from additional possible complicating components, such as alcoholism, cranial pathology or toxic conditions. Patients included in the study were given a physical examination upon entering the hospital, and were found to be in good physical health. They were also patients, who at the time of testing, had not yet been placed on any of the physical therapies, such as insulin or electro-convulsive therapy, nor were they receiving any form of medication or tranquilizing drugs.

The experimental population were all born and educated in Canada. They all received a minimum of Grade Six Education in English speaking schools. One reason for eliminating those persons who had not attained a Grade Six education was an attempt to eliminate mental defectives from the study to avoid possible distortion of pattern results.

The age group selected for study was from sixteen to fifty-five. It was decided not to use anyone over fifty-five years of age in an attempt to eliminate subjects with severe deterioration, whose results might also distort any existing pattern. The lower limit was imposed to avoid possible pattern distortion due to intellectual immaturity.

The control group consisted of one hundred male subjects who were gainfully employed by the Ottawa Fire Department. Persons included in the study had been found to be in good physical health at the time of their last physical examination, and according to their own reports, were not under the care of a psychiatrist at the time of testing, nor were they receiving any medication or drugs. Like the members of the experimental group, they were all born and educated in Canada, and received a minimum of Grade Six Education. The age range limitations again imposed were from sixteen to fifty-five.

The samples will be described with respect to their age range and means, educational range and means, and composition of subgroups. A comparison of the scores of both the experimental and control groups with the standardizing population, and with each other, for every factor of the Primary Mental Abilities Test, Form Aa, will be added in order to know to what extent the obtained results may be generalized.

The age range of the experimental group tested was from sixteen to fifty-five with a mean age of 33.23. The age range of the control group was from eighteen to fifty-five years with a mean age of 30.94 years.

The educational range of the experimental group was from six to seventeen years with a mean educational level of 9.89 years. The mean educational level of the control group was 10.29 years with a range of from six to fourteen years.

The experimental group was composed of 30 paranoids, 31 catatonics, 21 simple and 18 hebephrenic schizophrenics.

The raw scores of the firemen, the control group, were compared with the standardizing norms in an attempt to find if their results could be considered representative of the standardizing population. Comparisons were carried out by means of the 't' test, using the formula $t = \frac{D}{\sigma_D}$. Since the norm is considered a stable point of reference,

the 6_D in this case becomes the 6_{Mp}. The results of this study are to be found in Table II. The results obtained for the firemen are significantly different from those of the standardizing population for every factor.

The largest discrepancy in scores occurred on the Number Factor. It was also noted that the direction of this difference was not similar to the other factors in that the performance of the Firemen was considerably higher than that of the standardizing population, while the other factors, Verbal Meaning, Space, Reasoning, and Word Fluency were lower for the Firemen than the standardizing population. Among these factors, Space obtained the greatest deviation, followed by Reasoning, Word Fluency and Verbal Meaning in that order.

There are many reasons why this group might differ from the standardizing population. While the latter has not been described in detail by the Thurstones, it is known that a large number of college students were included in the standardizing population for the adult level. The educational range of the firemen, as mentioned above, was from six to fourteen years of schooling, with a mean at 10.29 years. It would not be unexpected that if the standardizing population possessed a higher educational level than the firemen, they would probably be of higher intellectual capacity and therefore score significantly

Table II.- Comparison of the Mean Raw Scores of the Firemen with the Mean Raw Scores of the Standardizing Population for every Factor of the P.M.A.

Factors	Means		Differences			
	Firemen	Norms	$M_F - M_N$	6_F	6_{MF}	t^a
V	24.28	27	- 2.72	8.7110	.871	3.123
S	20.45	28	- 7.55	10.8686	1.087	6.946
R	12.16	16	- 3.84	6.1607	.616	6.234
N	30.20	20	+10.20	12.331	1.23	8.293
W	41.50	45	- 3.50	11.1395	1.114	3.142

a At 99 degrees of freedom, t is significant at 2.627 for the .01 level of confidence.

higher than our control group.

The age range of the firemen tested was from eighteen to fifty-five with a mean age of 30.94. Again, we have insufficient information regarding the range of the standardising population, although we know that all the adults tested were seventeen years of age or over. However, a difference in the age groups tested might also account for some of the differences in scores.

The Number Factor being so much above the norms is to say the least, unexpected. Explanation of this unusual result could lie in faulty test administration, faulty test norms or something unusual in the particular group tested, including cheating or copying.

In order to investigate this further, it was decided to administer the Number Test to a group of twelve graduate students, hypothesizing that if their scores on this test were lower than those of the firemen the probability of faulty administration being the cause of the discrepancy would be increased. The mean of the twelve graduate students, who took the test in two groups of six each, was 34.8, which is 4.6 points higher than the score obtained by the Firemen and 14.8 points higher than the mean of the standardizing population.

This result suggests the possibility of faulty test norms, although the possibility of faulty administration

still remains, as does the possibility of cheating, etc. With our present data, we have no way of arriving at any definite conclusion, other than to say that the results of these firemen as measured on the Primary Mental Abilities Test, Form AH, were quite atypical when compared with the results of the standardizing population.

However, they are a non-hospitalized population, and as such may still be compared with the schizophrenic or experimental population of this study. The study involving pattern analysis, to be discussed later in this chapter, will take the results on the Number Factor into consideration.

The raw scores of the schizophrenics were also compared to the standardizing norms. The results of the 't' tests for every factor of the Primary Mental Abilities Test, Form AH, are reported in Table III. Again, for every factor, the schizophrenic scores differ significantly from the standardizing population.

The question of the results being due to age and education can again be raised. This time the age range of the schizophrenics is from sixteen to fifty-five with a mean age of 33.23. The educational range of the schizophrenics is from six to seventeen years with an educational mean of 9.39 years.

Table III.- Comparison of the Schizophrenics' Mean Raw Scores with the Mean Scores of the Standardizing Population for every Factor of the P.M.A.

Factors	Means		Differences	σ_C	σ_{MS}	t[a]
	Schiz.	Norms	$M_S - M_N$			
V	15.01	27	-11.99	11.5321	1.1532	10.397
S	7.53	28	-20.47	9.7463	.9746	21.003
R	5.65	16	-10.35	6.0537	.6054	17.096
N	12.19	20	- 7.81	10.0577	1.0058	7.765
V	21.25	45	-23.75	14.643	1.4643	16.219

a At 99 degrees of freedom, t is significant at 2.627 for the .01 level of confidence.

The differences this time are all in the same direction, i.e., the schizophrenics scored lower on all the factors than did the standardizing population, indicating the presence of impaired intellectual functioning in the schizophrenic group. The greatest discrepancy was on the Space Factor, followed by Reasoning, Word Fluency and Verbal Meaning. The least, though still highly significant difference was on the Number Factor.

Further evidence of the impairment of cognitive functioning in schizophrenia is to be found in the comparison of the raw scores of the schizophrenics and firemen for every factor of the Primary Mental Abilities Test, Form AH, as shown by Table IV.

It is felt that both the age and educational means are more comparable in this study than in the two reported above.

The greatest discrepancy between the schizophrenics and the firemen was obtained on the Word Fluency Factor. Here the schizophrenics displayed their inability to maintain directed effort. Perhaps the schizophrenic scores suffered both from the nature of the test, and the fact that it was administered last in the battery.

The impairment of the schizophrenics' ability to visualize objects in space is seen in their poor performance on the Space Test. Their impairment in reasoning is also

Table IV.- Comparison of the Mean Raw Scores of the Firemen and Schizophrenics for every Factor of the P.E.A.

Factor	Firemen Mean	$6M_1$	Schizophrenics Mean	$6M_2$	Difference $M_1 - M_2$	6_D	t^a
V	24.28	.871	15.01	1.1532	9.27	1.4452	6.414
S	20.45	1.087	7.53	.9746	12.92	1.460	8.849
R	12.16	.616	5.65	.6054	6.51	.8637	7.537
N	30.20	1.23	12.19	1.0057	18.01	1.569	5.041
W	41.50	1.114	21.25	1.4643	20.25	1.840	11.005

a At 99 degrees of freedom, t is significant at 2.627 for the .01 level of confidence.

seen in impoverished performance on the Reasoning Test.

The least difference between the two groups, although still a significant one, was obtained on the Verbal Factor. This factor represents the ability to deal with verbal concepts meaningfully. In comparing the results of the Verbal Meaning Test with those of the Word Fluency Test, we see that the schizophrenic's ability to understand words is not impaired to the same degree as his ability to recall words in a restricted context.

The findings of the studies comparing the PMA raw scores of the schizophrenics to the standardizing norms and to the scores of the firemen substantiate each other in indicating a somewhat lower level of functioning for the schizophrenics.

2.- Collection of the Data

The tests were administered by the same examiner to groups of six subjects in both the experimental and control groups. In their review of the literature on activity groups, Rudolf Dreikers and Raymond Corsini[2] point out that the preferred size of activity groups is from one to eight patients. In the particular setting in which the

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2 Rudolf Dreikers M.D., and Raymond Corsini, "Twenty Years of Group Psychotherapy", in the American Journal of Psychiatry, Vol. 110, No. 8, issue of February, 1954, p. 566-575.

tests were first administered to the schizophrenics, Group Therapy was conducted more frequently in groups of six and activities such as Finger Painting were carried on in groups of six. As six falls within the preferred ratio as revealed by the literature, it was decided to carry on with this number of subjects for each administration.

The administration procedure adhered to was that described in the PMA Manual[3].

3.- Method of Obtaining and Analyzing the Pattern.

The initial step in an attempt to find a pattern in the subtest scores of the schizophrenic population was to find a method in which the various subtest scores would be comparable.

In previous studies that have been completed on pattern analysis, some authors failed to take into consideration the great weakness of the scales of weighted scores, thus providing one of the reasons why their conclusions were doubtful. As Chagnon[4] points out

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3 L.L. Thurstone and Thelma Gwinn Thurstone, Examiner Manual for the SRA Primary Mental Abilities, Form AH, Intermediate, Chicago, Science Research Associates, 1949, p. 3-7.

4 Maurice Chagnon, Utilisation de L'Echelle d' Intelligence Ottawa-Wechsler, Ottawa, Les Editions de L'Universite d'Ottawa, 1955, p. 23.

> ... the unreliable variability of each subtest in each age group precludes, if one does not take into account their parametric values, any comparison between the scores obtained by a subject in the subtests, or by several subjects of differing ages in the same subtest.

Three authors have suggested different solutions to this problem, namely Foster, Spitz and Barnett.

Foster[5] proposed that weighted scores should be derived that were based on the age groups, thus rendering comparable the results obtained by individuals of different age groups. Spitz[6] also proposed that weighted scores be obtained for each age group, but with each scale having the same range, means and standard deviations. Spitz hoped by his method to create equality between the subtests as well as between the different age groups on each subtest.

Barnett's[7] solution is to convert the scores into standard or Z scores, thus making them comparable on a common scale. The Barnett solution was used on the Ottawa-

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5 Austin Foster, "Age the Wechsler-Bellevue Scattergraph", in the Journal of Clinical Psychology, Vol. 3, No. 4, issue of October 1947, p. 396-397.

6 D. Spitz, "De Wechsler-Bellevue Test", in Nederlands Tijdschrift voer Psychologie, 1950, p. 126-136, resume in Psychological Abstracts, Vol. 25, No. 1, issue of January 1951, p. 370.

7 Irving Barnett, "The Use of Z Scores in Equating the Wechsler-Bellevue Subtests", in the Journal of Clinical Psychology, Vol. 6, No. 2, issue of April 1950, p. 184-188.

Wechsler. Chagnon[8] justifies his choice by stating that Foster's weighted scores eliminated only one disadvantage of the weighted score scales. Spitz' solution would have made useless the Table of Weighted Scores where the results obtained by a subject are compared to the mean of the general population.

The Barnett Psychogram was chosen for use in this study because of its applicability to the problem, and because it was much more practical for this particular study.

The method was as follows: The raw scores were first converted to Z scores using the formula $Z = \frac{X-M}{6}$[9] where the Mean and Standard Deviation for each factor were the values obtained for the combined experimental and control groups.

Then the four Z scores for each individual were treated as a distribution of scores for which the Mean and Standard Deviation were then computed. Any deviation of greater than one standard deviation above or below the individual's own mean was regarded as a significant deviation. A psychogram of such deviations was prepared for each individual. An example of a Barnett psychogram

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8 Maurice Chagnon, op. cit., p. 23-25.

9 Lawrence T. Dayhaw, Manuel de Statistique, Ottawa, Editions de L'Universite d'Ottawa, 1958, p. 75.

may be seen in Appendix 1.

It will be noted that only four of the five subtests of the Primary Mental Abilities Test were used in the attempt to establish the pattern. The Number Factor was not used in this particular study because of the atypical features it manifested in the study reported previously in this chapter.

In preparing the data to investigate the first part of the hypothesis, i.e., that there is no common pattern of the PMA subtest scores for schizophrenics, Barnett Psychograms were computed for each subject. The deviations of the schizophrenics both one standard deviation above and one standard deviation below each individual's mean were charted. The percentages of positive, negative and no deviations were checked for every factor to establish a common pattern for schizophrenia.

The second part of the hypothesis suggested that even if a pattern existed that was common to schizophrenics, it might not be specific to them. The efficiency of the patterns was checked by ascertaining the number of schizophrenics and the number of the control group that were correctly and incorrectly classified by the patterns and applying a two by two Chi-Square Table to these frequencies.

The third part of the hypothesis dealt with the possibility that a variety of performance by the various

sub-groups of schizophrenics might interfere with the establishment of a common pattern for the experimental group. Possible raw score differences between the performance of the paranoids, hebephrenics, catatonics and simple schizophrenics were investigated by means of a one-dimensional analysis of variance for every factor of the PMA.

The relative efficiency of the patterns to differentiate each of the four types of schizophrenia was also checked by employing a two by four Chi-Square Table to the frequencies of those picked up and not picked up by the pattern in each category.

The relative efficiency of the pattern to pick up each sub category from the residual of the experimental group, i.e., the relative efficiency of the pattern to pick up paranoids from non-paranoids etc., was also checked by means of a two by two Chi-Square Table for each category.

In the next chapter we shall see the results that followed the employment of the above experimental procedure.

CHAPTER III

RESULTS

The objective of this study was to determine whether or not a specific pattern existed on the Primary Mental Abilities Test, Form AH, for schizophrenics. It was hypothesized that the diagnostic pattern might not be obtained because

1° there is no scatter pattern common to schizophrenics or

2° if there is a scatter pattern common to schizophrenics it is not specific to them or

3° the different schizophrenic subgroups perform differently on the PMA. The results of the experiment designed to test the above will be discussed in this chapter.

The method of obtaining patterns chosen for this study was the Barnett psychogram as described in Chapter II. Barnett psychograms were drawn up for each individual. The distribution of the scores, as they fell within, above or below one standard deviation from each individual's mean, are tabled for every factor, with a deviation of less than one standard deviation above or below the individual's mean being designated by a 0, a negative deviation of one sigma or more below the mean being designated by a -, and a positive deviation of one sigma or more above the mean

earning a +. The results of these tabulations may be seen in Table V.

By inspection of this table, we note that in the performance of the schizophrenics there were no common trends in the Verbal or Space factors. Fifty-two percent of the schizophrenics exhibited no deviations on the Verbal factor, with forty-eight percent showing some type of deviation. On the Space factor, fifty percent showed no deviation.

There is a trend in the Reasoning factor. Eighty-one percent of the schizophrenics did not deviate outside of the limits of one standard deviation from their own mean, that is to say that four out of five schizophrenics showed no deviation on the Reasoning factor.

On the Word Fluency factor, four out of five schizophrenics exhibited either no deviation, or a deviation in the negative direction.

In applying these factors individually to the control population, we find that using the criterion of the Reasoning factor not deviating, six out of ten of our controls could be classified as schizophrenics. In applying the Word Fluency criterion, seventy-two percent of the controls would be picked up as schizophrenics.

If both signs are applied, that is, taking as the pattern Reasoning not exhibiting any deviation and Word

Table V.- Frequency Distribution of the P.M.A. Deviations Obtained by Schizophrenics and Firemen as Computed from their Barnett Psychograms[1].

	V			S			R			W		
	+	0	-	+	0	-	+	0	-	+	0	-
Schizophrenics	29	52	19	27	50	23	10	81	9	18	49	33
Firemen	12	64	24	26	50	24	18	62	20	28	57	15

1 Symbol +, 0 and - are explained on pages 43-44.

Fluency exhibiting no deviation, or a deviation in the negative direction, sixty-six percent of the experimental group would be classified as schizophrenics as opposed to thirty-nine percent of the control group. In applying the Chi-Square technique to these results, the Chi-Square was 14.64, which is significant at the .01 level of confidence.

The diagnostic efficiency of the pattern was evaluated by considering the total percentage of correct diagnoses. In the total group, 63.5 percent of the subjects were correctly classified. The combined number of false positives and false negatives made up 33.5 percent of the total group.

On the basis of these results, the first part of our hypothesis, i.e., that there is no pattern on the PMA that is common to schizophrenics must be rejected. The common pattern is: Reasoning 0, Word Fluency 0 or -.

The second part of our hypothesis suggested that if there were a common pattern it might not be specific to schizophrenics alone. From our results it looks as if it could be specific to the schizophrenics, for when compared with a group of one hundred subjects, the pattern was successful in picking up schizophrenics at a statistically significant level. However, results from other groups should be obtained before the generalization can be made that the pattern is truly diagnostic of schizophrenia, for

it is possible that the pattern could be characteristic of the psychotic, or the emotionally imbalanced.

The third part of our hypothesis was that a diagnostic pattern would not be obtained because the different subgroups of schizophrenia performed differently on the PMA. If this were so, possible subgroup results might neutralize each other for the purpose of obtaining a pattern that was common to the group as a whole.

Having obtained a pattern that was common to the schizophrenics, the third part of the hypothesis would now be inapplicable. However, an investigation of the performance of the various subgroups is still in order due to the possible effect that such differences might impose on an obtained pattern. Also to be investigated is the relative efficiency of the obtained pattern to identify the various types of schizophrenic.

The comparison of the raw scores on the PMA between the four types of schizophrenia was made by one dimension analyses of variance for each PMA factor. The results for the Verbal factor are to be found in Table VI; for the Space factor in Table VII; for the Reasoning factor in Table VIII; for the Number factor in Table IX, and for the Word Fluency Factor in Table X. None of these results were significant at the .01 level of probability, thus indicating that no difference was found in the way that

Table VI.- Table of Variance for Intercomparison of Four Schizophrenic Types on the Verbal Factor of the P.M.A.

Source of Variation	Sum of Squares	Degrees of Freedom	Estimate of Variance
Between Groups	580.0071	3	193.3357
Within Groups	9,612.9829	96	100.1352

$$F = \frac{193.3357}{100.1352} = 1.93 \quad (P.01,\ F = 4.04)$$

Table VII.- Table of Variance for Intercomparison of Four Schizophrenic Types on the Space Factor of the P.M.A.

Source of Variation	Sum of Squares	Degrees of Freedom	Estimate of Variance
Between Groups	443.8989	3	147.9663
Within Groups	9,019.1411	96	93.9494

$$F = \frac{147.9663}{93.9494} = 1.57 \text{ (P.01, F = 4.04)}$$

Table VIII.- Table of Variance for Intercomparison of Four Schizophrenic Types on the Reasoning Factor of the P.M.A.

Source of Variation	Sum of Squares	Degrees of Freedom	Estimate of Variance
Between Groups	79.6075	3	26.5358
Within Groups	3,578.1825	96	37.2727

$$F = \frac{26.5358}{37.2727} = 0.712 \quad (P.01,\ F = 4.04)$$

Table IX.- Table of Variance for Intercomparison of Four Schizophrenic Types on the Number Factor of the P.M.A.

Source of Variation	Sum of Squares	Degrees of Freedom	Estimate of Variance
Between Groups	580.0071	3	193.3357
Within Groups	9,612.9829	96	100.1352

$$F = \frac{193.3357}{100.1352} = 1.93 \quad (P.01,\ F = 4.04)$$

Table X.- Table of Variance for Intercomparison of Four Schizophrenic Types on the Word Fluency Factor of the P.M.A.

Source of Variation	Sum of Squares	Degrees of Freedom	Estimate of Variance
Between Groups	474.7588	3	158.2529
Within Groups	21,024.2312	96	219.9002

$$F = \frac{158.2529}{219.9002} = .72 \quad (P.01,\ F = 4.04)$$

paranoids, catatonics, simple and hebephrenic schizophrenics perform on the various subtests of the PIA.

In attempting to determine whether the pattern that was common to the schizophrenics was more efficient in picking up one particular type of schizophrenia, a two by two Chi-Square Table was set up. The Chi-Square obtained was 2.175, which is not significant at the .01 level of confidence.

As an adjunct of the above, each particular subgroup of schizophrenia was compared with the total remaining schizophrenics to see if any one type could be more effectively differentiated from the residual.

The Chi-Squares obtained on the two by two tables were as follows: for the paranoid group, 1.027; for the catatonic group, .444; for the simple schizophrenics, .349; and for the hebephrenics, 1.067. None of these are significant at the .01 level of confidence, and we conclude that we were unable to find any type being more effectively picked out from the remaining schizophrenic population by the pattern discovered.

SUMMARY AND CONCLUSIONS

This study is concerned with the diagnostic concomitants of subtest score variations in a factorized test of intelligence.

Chapter I presented the rationale and the early history of pattern analysis. The literature was reviewed on the use of pattern or scatter analysis with the Binet and the Wechsler-Bellevue and some indications of the limitations of each of these tests for diagnostic work.

It appeared that point scales were more suitable for psychodiagnostics than the age scales. The Wechsler-Bellevue, as the representative of the point scales, did have some weaknesses, one of which was the construction of the subtests, which contained some overlapping. The imminent question arose: what would happen if pattern analysis were attempted with a point scale in which the subtests were factorized?

The Primary Mental Abilities Test, Form AH, was chosen as being representative of factorized tests of intelligence with the additional quality of being a group test. The test was described, and its validity and reliability discussed.

It was hypothesized that schizophrenics would not obtain a diagnostic pattern on the Primary Mental Abilities Test, Form AH, because

1° there is no pattern common to schizophrenics or
2° if there is a pattern it is not characteristic of schizophrenics alone or
3° the various subgroups perform differently on the PMA thus eliminating any pattern common to the schizophrenics as a whole.

The second chapter presented the experimental procedure. The principles of selection were given for the experimental and control groups. Both groups were described with respect to age and education. The numerical subgroup composition of the experimental group was given. Each of the groups was described in terms of the raw score results on the PMA. These performances were compared with that of the standardizing population and with each other, and some unexpected results were obtained which led to the exclusion of the Number factor in the work on pattern analysis.

The standardized administrative procedure was followed. The test was administered to both the experimental and control groups in groups of six. The method of obtaining a pattern and of attempting to investigate its efficiency was also given.

Chapter III presented the pattern that was common to the schizophrenics, which consisted of no deviation on the Reasoning factor, and either no deviation or a negative deviation on the Word Fluency factor. The pattern was not

found to be more effective in picking up any individual subtype of schizophrenia.

The finding of a pattern that was characteristic of the schizophrenics tested enabled us to reject the first part of the hypothesis that no characteristic pattern existed. That this pattern remained statistically significant in picking up schizophrenics when applied to the control group might lead to the assumption that there is a diagnostic pattern for schizophrenics on the PMA.

The problem of whether or not this pattern is truly diagnostic of schizophrenia still remains to be seen. Although it is probable that it might be, only further research would indicate whether this pattern is characteristic only of schizophrenics, or whether it is common among other groups, e.g. among psychotics or among various types of emotional disturbance.

The third part of the hypothesis, that there is no schizophrenic PMA pattern because the different subgroups perform differently, was somewhat inapplicable following the discovery of a common pattern in schizophrenia. However, the performance of the various subgroups was investigated, as the possibility would still exist that variety of performance by the different types of schizophrenia might influence the nature of the pattern. No significant difference in the performance of the various types of schizophrenia was

found on any factor of the PMA.

The obtained pattern of no deviation on Reasoning and a minus deviation on Word Fluency is in agreement with certain aspects of the studies completed by Wechsler.

Wechsler[1] found that schizophrenics obtained poor scores on the Similarities Test, and stated that this was evidence of impaired functioning in Reasoning. While the schizophrenics in the present study showed no deviation from the mean of their PMA scores on Reasoning, it is to be remembered that their mean score on every factor is significantly lower than that of either the control group or the standardizing population. This would confirm Wechsler's results that there is impairment of Reasoning in schizophrenia.

Wechsler[2] also found that the schizophrenic was unable to deal with specific situations. This was confirmed in our study by the trend of the schizophrenics to obtain a minus deviation score on the Word Fluency Test, indicating their inability to maintain directed effort.

It is to be noted that some of the subgroups, particularly the hebephrenic group, were rather small,

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1 David Wechsler, op. cit., p. 155.

2 Idem, p. 155.

and research on larger groups is to be recommended. Another direction for further research is a cross- validation of the obtained results through the analysis of the performance of larger and more varied groups. Also to be recommended is further work on the adult standardization of every factor of the Primary Mental Abilities Test, Form AH, with particular attention being given to the Number factor.

It would appear that the common pattern obtained by schizophrenics on the Primary Mental Abilities Test, Form AH, is probably diagnostic. Further work with other groups and on larger samples is to be recommended.

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Barnett devised a method to facilitate comparison of the various subtests. This article describes the method which involves the use of Z-Scores.

In this thesis Barnett's method was applied to the P.M.A. to make possible the comparison of the various subtest scores.

Bijou, Sidney, "The Psychometric Pattern Approach as an Aid to Clinical Analysis - A Review", in the American Journal of Mental Deficiency, Vol. 46, No. 3, issue of January 1942, p. 354-362.

Bijou indicates that the major problems in the pattern method are the aspects of behaviour to be measured, and what kinds of tests will be required to measure them.

Although not a thorough review of the psychometric pattern approach, the study indicates some defects found in some of the studies used with this method.

Chagnon, Maurice, Utilisation de l'Echelle d' Intelligence Ottawa-Wechsler, Ottawa, Les Editions de L'Universite D'Ottawa, 1955, 56 p.

This manuel includes information for the interpretation of the Ottawa-Wechsler. It was particularly useful for this study because it includes an excellent discussion of the various methods used in pattern analysis.

Cohen, Jacob, A Comparative Analysis of Factors Underlying Intelligence Test Performance of Different Neuropsychiatric Groups, Microfilm Ph.D. Thesis, University of New York, 1950, 162 p.

This study found similar functional abilities underlying the performance of the Wechsler-Bellevue Intelligence Scale in neurotics, schizophrenics and brain damaged people.

Cohen's thesis contains a good review of the literature on scatter analysis.

Dreikurs, Rudolf, and Raymond Corsini, "Twenty Years of Group Psychotherapy", in the American Journal of Psychiatry, Vol. 110, No. 9, issue of February 1954, p. 566-575.

Dreikurs and Corsini reviewed the field of group psychotherapy with the intention of clarifying its purposes, methods, and mechanisms. The article is accompanied by an excellent bibliography.

Of particular value for our study were their conclusions regarding patient ratio in activity groups.

Foster, Austin, "Age the Wechsler-Bellevue Scattergraph", in the Journal of Clinical Psychology, Vol. 3, No. 4, issue of October 1947, p. 396-397.

Foster suggests that normal decline in test scores with advancing age complicates any pattern analysis on the Wechsler-Bellevue. He discusses the construction of tables for correction of the age error.

This article indicated one way of avoiding one of the defects that may hamper pattern analysis.

Garfield, Sol, "A Preliminary Appraisal of Wechsler-Bellevue Scatter Patterns in Schizophrenia", in the Journal of Consulting Psychology, Vol. 12, No. 1, issue of January-February, 1948, p. 32-36.

This study is an attempt to analyze the performance of schizophrenics on the Wechsler-Bellevue scale in terms of possible group psychometric patterns.

Garfield concludes that there are no reliable scatter patterns for schizophrenic subjects. He indicates a few of the reasons why caution should be used in attempting to apply patterns for psychometric tests.

Gilliland, A.R., Littman, Phyllis and Goldman M., "Patterns and Scatter of Mental Abilities in Various Psychoses" in the Journal of General Psychology, Vol. 29, issue of October 1943, p. 251-260.

Ten subtests of the Wechsler-Bellevue were administered to schizophrenics, paretics, manics, psychoneurotics, drug and alcoholic cases and mental defectives. The distribution of the means and sigmas for the control and six other groups were analyzed. The results indicated that there was no greater scatter in abilities among any of the psychotic groups or the mentally deficient than among the normal control group which consisted of one hundred attendants.

Various factors are not controlled in this study, e.g., age, education, intellectual capacity, length of illness etc. Some of the groups had seventeen subjects, while others had as many as ninety-two. There is also some question as to the representativeness of the samples.

This is a rather poorly controlled study which draws many unwarranted conclusions regarding pattern analysis on the Wechsler-Bellevue.

Harper, A., "Discrimination of the Types of Schizophrenia by the Wechsler-Bellevue Scale", in the Journal of Consulting Psychology, Vol. 14, No. 4, issue of August 1950, p. 290-292.

This study was an attempt to measure patterns in a sample of 245 schizophrenics by means of Fisher's discriminant function.

This was a very thorough study. Comparisons were made initially on the basis of twenty-one variables, and then on the basis of the three variables: I.Q., chronological age and education.

Some parts of the method are not too clearly explained.

Harris, Albert J. and David Shakow, "The Clinical Significant Numerical Measures of Scatter on the Stanford-Binet", in the Psychological Bulletin, Vol. 34, issue of January 1937, p. 134-150.

This article contains a review of the literature of scatter with the Stanford-Binet, and some reasons given for opposing results.

Harris, Albert J. and David Shakow, "Scatter on the Stanford-Binet in Schizophrenia, Normal and Delinquent Adults", in the Journal of Abnormal and Social Psychology, Vol. 33, No. 1, issue of January 1938, p. 100-111.

This was an excellent study of scatter on the Stanford-Binet in which four different scatter measures were used. Mental age was held constant, and there were no significant differences.

Hewson, Louise R., "The Wechsler-Bellevue and the Substitution Test as Aids in Psychiatric Diagnosis", in the Journal of Nervous and Mental Disease, Vol. 109, No. 2, issue of February 1949, p. 158-183.

On the basis of the subtest scores of the Wechsler-Bellevue Test, Hewson establishes several ratios to distinguish between neurotics, normals and organics. A weakness in the study is that the norms do not consider other categories, such as the psychotics.

Heyer, Albert W., "Scatter-Analysis Techniques Applied to Anxiety Neurotics from a Restricted Cultural, Educational Environment", in the Journal of General Psychology, Vol. 40, issue of April 1949, p. 155-159.

Heyer found that the earlier publicized Wechsler scatter patterns were not successful in differentiating a sample of neurotics and normals derived from a restricted culture-educational environment.

Heyer is rather critical of the limitations of other studies using scatter analysis, but neglects to see the uncontrolled variables in his own.

Holzberg, Jules D. and Maurice A. Deane, "The Diagnostic Significance of an Objective Measure of Intra-Test Scatter on the Wechsler-Bellevue Intelligence Scale", in the Journal of Consulting Psychology, Vol. 14, No. 3, issue of June 1950, p. 180-188.

An objective measure of intra-test scatter on the Wechsler-Bellevue subtests was devised and applied to a group of neurotics, organics and schizophrenics. Although the method is somewhat involved and time-consuming, it appears to differentiate these three groups more significantly than other methods of analyzing the Wechsler-Bellevue.

Hunt, J. McVey, Ed., Personality and the Behaviour Disorders, Vol. II, New York, The Ronald Press Company, 1944, p.

This is the second of two volumes devoted to a careful, thorough and systematic presentation of opinions and results of research on personality and its disorders.

Of particular value for this study was Hunt's excellent chapter on psychological deficit in mental functioning.

Jastak, Joseph, "Ranking Bellevue Subtest Scores for Diagnostic Purposes", in the Journal of Consulting Psychology, Vol. 17, No. 6, issue of December 1953, p. 403-410.

This is an investigation of Wechsler's sign lists for diagnostic purposes. It presents some of the instances where the diagnostic signs hold up, but indicates that neither schizophrenics or organics can be adequately differentiated from each other by test results. It is a useful article in helping to evaluate pattern analysis.

Klugman, S.F. "The Effect of Placement of the Digit-Test in the Wechsler-Bellevue Intelligence Scale", in the Journal of Consulting Psychology, Vol. 12, No. 5, issue of September-October, 1948, p. 345-348.

Klugman's study indicates that there are significant differences in results when the Digit Span Subtest is administered at the beginning, in the middle and at the end of the battery.

This study is very helpful in indicating the importance of following the standardized administration procedures.

Magaret, Ann, "Parallels in the Behaviour of Schizophrenics, Paretics and Pre-Senile Non-Psychotics", in the Journal of Abnormal and Social Psychology, Vol. 37, No. 4, issue of October 1942, p. 511-528.

Magaret compared the mean standard scores of the eleven Wechsler subtests for each of the three groups. The psychotic group fell below the non-psychotic group on every test, with the paretics being consistently lower than the schizophrenics.

Magaret A. and C. Wright, "Limitations in the Use of Test Performance to Detect Mental Disturbance", in the Journal of Applied Psychology, Vol. 27, No. 5, issue of October 1943, p. 387-398.

This study compared the test performances of morons, schizophrenics and normal controls in the age group from thirty to thirty-nine. The signs that were reported in previous studies failed to differentiate the three groups.

This was another helpful article in attempting to evaluate pattern analysis. It has the merit of holding age constant in the three groups.

Malamud, W., and E.M. Palmer, "Intellectual Deterioration in the Psychoses", in the Archives of Neurology and Psychiatry, Vol. 39, issue of 1938, p. 68-81.

This was another pattern analysis study conducted with schizophrenics, organics and defectives. The schizophrenics and organics showed significantly greater scatter than those of subnormal intelligence.

This was one of the studies that controlled for mental age.

Rabin, A.I., "Test-Score Patterns in Schizophrenics and Non-Psychotic States", in the Journal of Psychology, Vol. 12, No. 2, issue of July 1941, p. 91-100.

Rabin devised an index which he felt to be characteristic of schizophrenia or schizophrenic deterioration.

The study illustrates one of the different approaches used in relating psychometric characteristics to disease symptomatology.

--------, "Differentiating Psychometric Patterns in Schizophrenia and in Manic Depressive Psychosis", in the Journal of Abnormal and Social Psychology, Vol. 37, No. 2, issue of 1942, p. 270-272.

A comparison of the Wechsler-Bellevue test patterns of schizophrenics, manics and student nurses was made by (1) Sub-test mean and Rank comparisons, (2) Discrepancies between Verbal and Performance Scales and (3) the Schizophrenic Index. The schizophrenics obtained higher Verbal I.Q.'s, while the manics obtained higher I.Q.'s on the Performance Scale.

The schizophrenic index differentiated between the schizophrenics on the one hand and nurses and manics on the other.

This study uses three approaches in analyzing psychometric data for diagnostic purposes.

Rapaport, David, Diagnostic Psychological Testing, Vol. 1, Chicago, The Year Book Publishers, Inc., 1946, 573 p.

This volume explores systematically the diagnostic potentialities of several psychological tests. One of the criticisms that could be made is that the groups employed in the various studies are very small and inadequately described.

Of particular value to this study was the review of scatter analysis, and the reviews of the Stanford-Binet and the Wechsler-Bellevue Test.

Schlosser, John R. and Robert E. Kantor, "A Comparison of Wechsler's Deterioration Ratio on Psychoneurosis and Schizophrenia", in the Journal of Consulting Psychology, Vol. 13, No. 2, issue of April 1949, p. 108-110.

This study compared neurotics and psychotics by means of Wechsler's Deterioration Ratio. No significant statistical differences were found between the two groups, nor was there a significant statistical difference found between a paranoid group and a residual schizophrenic group composed of the simple, catatonic and hebephrenic categories.

This well-controlled study illustrates still another method of attempting to implement an intelligence test for psychodiagnostic purposes.

Thurstone, L.L. and Thelma Gwinn Thurstone, Examiner Manual for the SRA Primary Mental Abilities Test, Form AH, Intermediate, Chicago, Science Research Associates, 1949, 19 p.

This manual contains directions for the administration scoring and interpretation of the PMA, Form AH. The relationship of the test to other tests is discussed and many references given.

A serious lack in this manual is the absence of data regarding the standardizing population.

Wechsler, David, The Measurement of Adult Intelligence, Third Edition, Baltimore, the Williams and Wilkins Company, 1944, 258 p.

This book is intended to be an accompanying manual for the Wechsler-Bellevue Intelligence Test. It contains a theoretical section on the nature and classification of intelligence as well as sections on the administration and interpretation of the test. It also includes a bibliography of most of the important studies with the Wechsler-Bellevue Scale.

Wechsler's overview of pattern analysis and his studies on schizophrenics were of particular value to this study.

APPENDIX I.

Factor	Raw Score	Z-Score	Z-M	Pattern
V	24	+.3876	+.5501	0
S	13	-.0813	+.0812	0
R	10	+.1582	+.3207	0
W	13	-1.1146	-.9521	-

$\Sigma(Z-M)^2 = 1.31855$

$\Sigma = -.6501$ $\quad \sigma^2 = .329636$

$M = -.1625$ $\quad \sigma = .5741$

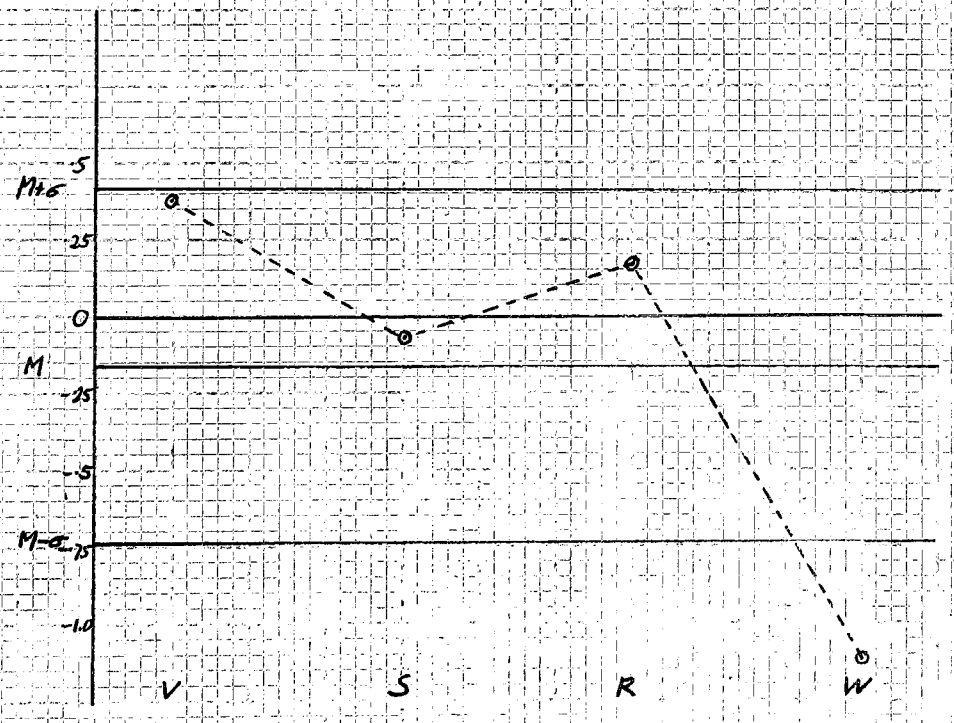

Figure 1.- Barnett Psychogram of Experimental Subject Nº 31.

APPENDIX 2

Table XI.- Raw Scores Obtained by the Experimental Group for Every Factor of the P.M.A.

	V	S	R	N	W
1	30	1	10	33	54
2	1	0	1	5	12
3	3	0	2	4	17
4	8	5	2	5	8
5	9	3	1	14	13
6	21	15	1	12	12
7	27	19	7	19	21
8	4	1	1	0	8
9	21	6	9	25	16
10	9	18	10	13	30
11	38	21	11	44	50
12	9	13	0	2	46
13	22	29	13	23	30
14	25	22	12	21	40
15	32	15	14	18	18
16	15	35	3	14	21
17	40	20	18	34	64
18	15	2	3	20	15
19	43	31	13	16	23
20	19	0	1	11	27
21	15	0	2	6	19
22	4	0	0	0	13
23	9	0	1	11	14
24	28	10	10	15	28
25	35	0	5	23	26
26	21	0	1	13	32
27	21	17	6	22	30
28	7	21	19	20	20
29	26	15	12	30	38
30	9	0	0	0	7
31	24	13	10	15	13
32	25	15	1	13	26

Table XI.- Continued - Raw Scores Obtained by the Experimental Group for Every Factor of the P.M.A.

	V	S	P	N	W
33	8	5	1	7	17
34	0	0	0	0	12
35	19	6	5	16	38
36	13	11	10	11	37
37	8	0	2	1	0
38	17	24	7	3	21
39	43	26	25	10	48
40	33	23	5	9	34
41	0	0	0	0	1
42	16	0	3	21	20
43	6	0	2	4	3
44	11	14	2	11	22
45	46	20	22	28	29
46	1	0	0	0	0
47	11	0	0	8	49
48	29	26	14	14	30
49	12	0	4	20	24
50	14	9	5	16	21
51	6	4	2	9	20
52	11	0	0	7	7
53	13	0	1	0	9
54	32	16	17	31	48
55	26	13	10	12	29
56	4	0	1	6	0
57	12	0	12	28	26
58	17	22	11	17	32
59	13	0	14	17	43
60	37	15	18	20	35
61	17	0	5	26	19
62	17	0	0	20	13
63	17	5	10	24	14
64	11	7	4	7	21

Table XI.- Continued - Raw Scores Obtained by the Experimental Group for Every Factor of the P.M.A.

	V	S	[illegible]	N	[illegible]
65	6	0	0	0	2
66	20	5	8	13	30
67	7	13	8	4	17
68	11	0	4	15	32
69	[illegible]	6	4	1[illegible]	15
70	16	0	3	26	34
71	13	30	11	5	33
72	49	6	20	33	47
73	26	41	23	24	44
74	2	0	5	0	9
75	0	0	1	5	2
76	14	11	5	16	35
77	5	0	7	0	6
78	2	0	0	0	0
79	4	0	0	2	7
80	13	4	4	14	26
81	4	0	0	4	0
82	21	10	9	6	26
83	10	5	3	16	23
84	[illegible]	6	1	0	16
85	9	0	1	22	6
86	22	0	3	0	13
87	1	0	1	1	6
88	13	0	7	17	15
89	19	17	10	19	33
90	6	0	1	4	7
91	22	0	1	0	47
92	2	0	1	1	5
93	0	0	0	0	9
94	7	0	1	13	6
95	0	2	0	0	7
96	0	0	0	0	0

Table XI.- Continued - Raw Scores Obtained by the Experimental Group for Every Factor of the P.F.A.

	V	S	[illegible]	N	[illegible]
97	6	1	0	9	14
98	17	3	11	28	39
99	0	0	0	0	0
100	3	0	1	0	1

Table XII.- Raw Scores Obtained by the Control Group for Every Factor of the P.M.A.

	V	S	D	N	W
1	13	14	8	29	35
2	34	12	4	20	36
3	20	30	21	29	38
4	30	36	11	53	30
5	22	36	6	13	29
6	28	18	12	33	36
7	26	10	2	39	22
8	21	11	8	26	43
9	18	1	6	35	41
10	31	7	20	29	44
11	27	36	14	34	39
12	23	3	7	36	50
13	28	0	12	32	38
14	45	29	17	49	50
15	18	22	8	26	33
16	14	26	3	8	41
17	28	43	21	44	47
18	9	22	10	19	20
19	0	27	15	40	36
20	14	12	9	25	34
21	10	29	10	15	36
22	16	0	7	19	66
23	30	17	21	36	54
24	22	22	12	22	48
25	21	19	12	22	54
26	19	23	13	20	46
27	27	24	20	28	69
28	24	32	19	46	55
29	18	21	9	26	51
30	29	25	18	30	46
31	19	0	7	24	47
32	26	1	18	28	29
33	23	26	11	29	57
34	25	15	19	64	42
35	26	26	23	34	43

Table XII.- Continued - Raw Scores Obtained by the Control Group for Every Factor of the P.M.A.

	V	S	[illegible]	N	[illegible]
36	17	17	14	26	52
37	17	31	19	21	46
38	17	0	2	15	31
39	26	24	13	45	43
40	19	19	7	35	40
41	4	28	4	10	25
42	21	12	9	20	42
43	30	25	11	36	48
44	26	23	18	35	47
45	42	30	9	48	59
46	22	41	16	15	44
47	12	15	1	15	34
48	15	18	8	32	46
49	20	26	14	46	57
50	23	4	7	15	48
51	48	49	29	33	69
52	22	44	10	26	48
53	22	6	2	21	49
54	23	44	7	45	45
55	18	13	5	24	27
56	16	17	3	30	32
57	35	15	18	25	58
58	32	16	25	53	52
59	34	35	20	26	65
60	13	6	14	27	44
61	21	22	12	31	30
62	16	21	11	22	37
63	21	23	9	31	15
64	24	31	15	44	34
65	25	34	20	16	53
66	26	9	17	22	44
67	28	28	9	32	45
68	47	24	16	38	55
69	21	0	13	41	50
70	32	13	24	31	40

Table XII.- Continued - Raw Scores Obtained by the Control Group for Every Factor of the P.M.A.

	V	S	I	N	W
71	34	9	19	62	56
72	36	31	18	57	50
73	26	13	10	12	46
74	25	24	13	31	38
75	46	21	11	30	34
76	26	19	18	46	33
77	18	16	4	10	31
78	29	21	14	12	45
79	13	15	3	3	36
80	24	8	6	25	47
81	21	20	16	19	28
82	29	30	8	24	38
83	33	20	10	27	26
84	35	20	23	46	31
85	28	17	6	11	42
86	26	39	3	29	42
87	20	9	9	28	34
88	32	16	15	47	38
89	29	16	17	37	33
90	12	26	12	19	20
91	21	22	2	17	24
92	25	20	10	42	30
93	39	35	14	46	68
94	36	8	6	41	29
95	16	19	4	12	32
96	22	8	10	38	25
97	17	27	9	38	35
98	22	20	22	41	32
99	25	30	19	28	39
100	44	28	16	48	49

APPENDIX 3

ABSTRACT OF

Is There a Schizophrenic Pattern on the P.M.A.?[1]

An endeavour was made in this study to investigate the possible existence of a diagnostic pattern for schizophrenia on the Primary Mental Abilities Test, Form AH. The experimental group consisted of 100 hospitalized schizophrenics, while the control group was composed of 100 firemen.

The criterion of selecting the paranoid, catatonic, simple and hebephrenic schizophrenics was an independent diagnosis given by three psychiatrists. The pattern analysis was completed in terms of individual Z-Score profiles after the manner of Garnett.

The analysis resulted in the discovery of a pattern common to the schizophrenics. When this pattern was applied to the individual profiles it correctly identified sixty-six percent of the experimental group, and gave thirty-nine percent false positives in the control group. The pattern was not found to be relatively more efficient in picking up any particular subgroup of the schizophrenics.

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1 Muriel F. Wilkins, M.A. Thesis, presented to the School of Psychology of the University of Ottawa, Ontario, May, 1959, viii-75 p.

In future research the method should be applied to neurotic and other psychotic groups to determine whether this pattern is characteristic of schizophrenia, of psychotic existence or emotional disturbance in general. Cross-validation studies should also be carried out.