THE UNIQUENESS, NOVELTY, COMPLEXITY, AND VARIABILITY OF RESPONSE IN PROCESS AND REACTIVE SCHIZOPHRENICS

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THE UNIQUENESS, NOVELTY, COMPLEXITY, AND VARIABILITY OF RESPONSE IN PROCESS AND REACTIVE SCHIZOPHRENICS

By

Martin Zlotowski

AN ABSTRACT

Submitted to the School for Advanced Graduate Studies
of Michigan State University in partial
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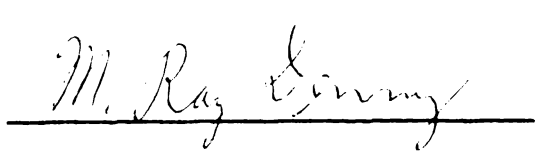
1960

Approved 

ABSTRACT

The present study was designed to investigate the performance of process and reactive schizophrenics on a prolonged repetitive task, which allowed for thousands of variations in response, under instructions to produce many different solutions (patterns of responses).

Process schizophrenia is viewed as a disorder of gradual or insidious onset in which signs of illness can be found early in life. The case histories of patients falling into the process group characteristically reveal absence of precipitating factors, failure to interact with peers in childhood, rigid and inappropriate affect which is noted early in life, and withdrawal symptoms. This group of patients is considered to be chronically ill with little likelihood of recovery.

Case histories of reactive schizophrenics, on the other hand, reveal a fairly good pre-psychotic adjustment and a relative absence of symptomatic signs noted in the process group. The precipitating stress can generally be identified and the overall prognosis for recovery is good.

The process and reactive patients, in this study, were selected from a sample of 82 hospitalized veterans in a V. A. Neuropsychiatric hospital on the basis of scores obtained on Becker's revision of the Elgin Prognostic Scale. The 20 patients having the lowest scores comprised the reactive sample, and the 20 patients having the highest scores made up the process sample. The two groups did not differ with respect to the mean age, level of education, and intelligence.

Additional samples of 29 non-psychotics and 50 normals were also used in the present study.

The apparatus for this study consisted of 8 vertical levers arranged horizontally on a table; 8 green lights which were mounted on a panel directly above, and parallel to the 8 levers; and an amber light located to the right, and above the last green light. Pulling a lever toward the subject lighted the green light directly above it. Pulling all eight levers, in any order, turned on the amber light and signified a successful solution. Thus there were 8 factorial or 43, 200 possible solutions (patterns).

The produced patterns were classified into 5 categories: 1 and 2 (simple patterns), 3 and 4 (relatively simple patterns), and 5 (relatively complex patterns). The data are further analyzed with respect to the number of new and unique patterns and with respect to response-pair frequencies (lever-pair frequencies).

Analysis of the data revealed, essentially as hypothesized, that: (1) the reactive schizophrenics produced significantly greater number of new and unique patterns, a significantly greater number of complex patterns (category 5), and significantly fewer simple patterns (categories 1 and 2) than process patients; (2) the reactive schizophrenics did not differ appreciably from the non-psychotics and normals on the above variables; (3) the non-psychotics and normals differed significantly from process patients in the same direction as the reactives; (4) the patterns produced by process patients consisted of lever-pairs having a high frequency of occurrence, whereas the patterns produced by reactives consisted of lever-pairs having a low frequency of occurrence; and (5) the behavior of process patients could be changed (variability of performance increased), but this change took a longer time and was of a lesser magnitude than was the case with the reactive patients.

The results were discussed in terms of process-reactive theory (levels of personality development) and the consistencies between the present results and other research.

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INTRODUCTION

The Problem of Classification

The continued problem of classifying mental illness has led to frequent re-evaluation of the existing diagnostic categories. As a result, the concept of schizophrenia has undergone considerable scrutiny. Although the Kraepelinian subdivision into simple, paranoid, catatonic, and hebephrenic types is still widely used in the classification of hospitalized patients, its usefulness, notably in research, has often been questioned (Windle 1952, Kelly 1954, King 1954).[1] The growing dissatisfaction with the Kraepelinian system of classification has led to attempts, by many, to develop different and hopefully better diagnostic classifications.

The Development of Process-Reactive Distinction

The process-reactive distinction is not a new or revolutionary classification. Rather, it is an attempt to systematize and organize a considerable amount of thought and research on the part of many investigators (Arieti 1955, Ausebel 1948, 1951; Bellak 1948, 1949; Bleuler 1936; Brackbill 1956; Cameron 1944; Darrah 1940; Hunt and Apple 1940; Kant 1940, 1942; Kretchmer 1928; Langfeldt 1937, 1951; Malamud 1935, Malamud and Render 1940; Muller 1935; Strecker 1928; Sullivan 1947).

Process and reactive syndromes are considered by their originators to represent end-points on a developmental continuum of levels of personality organization (Kantor, Wallner, and Windner 1953; Becker

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[1]The clinicians dissatisfaction is due, in large measure, to the low reliability between diagnosticians in assigning the mentally ill patients to different diagnostic groups. Empirical research by Ash (1949), Mehlman (1952), Schmidt and Fonda (1956), and others has demonstrated the poor reliability of such classification. A further discussion of the shortcomings of the existing system of classification can be found in A. I. Rabin and G. F. King chapter of Bellak's Schizophrenia (1959).

1955, 1956; Fine and Zimet 1958).[2] Process schizophrenia is viewed as a disorder of gradual or insidious onset in which signs of illness can be found early in life. The case histories of patients falling into the process group characteristically reveal a relative absence of precipitating factors, failure to interact with peers in childhood, rigid and inappropriate affect which is noted early in life, and withdrawal symptoms. This group of patients is considered to be chronically ill with little likelihood of recovery.

The histories of patients falling into the reactive group show a fairly good pre-psychotic adjustment and a relative absence of symptomatic signs noted in the process group. The precipitating stress can generally be identified and the overall prognosis for recovery is good.

From the above distinction it can be assumed that patients falling closer to the reactive end of the continuum should have achieved a higher level of personality organization than those patients falling closer to the process end of the continuum. Since the present writer considers that the degree of personality organization is related to (1) the ability of a person to cope with a variety of problems, and (2) the manner in which one attempts to resolve them (which is the main issue of this research), three studies which bear on the relationship between levels of personality organization and the relative position of schizophrenic patients on the process-reactive continuum will now be reviewed.

Becker (1956) investigated the degree of regressive and immature thinking in a group of male and female schizophrenics by means of the

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[2]The concept of levels of personality organization deals with changes in the content or structure of mental organizations as one develops toward psychological maturity. Becker (1956) states that a complete definition of this term would have to include such factors as objectivity in perception, differentiation of needs, interests, and other motivational aspects, and the degree of emotional control. A further discussion of this concept can be found in Baldwin (1955) and Werner (1948).

Rorschach test and the Benjamin Proverbs. Rating of case history material by means of the Elgin Scale (see the modified form of the scale in Appendix I and the discussion of it in the method section) determined the relative position of each patient on the process-reactive continuum. Scaling of schizophrenic metal productions was done by using Friedman's signs.[3] The performance on the Benjamin Proverbs was judged on the basis of "proverb-minus-vocabulary" scores.[4] The results showed that schizophrenic patients with more process-like case histories obtained significantly lower mean-genetic-level scores on the Rorschach test than those schizophrenics with more reactive-like case histories. The results on the Benjamin Proverbs showed male schizophrenics with process-like histories to have significantly lower "proverb-minus-vocabulary" scores, than reactive-like males, but no significant differences were obtained between the two female groups.

Fine and Zimet (1959) replicated in part Becker's study on an all male sample of 36 process and 24 reactive schizophrenics.

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[3]Friedman uses two main categories: genetic-early and genetic-late perceptions. Each genetic group is further divided into three progressive levels--a total of six levels. To derive an overall score for average level of mental organization each response is given a weight from one to six, corresponding to the genetic level of response, and the sum of the weight is divided by the number of responses. The six progressive levels have the following characteristics:

Level one: difuse, global, undifferentiated perceptions.
Level two: Attempt at differentiation in which the difuse nature of perceptions is still evident.
Level Three: Moderate differentiation.
Level Four: Accurate differentiation and simple integration.
Level Five: Clear integration with ability to subordinate differential parts to the whole.
Level Six: Highest form of differentiation found only in mature perceptions. (Abstracted from Becker 1956).

A further elaboration of Friedman's technique can be found in articles by Friedman (1935) and Hemmendinger (1953).

[4]High proverb-minus-vocabulary scores are considered to represent a higher level of personality organization than low proverb-minus-vocabulary scores.

The only difference between the two studies was that Fine and Zimet omitted the Benjamin Proverbs test. The findings closely corraborate those obtained by Becker: those patients classified as process schizophrenics showed significantly more indicies of perceptual immaturity than those classified as reactive, and conversly, reactive schizophrenics showed significantly more indicies of perceptual maturity than the process patients. In the last study, to date, dealing with the relationship between process-reactive schizophrenia and the degree of personality organization, Windner (1959) used a Sullivanian system as means of evaluating the stages of personality development. Age-level Rorschach scores based on five age levels (infancy, childhood, juvenile, pre-adolescence, and adolescence) and rating of psychiatric symptoms during the initial stage of hospitalization determined the extent of personality organization. Correlations between life history pathology (as determined by scores on the Elgin Scale) and personality disorganization supported Windner's hypothesis of continuity between pre-morbid factors and later schizophrenic manifestations, as well as the hypothesis of heterogeneity of characteristics among schizophrenics.

Physiological Differences Among Schizophrenic Groups

Since the process-reactive terminology is rather recent, a limited amount of research has been done in comparing process and reactive subjects with respect to performance and behavior. In fact, the early research centered around the differences in physiological responsiveness in groups analogous to process and reactive types. The majority of these physiological studies (Funkenstein, Greenbladt, and Solomon 1948, 1949, 1953; Hirschstein 1955; Geocaris and Kociker 1956) indicate that groups analogous to reactives show more oscilation and take longer to reach a state of "homoestasis" than do normals.

King (1958) reports success in predicting patients' autonomic responsiveness according to their relative position on the process-reactive continuum. He found reactives to have a significantly greater fall in blood pressure level after mecholyl than process patients. More recent studies by Pearl and Vanderkamp, and by Zuckerman and Grosz fail to confirm King's results. Pearl and Vanderkamp (1960) failed to find differences between process and reactive schizophrenics in autonomic reactivity to mecholyl, whereas Zuckerman and Grosz (1959) report significantly higher autonomic reactivity for process schizophrenics than for reactives. Obviously, the relationship between process-reactive schizophrenia and autonomic reactivity needs further clarification.

Williams (1953), using psychological variables (pictures), rather than chemical stimuli, found early chronic patients to have different GSR, pulse, and respiration rates from normals. Similar results were obtained by DeVault (1955), who was the first to use explicitly process and reactive groups as an independent variable. He found that reactives were similar to normals in amplitude of GSR and heart rate change but tended to be slower in homoestatic recovery than process patients or normals.

Behavioral Differences Between Process and Reactive Schizophrenics

Since the present study is concerned with psychological rather than physiological differences between process and reactive patients, a detailed review of the few studies which bear on behavioral differences will now be presented.

Reisman (1958, 1960) has shown that process and reactive schizophrenics vary in motivation. He used speed of card sorting as a measure of motivational strength and related this to viewing magazine pictures which were judged to vary in the degree of interpersonal

conflict or stress. In one condition, slower sorting than on the preceding trial resulted in the patient's having to view the pictures, whereas in the other condition, the subject was presented with the pictures when he sorted the cards faster than on the trial just preceding it. Control conditions where a neutral light was substituted for the pictures were also included. The results indicated (1) that the reactive patients sorted cards in such a way as to avoid seeing the stressful pictures, and (2) that the process patients sorted in general faster when pictures were involved than when a neutral light was present, whereas this was not true for the reactives or normals. In short, the process patients were motivated by the pictures, particularly in order to see them, while the reactives were negatively motivated toward the pictures. Reisman's study demonstrated both differential performance in process and reactive patients, and differential levels of motivation in a neutral situation.

The second of the series of three studies dealing with behavioral differences between process and reactive patients was performed by Smith (1959) using a pursuit rotor. Subjects were tested under a variety of conditions involving both spaced and massed practice, as well as being shifted from one condition to another. The results showed clear differences in the performance of the two groups. The reactive subjects' performance was relatively better with each shift of conditions than was that of the process patients or normals, and their performance to begin with was depressed more by massed conditions than was true for the process and normal subjects. The main finding with respect to the process group was that their performance kept improving under constant conditions as trials progressed. We may conclude from Smith's study that reactive patients are sensitive to change in conditions and their performance is facilitated by this, whereas process

patients are relatively unaffected by changed conditions and under constant conditions eventually arrive at a performance level comparable to the reactives.

In the last study, Zlotowski and Bakan (1959) attempted to expand on one phase of Smith's study. The authors were interested in seeing whether reactive patients when faced with a prolonged repetitive task calling for more or less uniform behavior would depart, more than the process patients from the routine response for the sake of change. For this purpose, Zlotowski and Bakan had a group of 16 process and 13 reactive schizophrenics guess the outcome of 300 hypothetical coin tosses. Each subject was presented with an IBM sheet containing 300 numbers and told to imagine that he was tossing an imaginary coin, where each toss was independent of every other toss.[5] For each of the three hundred imaginary tosses the subject was told to draw a line through the first column if he felt the coin came out "heads" or through the second column if he felt the toss came out "tails." In order to determine the consistency of the guessing behavior for each group a correlation coefficient was computed between the first and second 150 guesses for each of the two groups. The resulting r for process group corrected by the Spearman-Brown formula was .92 and for the reactive group .50. The two correlations were significantly different. In order to compare the behavior of the two groups a t-test was computed on the mean number of alterations between heads and tails. The results showed reactive patients to alternate significantly more than did the process patients. The above results strongly suggest that reactive patients are much more likely to vary their behavior in a repetitive situation than are process patients.

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[5]In three instances a plain sheet with 300 numbers was substituted for the IBM sheet and the subjects wrote T or H instead of drawing a line.

PURPOSE

The main purpose of the present study was to investigate whether the differential performance of process and reactive schizophrenics would hold up in a different situation than the ones used by Reisman, Smith, and Zlotowski and Bakan, namely, in a situation which lends itself to thousands of variantions in response. More specifically, the two groups were compared on a prolonged repetitive task when instructions to produce many different solutions (patterns of responses) were imposed.

Since the specific wording of hypotheses stems from the statistical procedures which will be applied to the data the hypotheses will be presented in the last section of methodology.

METHODOLOGY

Apparatus

The apparatus for this study was developed by Armitage and Brown (1957) (see Figure 1). The top panel contained eight horizontal green lights arranged four inches apart. The table top contained eight vertical levers which were directly below, and parallel to the eight green lights. Each lever when pulled toward the subject lighted the green light above it, which remained on until the lever was released.

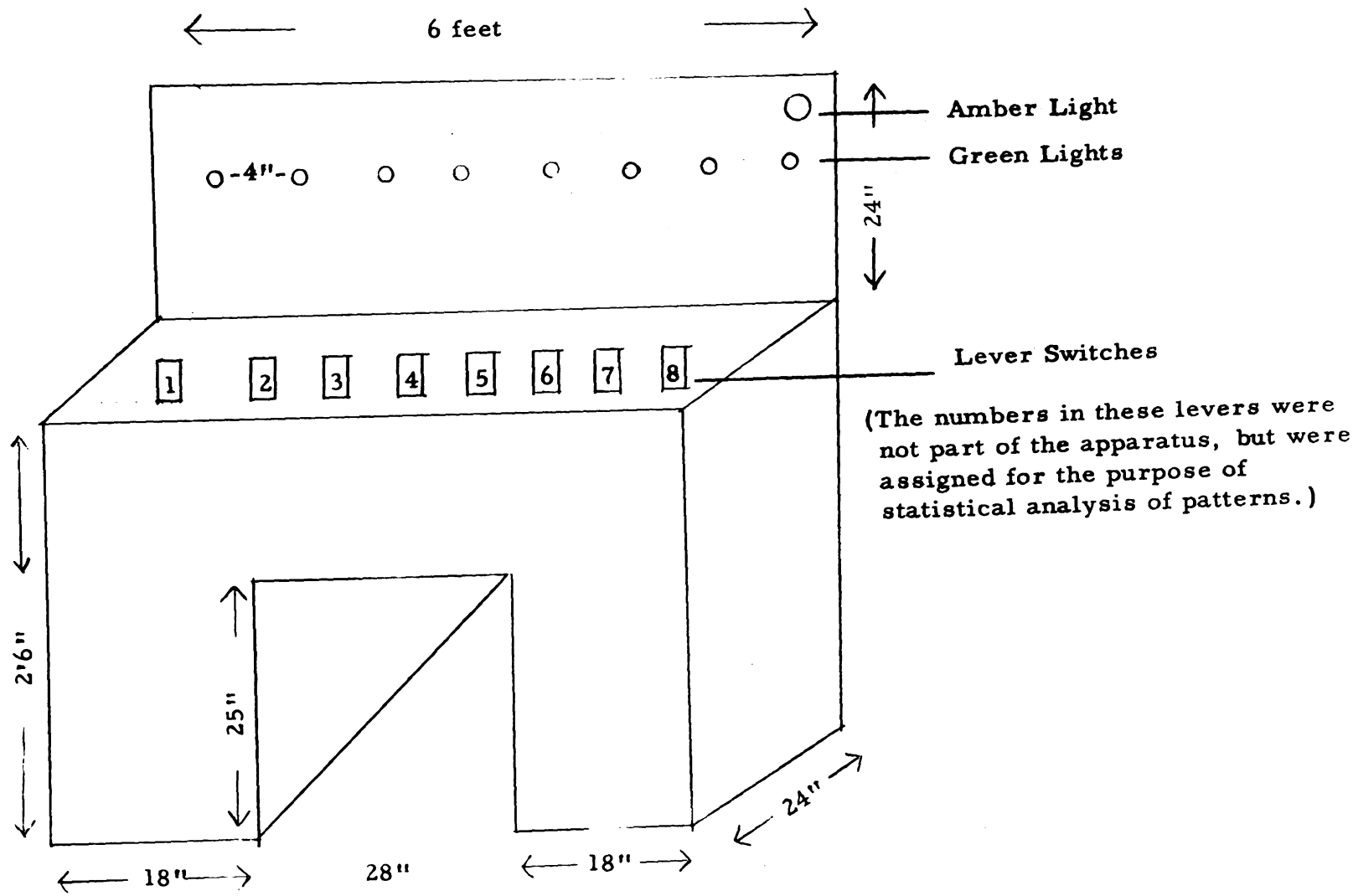
An amber light in the upper-right-hand corner of the panel was lighted when all eight green lights were turned on in any order (the green lights being turned on by pulling each of the eight levers) and could be turned off by means of a foot switch operated by the examiner. The amber light served as a signal to tell the subject that he had solved the problem correctly. Turning off the amber light signalled the subject that he could proceed with the next trial.

The sequences of lever pulls for each trial were recorded electrically by means of an Esterline Angus Recorder. Eight pens corresponded to the eight levers, and a ninth pen which was wired to the amber light indicated termination of a trial.

Subjects

The final sample selected for the present statistical analysis consisted of 40 male schizophrenic patients. Initially, case histories of 108 schizophrenics who had participated in the experiment were examined to determine if they could be rated. However, the case histories of 26 of these patients were too incomplete or contradictory to allow for an adequate evaluation. The remaining 82 were sufficiently complete so that they could be rated by means of Becker's revision of

FIGURE 1. VARIABILITY APPARATUS



the Elgin Prognostic Scale. In the initial selection of patients for this experiment, each patient had to meet the following criteria: no evidence of organic involvement, reality contact adequate enough to comprehend experimenter's instructions, and no shock therapy within six months prior to testing.

Becker's revision of the Elgin Prognostic Scale is a device used for differentiating between process and reactive patients. The Elgin Scale was initially developed by Wittman (1941) for the purpose of predicting prognosis in schizophrenic patients. The scale showed much promise, as rater reliability was high (Wittman 1941, Kantor, Wallner, and Windner 1953; Fine and Zimet 1959) and subsequent research has shown it to be a valid predictor of prognosis (Wittman 1948, Wittman and Steinberg 1944).

Becker undertook the revision of the scale to add precision to the rating. Whereas the original scale utilized only end-points to rate each of the 20 statements, Becker subdivided each of the statements into a number of items "describing more specifically the degree to which the statement was applicable to the person being rated" (Smith 1959), and each of the items had an assigned score. Adding the scores for all items yielded the person's total score. Recent studies by McDonough (1958), Smith (1959), and Becker (1959) show the revised scale to have high rater reliability and yield a continuum of scores which suit the process-reactive distinction better than the original Elgin Scale.[6]

The present writer and a colleague had a two-rater reliability of .91 on 46 of the eighty-two case histories that were rated by both on Becker's revision of the Elgin Prognostic Scale. The remaining 36 case histories were rated only by this writer (see Table A in the Appendix for the actual distribution of scores assigned to the 82 patients). Figure 2 presents the distribution of the given 82 patients on Becker's revision

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[6]A detailed discussion of the revised scale can be found in McDonough (1958) and Smith (1959).

of the Elgin Prognostic Scale. Twenty patients with the lowest scores constituted the reactive sample, and the 20 patients having the highest scores comprised the process sample.

Figure 2. Ratings on Elgin Prognostic Scale (Becker's revision) assigned to population from which psychotic samples were drawn.

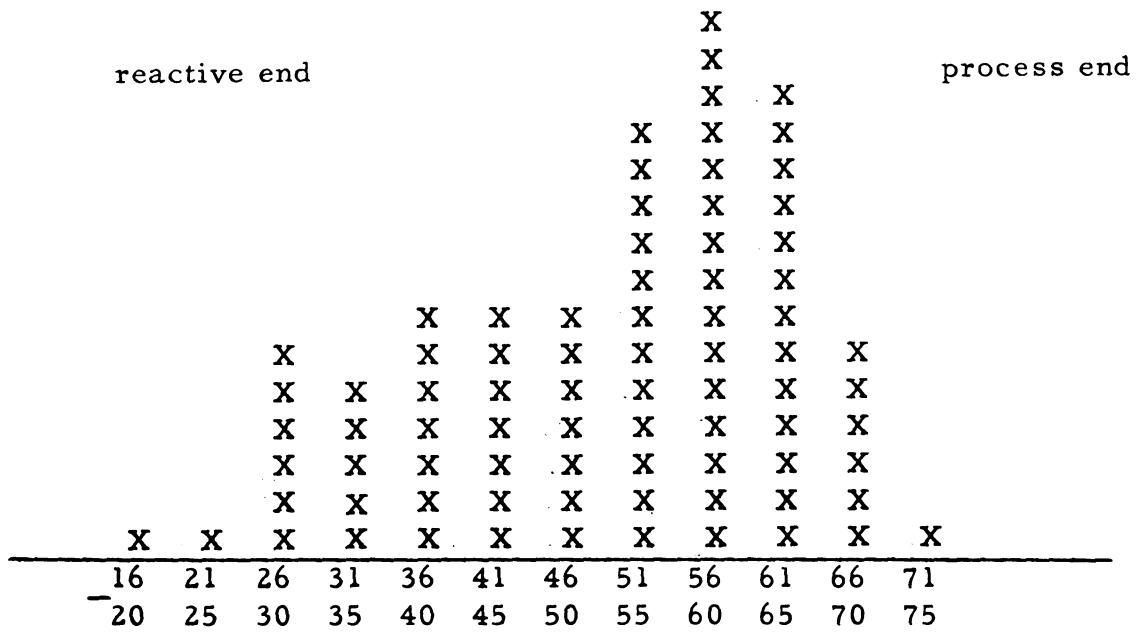

Table 1 gives a summary of the mean age, education, and intelligence for the three groups. Statistical analysis shows that the three groups do not differ significantly with respect to the above variables.

The process group ranged in age from 22 to 40 years; Mean was 33.8 years. Level of education ranged from 8 to 13 years with a mean of 10.8 years of schooling. Of the 20 process patients 12 carried a diagnosis of schizophrenic reaction, unclassified, 5 paranoid type, and 3 catatonic type. All 20 patients were on drugs during testing. The IQ ranged ranged from 80 to 130. The mean IQ was 103.6.

TABLE 1. Mean age, years of education, and IQ scores, and the corresponding standard deviations for process, reactive, and non-psychotic patients.*

Patient Group	Age		Education		IQ**	
	MN	S.D.	MN	S.D.	MN	S.D.
Process	33.8	5.96	10.8	1.82	103.6	15.05
Reactive	34.9	4.84	10.8	1.45	103.1	9.27
Non-Psychotic	33.2	5.41	10.1	2.52	107.1	10.76
Normals	Not available					

*The following abbreviations will be used in succeeding tables when space requires it: P for the process group, R for the reactive group, NP for the non-psychotic group, and N for the normal group.

**The mean IQ scores are based on 17 process, 14 reactive, and 22 non-psychotic patients. IQ scores for the remaining patients were not available. The IQ scores were obtained on W-B Intelligence Test--form II.

The reactive group ranged in age from 21 to 41 years. The mean age was 33.9 years. The level of education ranged from 8 to 14 years with a mean of 10.8 years. Fifteen patients were diagnosed schizophrenic reaction, unclassified type, and 5 paranoid type. Nineteen of the 20 patients were on drugs. The IQ ranged from 85 to 122 with a mean IQ of 103.1.

In addition to the process and reactive groups, data on 29 non-psychotic patients and 50 non hospitalized controls used in the study were available.[7] The 29 non psychotic patients ranged in age from 21 to 42 years, with a mean of 33.1 years. The level of education ranged from 3 to 16 years with a mean of 10.1 years. The IQ ranged from 88 to 128 with a mean IQ of 107.1. The 50 normal controls consisted of a cross section of the hospital personnel.[8]

Procedure

The testing period for each subject lasted 5 days. On days one through three each subject was told to light the amber light by turning on each one of the green lights. No mention was made in what sequence the green lights were to be turned on. The apparatus was set up in such a manner that any pattern of eight green lights turned on the amber light. Pulling the lever more than once in any one trial did not penalize the subject, but when a lever which had already been pulled was pulled for the second time in any one trial, the green light above it did not

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[7]These subjects as well as the 82 who were rated, were part of a larger sample used in a study by Armitage et al. (1957-58). Although the data used in this paper are the same, the treatment of data and hypotheses are different from the ones explored by the group that undertook the study. The present writer ran about 50% of all subjects used in the study by Armitage et al.

[8]The normal sample consisted of hospital aides, social service and psychology service trainees, occupational therapists, special services personnel and clerical employees.

go on. Thus all that was necessary for lighting the amber light was pulling each one of the eight levers (as was previously mentioned, pulling a lever turned on the green light above it) in any order. Testing on each of the first three days was terminated after 60 trials.

On the fourth day of testing the subject was told that he was to find as many different ways of lighting the amber light as he could, by turning on the green lights in different orders. Day 4 was subdivided into three parts of 25 trials each. After trial 25 the subject was reminded that he was to find as many different ways as he could to light the amber light, and not to repeat any that he had done on the preceding 25 trials. After each trial following trial 50, each subject was asked to make the next pattern of lever pulls different from the one that just preceded it. Testing was terminated at the end of 75 trials.

On the last day of testing the subject was just told to light the amber light. Testing was terminated after 60 trials.

Hypotheses and Statistical Treatment of Data

The primary concern of the present study was the behavior of process and reactive patients on the fourth day of testing (when variability was stressed). The primary interest was whether these two groups differed in the number of different patterns, in the type of patterns, and in the manner in which these patterns were produced. Secondary interest was in the extent to which process and reactive patients differed from the non psychotic and non hospitalized groups on the above variables. As previous research points in the direction of greater stereotopy for process than for the reactive patients, it was expected that the reactive group would produce more different patterns and different types of patterns from those produced by process patients. It was further expected that the patterns produced by the reactive patients would be

made up of lever-pairs having lower frequency of occurrence than in the patterns of process patients.

In order to evaluate the above statements all patterns produced by the four subject groups were assigned to several categories. This was necessary to compare the type of patterns produced. The following are definitions of the categories and terms used:

Lever-pair - A sequence of 2 levers.

A pattern - A sequence of eight lever-pulls. (Eg: 13572468, 86427531 etc...)

Pair frequency - how often any one lever is followed by another lever. (Eg: how often lever 2 is pulled after lever 1, how often lever 3 is pulled after lever 1, etc...)

Category 1. - sequence 12345678 (this is one of the two simplest patterns).

Category 2. - sequence 87654321 (this is the second of the two simplest patterns).

Category 3. - a sequence of lever-pulls which maintains the first four and last four levers as a unit. Variability of lever-pulls within the first four and last four levers falls in this category. (Eg: the following would be considered category 3: 1234/8765, 1432/5678, 1243/5687, 5687/4321, 8765/1234, etc...; the following examples would not be considered Category 3: 1235/4768, 8764/5321, 5671/2348, 7654/3218, etc...) Category 3 is considered a rather simple form of variation.

Category 4. - if three consecutive patterns showed systematic variation they were considered to belong to category 4. (Eg: 23456781, 34567812, 45678123, or 12456783, 12356784, 12346785, etc...)

Category 5. - all patterns occurring more than once, that could not be classified into any of the other categories.

Unique pattern. - a pattern that has only been produced by one subject, i.e., it is unique to him.

The following method was used for the comparison of process and reactive patients on pair frequencies for all patterns produced on Day 4.

1. A summation of frequencies for each pair of lever-pulls for all different patterns produced on days 1 through 5 for the total hospitalized sample. (This included in addition to the patients used in this study all those used by Armitage et al.)
2. A summation of the frequencies for each pair of lever-pulls for all different patterns produced on days 1 through 5 by the non-hospitalized sample.
3. Conversion of frequencies to standard scores, by first converting them to z-scores and then using a mean of 10 and a standard deviation of 2 to arrive at a standard score.

The above method leads to two further definitions.

Pair score. - a score derived by assigning a standard score to a lever pair. (pair frequency)

Pattern score. - Summation of seven pair scores comprising a pattern.

On the basis of the preceding analysis the following hypotheses are now proposed:

Hypothesis 1. Reactive subjects when compared with process subjects will produce:

a) more different patterns
b) more unique patterns
c) more category 5 patterns
d) fewer category 1 and 2 patterns
e) lower pattern scores (for all 75 trials)

Hypothesis 2. Non-psychotic and normal subjects compared to process subjects will produce:

a) greater number of different patterns
b) greater number of unique patterns
c) greater number of category 5 patterns
d) fewer category 1 and 2 patterns

Hypothesis 3. Reactive subjects compared to non-psychotics and normals will not differ on the measures directly above.[9]

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[9]Although the major part of the discussed research has dealt with the differences between process and reactive subjects, research by DeVault 1955, Kantor, Wallner, and Windner 1953, Brackbill and

Hypothesis 4. Instructions to produce as many different patterns as possible will have a differential effect on process and reactive subjects as measured by pattern scores on each set of 25 trials.[10]

Fine 1956, Fine and Zimet 1959, and Windner 1959; as well as the theory behind the process reactive distinction suggests that reactive subjects are very similar to neurotics and normals. Hypothesis 3 stems from the above considerations.

[10]This hypothesis stems directly from findings obtained by Smith (1959).

RESULTS

The first three hypotheses except hypothesis 1e were to the effect that on Day 4 reactive, non-psychotic, and normal subjects would produce a greater number of different patterns, a greater number of unique patterns, a greater number of category 5 patterns, and fewer category 1 and 2 patterns than process subjects; and that reactive subjects when compared with non-psychotics and normals would not differ on the above variables.

Table 2 presents the means and standard deviations for the number of different and unique patterns, and Table 3 gives the means and standard deviations for category 1 and 2 and category 5 patterns. Inspection of Table 2 shows that the mean of the process group for different and unique patterns is much lower than the corresponding means for the other three groups. Table 3 indicates the same thing for the category 5 patterns and, conversly, that the mean of the process group for the number of category 1 and 2 patterns is higher than the mean for the remaining groups.

The t ratios presented in Tables 4 and 5 show that process subjects do produce significantly fewer different, unique, and category 5 patterns, and a significantly greater number of category 1 and 2 patterns than reactive, non-psychotic, and normal subjects.

Tables 4 and 5 further show that reactive subjects do not differ significantly in their performance on the above variables from non-psychotic and normal subjects.

It can be readily concluded that the results support the first three hypotheses.

The only other difference of note shows that normal subjects produce significantly fewer category 1 and 2 patterns than the non-psychotic subjects, which in no way contradicts the hypotheses being tested.

TABLE 2. Means and standard deviations for number of different patterns (NDP) and number of unique patterns (NUP) for process, reactive, non-psychotic, and normal subjects.

Patient Group	NDP		NUP	
	Mean	S.D.	Mean	S.D.
Process	32.00	24.21	6.55	8.33
Reactive	53.55	11.21	16.05	9.41
Non-Psychotic	52.59	15.68	13.83	11.80
Normal	49.64	15.83	13.82	11.85

TABLE 3. Means and standard deviations for number of patterns falling into category 5 and categories 1 and 2.

Patient Group	Category 5		Category 1 & 2	
	Mean	S.D.	Mean	S.D.
Process	34.55	16.07	22.55	20.89
Reactive	49.35	13.69	9.05	11.18
Non-Psychotic	43.00	14.44	12.62	10.54
Normal	44.60	12.70	6.26	4.75

TABLE 4. t-Test analysis with respect to number of different patterns (NDP) and number of unique patterns (NUP) for process, reactive, non-psychotic, and normal subjects.

Patient Groups	NDP	NUP
Process vs. Reactive	3.523*	2.923*
Process vs. Non-Psychotic	3.631*	2.387**
Process vs. Normal	3.593*	2.498**
Reactive vs. Non-Psychotic	n.s.	n.s.
Reactive vs. Normal	n.s.	n.s.
Normal vs. Non-Psychotic	n.s.	n.s.

*P < .005 One tailed test.
**P < .01 One tailed test.

TABLE 5. t-Test analysis with respect to number of patterns falling into category 5 and categories 1 and 2 for process, reactive, non-psychotic, and normal subjects.

Patient Groups	Category 5	Category 1 & 2
Process vs. Reactive	3.136*	2.551**
Process vs. Non-Psychotic	1.929****	2.220***
Process vs. Normal	2.761*	5.238*
Reactive vs. Non-Psychotic	n.s.	1.167
Reactive vs. Normal	n.s.	1.468
Normal vs. Non-Psychotic	n.s.	3.698*

* P < .005 One tailed test
** P < .01 One tailed test
*** P < .025 One tailed test
**** P < .03 One tailed test
***** P < .01 Two tailed test

The analysis of patterns falling into categories 3 and 4 failed to reveal any significant differences between the four groups. The means for category 3 patterns were similar for all four groups, and the distribution of category 4 patterns was highly skewed and showed considerable ingroup variability. The data are summarized in Table 6.

Our last hypothesis stated that instructions following trials 25 and 50 on Day 4 would have a differential effect on process and reactive patients as measured by pattern scores on each set of 25 trials; and hypothesis 1e stated that for all 75 trials reactive patients would have lower pattern scores than process patients.

As previously mentioned, a pattern score was arrived at by summing the seven pair scores which comprised a pattern. A pair score, was, in turn, determined by transforming pair frequencies for all different patterns for all five days to standard scores. Table 7 gives the distribution of pair frequencies for the hospitalized and normal samples.

In the initial design the plan was to convert both of these distributions to standard scores and thus arrive at two sets of pair scores: one based on the hospitalized sample, and one based on the normal sample. Using the pair scores based on normal subjects as the standard would allow for comparison of pattern scores obtained by process and reactive subjects with respect to the pattern scores of normals. Using the pair scores based on the hospitalized subjects would permit a direct comparison of process and reactive patients with respect to pattern scores produced by these two groups as well as the remaining hospitalized subjects. The pair frequency distributions in Table 7, however, are very similar; the rank order correlations between them indicates that we need to convert only one of these distributions to standard scores. The choice of which distribution was to be converted became arbitrary,

TABLE 6. Means and standard deviations for patterns falling into categories 3 and 4 for process, reactive, non-psychotic, and normal subjects.

Patient Group	Category 3		Category 4	
	Mean	S.D.	Mean	S.D.
Process	11.75	6.69	6.05	8.05
Reactive	12.90	8.09	3.80	5.36
Non-Psychotic	13.96	9.07	5.48	8.91
Normal	14.90	9.63	9.18	13.22

TABLE 7. Distribution of lever-pair frequencies (F) and percentages for the normal and hospitalized samples. Also ranks and rank order correlations between the two distributions.

Lever Pair	Normals			Patients			ρ
	F	%	Rnk	F	%	Rnk	
1-2	518	28.2	1	919	27.9	1	
1-3	295	16.1	2	556	16.9	2	
1-4	261	14.2	3	443	13.4	4	
1-5	203	11.1	5	336	10.2	5	
1-6	153	8.3	7	300	9.1	6	
1-7	168	9.1	6	292	8.8	7	
1-8	238	13.0	4	450	13.7	3	
	1836			3296			.94
2-1	676	33.8	1	1153	32.1	1	
2-3	488	24.4	2	772	21.5	2	
2-4	244	12.2	3	434	12.1	3	
2-5	172	8.6	5	337	9.4	5	
2-6	144	7.2	6	296	8.2	6	
2-7	175	8.7	4	365	10.2	4	
2-8	103	5.1	7	238	6.6	7	
	2002			3595			1.00
3-1	351	17.4	3	639	17.6	3	
3-2	483	23.9	1	863	23.8	1	
3-4	415	20.6	2	705	19.4	2	
3-5	276	13.7	4	481	13.3	4	
3-6	269	13.3	5	428	11.8	5	
3-7	144	7.1	6	267	7.4	6	
3-8	81	4.0	7	240	6.6	7	
	2019			3623			1.00
4-1	205	10.1	6	388	10.8	5	
4-2	313	15.5	3	527	14.6	3	
4-3	408	20.2	2	725	20.1	2	
4-5	442	21.8	1	804	22.3	1	
4-6	290	14.3	4	472	13.1	4	
4-7	208	10.3	5	361	10.0	6	
4-8	158	7.8	7	323	9.0	7	
	2024			3600			.96

Continued

TABLE 7 - Continued

Lever Pair	Normals F	Normals %	Normals Rnk	Patients F	Patients %	Patients Rnk	p
5-1	173	8.6	7	268	7.4	7	
5-2	216	10.7	6	340	9.4	6	
5-3	272	13.4	4	514	14.2	4	
5-4	414	20.5	1.5	758	21.0	1.5	
5-6	415	20.5	1.5	760	21.0	1.5	
5-7	311	15.4	3	535	14.8	3	
5-8	221	10.9	5	439	12.1	5	
	2022			3614			1.00
6-1	102	5.0	7	236	6.4	7	
6-2	147	7.3	6	273	7.5	6	
6-3	235	11.6	5	449	12.5	5	
6-4	280	13.9	4	492	13.5	4	
6-5	397	19.7	2	668	18.3	3	
6-7	501	24.8	1	862	23.6	1	
6-8	357	17.7	3	676	18.4	2	
	2019			3656			.96
7-1	116	5.8	7	252	7.0	7	
7-2	188	9.4	4	354	9.8	5	
7-3	154	7.7	6	340	9.4	6	
7-4	174	8.7	5	362	10.0	4	
7-5	250	12.5	3	477	13.2	3	
7-6	450	22.5	2	789	21.9	2	
7-8	667	33.4	1	1029	28.6	1	
	1999			3603			.96
8-1	251	13.7	4	530	15.5	2.5	
8-2	161	8.8	6	340	10.0	6	
8-3	150	8.2	7	299	8.8	7	
8-4	181	9.8	5	351	10.3	5	
8-5	253	13.8	3	456	13.4	4	
8-6	320	17.4	2	530	15.5	2.5	
8-7	520	28.3	1	906	26.6	1	
	1836			3412			.96

and the distribution based on normal subjects was selected. The converted pair frequency distribution or pair score distribution is presented in Table 8.

Inspection of Table 8 reveals that pair-score values range from 7.1 for pair 3-8 to 14.0 for pairs 1-2 and 8-7. The higher the pair-score, the higher is the frequency with which the particular pair was produced; and conversely, the lower the pair-score the lower is the frequency with which the particular pair was produced. In the same vein, high pattern scores are composed of more frequently occurring pairs than low pattern scores.

Table 9 presents the distribution of mean pattern scores, from lowest to highest, for each set of 25 trials and for all 75 trials. Inspection of the table shows the mean pattern score to range from 71.13 to 89.90 for the first set of 25 trials, from 73.44 to 89.90 for the second set of 25 trials, from 71.21 to 87.39 for the third set of 25 trials, and from 72.60 to 89.06 for all 75 trials. Comparing the mean pattern scores with corresponding patient groups (column DC) shows that the reactive subjects have, for the most part, lower means than process subjects, especially with respect to the first two sets of 25 trials and with respect to all 75 trials. In the first set of 25 trials the lowest 11 means were produced by reactive subjects. Likewise in the second set of 25 trials, the 5 lowest as well as 15 of the lowest 20 means were produced by reactive subjects. A very similar breakdown is also in evidence when one examines all 75 trials where the 8 lowest and 14 of the lowest 20 means were obtained by reactive subjects. In the third set of 25 trials, the differences are not so pronounced.

The first two rows of Table 10 present the overall means and standard deviations for 20 process and 20 reactive subjects on each

TABLE 8. Pair scores (PS) for 56 lever pairs: Standard scores based on lever-pair frequencies (LP) on the normal subjects.

LP	PS	LP	PS
1-2	14.0	5-1	7.6
1-3	10.5	5-2	8.5
1-4	9.9	5-3	9.6
1-5	9.1	5-4	12.6
1-6	8.3	5-6	12.6
1-7	8.5	5-7	10.5
1-8	9.6	5-8	8.6
2-1	13.6	6-1	7.3
2-3	11.9	6-2	8.0
2-4	9.6	6-3	9-2
2-5	8.9	6-4	9.9
2-6	8.7	6-5	11.5
2-7	9.0	6-7	13.0
2-8	8.5	6-8	11.3
3-1	10.9	7-1	8.3
3-2	12.7	7-2	9.0
3-4	11.8	7-3	8.7
3-5	9.8	7-4	8.9
3-6	9.7	7-5	9.8
3-7	8.0	7-6	11.6
3-8	7.1	7-8	13.8
4-1	8.4	8-1	9.8
4-2	10.5	8-2	8.4
4-3	12.3	8-3	8.3
4-5	12.8	8-4	8.7
4-6	10.0	8-5	9.9
4-7	8.5	8-6	11.2
4-8	7.5	8-7	14.0

TABLE 9. Distribution of mean pattern scores (PSc), from lowest to highest, for each 25 and all 75 trials, for the 40 process and reactive patients. (P-process, R-reactive, DC-diagn. Classific.

Trials 1-25		Trials 26-50		Trials 51-75		Trials 1-75	
PSc	DC	PSc	DC	PSc	DC	PSc	DC
71.13	R	73.44	R	71.21	R	72.60	R
71.93	R	74.66	R	72.40	P	75.96	R
73.92	R	75.32	R	74.21	R	76.38	R
76.14	R	76.14	R	74.22	R	77.64	R
77.28	R	76.39	R	76.76	R	77.85	R
78.32	R	76.76	P	77.46	P	78.80	R
79.52	R	77.10	R	77.62	P	78.88	R
81.14	R	77.32	R	77.78	P	79.00	R
81.22	R	77.52	R	78.46	P	79.21	P
81.24	R	77.67	R	79.09	R	79.25	R
81.29	R	77.92	R	79.36	P	79.97	R
82.02	P	78.02	R	79.75	P	80.13	R
81.42	P	78.05	R	79.91	P	80.13	R
81.75	R	78.52	P	80.11	R	80.37	P
84.35	R	78.69	R	80.22	R	80.90	R
84.84	P	78.74	R	80.30	R	81.02	R
85.09	P	79.06	R	80.76	R	81.02	P
85.32	R	79.08	P	81.01	R	81.08	P
85.36	P	79.50	R	81.01	R	81.17	P
85.53	P	79.87	P	81.18	R	81.54	P
85.61	P	80.10	R	81.19	R	82.28	R
85.67	R	80.25	R	81.21	R	81.45	R
85.84	P	80.34	R	81.65	R	82.92	P
85.91	P	81.75	P	82.10	R	82.13	R
85.94	P	82.43	R	82.91	R	83.54	R
86.44	R	82.79	P	83.24	R	82.67	R
86.64	R	83.54	P	83.42	P	84.02	P
87.14	P	83.65	P	83.67	P	84.07	P
87.17	P	84.36	P	84.55	R	84.91	P
87.22	P	85.13	P	85.48	P	85.95	P
87.38	P	86.31	P	86.36	P	86.12	P
87.38	R	86.42	P	86.36	P	86.16	P
88.30	R	87.12	P	86.45	P	87.01	R
88.30	R	87.46	P	86.56	P	87.09	P
88.30	P	87.52	P	87.00	P	87.10	P
89.66	P	88.19	R	87.01	R	87.20	P
89.82	P	89.54	P	87.11	P	87.30	P
89.90	P	89.90	P	87.27	P	88.55	P
89.90	P	89.90	P	87.34	P	88.72	P
89.90	P	89.90	P	87.39	P	89.06	P

set of 25 trials and on all 75 trials; and the third row gives the t values obtained when the group means for process and reactive subjects were compared. The obtained t's show process and reactive patients to differ significantly on the three sets of 25 trials and on all 75 trials. More specifically, process patients produced patterns made up of lever-pairs having high frequency of occurrence, whereas reactive subjects tended to produce patterns made up of low frequency lever-pairs.

Although the results clearly show process subjects to differ from reactives, it remains still to be evaluated how this difference was affected by the instructions. As previously mentioned, Day 4 was the first day on which the subjects were asked to produce different patterns. Since the first three days of testing failed to disclose any differences between process and reactive groups (only 5 process and 6 reactive patients produced patterns other than those which could be classified into categories 1 and 2) it appears clear that the instructions just prior to the first 25 trials had an effect on the type of patterns produced on these trials. The following analysis will be concerned with determining the effect of the instructions on each of the periods of 25 trials for both the process and reactive groups: (1) the differences between pattern score means obtained on trials 1 through 25, 26 through 50, and 51 through 75 were evaluated by means of a t-test for related measures for both process and reactive groups; (2) the degree of relationship between the first and second, second and third, and first and third sets of 25 trials was analyzed by means of Pearsonian correlations for each group separately (this permitted a direct comparison with data obtained by Zlotowski and Bakan); and (3) the correlation coefficients obtained with the process group were compared to those obtained with the reactive group by means of a z-transformation.

Table 10. t-Test analysis of pattern scores for each 25 and all 75 trials between process and reactive groups.

	Trials 1-25		Trials 26-50		Trials 51-75		Trials 1-75	
	Proc.	Reac.	Proc.	Reac.	Proc.	Reac.	Proc.	Reac.
Mn	86.75	81.60	84.41	78.44	82.86	80.16	84.68	80.03
SD	2.35	5.17	4.27	3.13	4.57	3.61	3.10	2.78
t	4.055*		5.059*		2.154**		5.000***	

*p < .01 Two tailed test
**p < .01 Two tailed test
***p < .005 One tailed test

The t-test for related means (analysis 1) is aimed at evaluating any changes in pattern scores as trials progress within each group; The Pearsonian coefficients (analysis 2), in a sense, get at the same thing as analysis 1, but do so in terms of the degree of relationship between the various sets of pattern scores; analysis 3, comparing the correlations obtained by the process group with those obtained by the reactive group indicates whether the degree of relationship between the various sets of 25 trials differ between groups.

Table 11 presents the results of analysis 1. Inspection of this table indicates that both process and reactive subjects produced different pattern scores on the second set of 25 trials than they produced on the initial 25 trials. Unlike the process subjects, the reactive subjects also produced different pattern scores on the third set of 25 trials than they produced on the second set of 25 trials. On the other hand, the process group produced pattern scores on the third set of 25 trials which were different from those on the initial 25 trials, whereas the reactives did not.

Analysis 2 and 3 are represented in Table 12. This table reveals that pattern scores produced by process subjects, on the second set of 25 trials, were considerably more similar to the pattern scores on the first 25 trials than is the case for the reactive subjects. When the two groups are compared with respect to the second and third sets of 25 trials, a reverse relationship occurs. It is the reactive subjects who produced pattern-scores that were more similar on both the second and third sets of 25 trials. When one compares the last set of 25 trials with the initial 25 trials, both groups tended to produce different pattern scores toward the end than they did initially, even though the reactives were more similar than the process.

One final result is that the performance of process and reactive subjects on Day 5 was similar to their performance on the first three

Table 11. Comparison of mean pattern score changes (mean difference) from trials 1-25 to trials 26-50, trials 26-50 to trials 51-75, and trials 1-25 to trials 51-75 within Process and Reactive groups.

Between Trials	Process		Reactive	
	Diff. between means†	t	Diff. between means	t
1-25 & 26-50	2.33	3.530*	3.16	2.873*
26-50 & 51-75	1.55	1.666	1.72	2.820**
1-25 & 51-75	3.89	3.536*	1.57	1.427

*p < .01 Two tailed test
**p < .02 Two tailed test
† These are the differences between means presented in Table 10.

Table 12. Relationship of pattern scores between trials 1-25 and 26-50, 26-50 and 51-75, 1-25 and 51-75 for process and reactive groups.

Trials	Correlation Coefficient		z	p.
	Process	Reactive		
1-25 & 26-50	.754	.504	3.96	.01
26-50 & 51-75	.523	.667	2.24	.05
1-25 & 51-75	.274	.397	1.29	n.s.

days of the experiment. Both groups again produced very few patterns other than those falling into categories 1 and 2, and few subjects who failed to vary prior to Day 4 varied following it. Thus the behavior of process and reactive subjects on Day 5 appeared to be uninfluenced by their experience on Day 4.

One last comment is in order. A question arose whether the differential performance between process and reactive patients was not per chance due to differential length of hospitalization. Since length of hospitalization is one of the items on the Becker Scale which is said to differentiate between the two groups, it was expected that the mean length of hospitalization for the process subjects would be greater than that for the reactive subjects. This proved to be the case. However, a correlation computed between length of hospitalization and number of different patterns produced on Day 4, yielded a non-significant coefficient of -.21. This suggests that the differences between process and reactive groups are not due to differential length of hospitalization.

DISCUSSION

The results of this study consistently indicate that reactive schizophrenics are more variable in their behavior than process schizophrenics. These findings are in line with the stated hypotheses and are in general agreement with theory.

Theoretically, a process schizophrenic has been ill for a long time, showing poor adjustment even when a child. During and after this developmental period, however, a certain amount of stabilization or adjustment to the illness has occurred and corresponding modes of behavior have been adopted. Since a process schizophrenic, by virtue of his poor pre-psychotic adjustment, has not achieved a high level of personality organization, of necessity his adopted modes of behavior tend to be limited in number, stereotyped, and resistant to change. It appears that a process schizophrenic may be considered "happy with his psychosis," since he is adjusted to it and it is no longer a problem to him. Thus it seems reasonable that a process schizophrenic would tend to have only a limited number of ways in dealing with a problem.

On the other hand, a reactive schizophrenic is not at all "happy" with his psychosis. Far from being adjusted to it, he still is trying to maintain a relationship with the outside world. Unlike the process, his pre-psychotic adjustment has been fairly good throughout his life and hence he should have achieved a fairly high level of personality organization. His breakdown is presumably due to an excessive amount of stress with which he was incapable of dealing. In this respect the reactive schizophrenic is more similar to the non-psychotic and the normal person than is a process schizophrenic. Consequently,

the behavior would tend to be more flexible and he should be more capable of a variety of solutions to a specific problem.

In light of the above discussion it is not surprising to find that reactive patients produce more different and unique patterns, and fewer category 1 and 2 patterns than do process patients. In the same vein, it should be clear why reactives do not differ appreciably on the above variables from non-psychotics and normals, whereas the process patients do.

Category 5 patterns are also produced more frequently by the reactive group than by the process group. Category 5 includes all patterns which do not fall into any of the simpler categories, and categories 3 and 4 which represent mainly only minimal changes. Thus category 5 patterns of necessity are more random or complex, and they are more likely to be produced by the reactive patients.

The investigation of lever-pairs, adds further support to the notion that reactive schizophrenics tend to make their patterns more variable than process schizophrenics. That process patients use lever-pairs which have a high frequency of occurrence, whereas reactive patients use lever-pairs which have a low frequency of occurrence testifies to this end. Thus, for the most part, process patients tend to be considerably stereotyped in their use of lever-pairs.

This stereotopy, however, can be disrupted under certain conditions as the ability to change is not altogether absent in these patients. The fact that toward the end (last set of 25 trials) the process group is performing on pretty much the same level as the reactive group, clearly indicates that process patients can change. It may take longer or may require a greater amount of stress before a change will take place than is the case for reactive subjects, but the potential to change is still present. That this is the case can be

seen from several other studies which show that chronic or process schizophrenics can be made to modify their behavior under certain conditions (Peters and Murphree 1954; Bleke 1955, Rodnick and Garmezy 1957; Smith 1959; Cavanaugh, Cohen, and Lang 1960).

Two additional comments with respect to the results of this study are in order. There appears to be a consistency between the performance of process and reactive patients in the present study and in the coin-tossing study by Zlotowski and Bakan. As mentioned earlier, the correlations between the first and second 150 tosses (guesses) in the coin-tossing study were .92 for the process group and .50 for the reactive group, while the correlations between the first and second sets of 25 trials in the present study were .75 for the process subjects and .52 for the reactive subjects. Thus both studies would suggest that process subjects, at least for a while, tend to be more stereotyped, whether or not instructions to change are used. The reverse correlation between the second and third sets of 25 trials does in no way detract from the above conclusion. The reactives respond to the instructions by changing their behavior in the direction opposite to what they did, whereas the process subjects continue in the same direction. The reversal, therefore, appears to further support the conclusion that reactive patients are quicker to alter their behavior than are the process patients.

Finally, in attempting to evaluate the results of the present study, it is indeed rewarding to see that they are in line with the majority of other findings. Windner (1959), in a paper presented before the APA convention, has summarized the results of other studies bearing on the process-reactive distinction. If one compares the results obtained in this study with the following excerpt from Windner's paper, it becomes quite clear how well the present results fit in with the majority of the other findings.

> . . . emperical studies seem to show that samples which are very likely predominantly reactive cases are generally not very different from normals, . . . whereas process cases are typically very deficient in performance. This applies . . . to perceptual constancy, concept formation, use of concepts, and learning. If the experimental situation is arranged so motivational conditions of certain kinds are manipulated, both groups often improve, but there seem to be residual deficiencies among the process sample. In some situations . . . the reactives depart from the so called normal group in the same direction as neurotics, but the process cases depart from the normal in the opposite direction. For example, it seems to be the reactive cases who acquire responses rapidly . . . , whereas the process cases condition usually slowly. (pp 1-2).[11]

Suggestions for future research

One serious question must arise when one looks at the differential performance of process and reactive schizophrenics; namely, what role does motivation play in the performance of the two groups. Past research would suggest that what may motivate the process group will not motivate the reactives, and vice versa (Reisman 1959, Smith 1959, Rodnick and Garmezy 1957), but it remains for someone to determine what are the motivating forces for each group. A possible way of determining this might be to relate the process-reactive distinction to need-achievement and need-affiliation. When more is known about the motivation of these two groups a more precise evaluation of the process-reactive distinction will be possible.

There is one other area of research which could further clarify the value of the process-reactive classification, and which the present writer believes to be crucial, if this classification is to be used

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[11]Windner is refering to the work of Kantor, Wallner and Windner 1953, Brackbill and Fine 1956, Becker 1955, 1956, Fine and Zimet 1959, Windner 1959 and others.

prominantly in the future. Although it is well-established that reactive schizophrenics have a higher rate of discharge than process schizophrenics (Zimet and Fine 1959, McDonough 1958, Smith 1959, Reisman 1958, 1960, and Bakan and Zlotowski 1960) little is known about the readmission rate of these patients.[12] More specifically, no one as yet has determined how many of the schizophrenics who are initially classified as reactives and who in later years are re-admitted to the hospital would still be classified as reactives and how many would now be classified as process. If the theoretical formulation of the process-reactive classification is correct then a reactive should not become process several years later. If this does not prove to be the case, one could seriously question the validity of process-reactive classification. It is the [fervent] hope of the present writer that, tedious as such longitudinal study can be, it will be undertaken in the near future.

By way of closing this discussion this writer would like to advise a word of caution. Significant as the present results may be, the reader should keep in mind that we need to know a great deal more about the process-reactive distinction before an adequate evaluation can be made. Since this area is relatively recent to psychology the instruments devised so far are still somewhat crude and need further implementation. For example, it was discovered in the process of rating the patients on the Becker's revision of the Elgin Prognostic Scale, that the last four statements, which are concerned with current symptomatology failed to discriminate between the two groups. Case history material is also often highly unreliable as it tends to be gathered by a variety of people who often write down their

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[12]In the present study only 2 of 20 reactive patients were still in the hospital one year after the data was gathered, whereas 16 of the 20 process patients were still hospitalized.

interpretation of the patient rather than the facts. Furthermore some case history material is gathered from the patient while some is gathered from interview of the family.

Despite all the shortcomings this area appears promising and worth-while of continued research.

SUMMARY

The present study was designed to investigate the performance of process and reactive schizophrenics on a prolonged repetitive task, which allowed for thousands of variations in response, under instructions to produce many different solutions (patterns of responses).

The process and reactive patients were selected from a sample of 82 hospitalized veterans carrying a schizophrenic diagnosis on the basis of scores obtained on Becker's revision of the Elgin Prognostic Scale. The 20 patients having the lowest scores comprised the reactive sample, and the 20 patients having the highest scores made up the process sample. The two groups did not differ with respect to the mean age, level of education, and intelligence. Additional samples of 29 non-psychotics and 50 normals were also used in this study.

The produced patterns were classified into 5 categories: categories 1 and 2 (simple patterns), categories 3 and 4 (relatively simple patterns), and category 5 (complex patterns). The data were further analyzed with respect to the number of new and unique patterns and with respect to response-pair frequencies (lever-pair frequencies).

Analysis of the data revealed essentially as hypothesized that: (1) the reactive schizophrenics produce significantly greater number of new and unique patterns, a significantly greater number of complex patterns (category 5), and significantly fewer simple patterns (categories 1 and 2) than process patients; (2) the reactive schizophrenics do not differ appreciably from non-psychotics and normals on the above variables; (3) the non-psychotics and normals differ significantly from process patients in the same direction as the reactives; (4) the behavior of process patients can be changed, (variability of performance increased) but this change takes a longer time and is of lesser magnitude

than is the case with the reactive patients; and (4) the patterns produced by process patients consist of lever-pairs having a high frequency of occurrence, whereas the patterns produced by reactives consist of lever-pairs having a low frequency of occurrence.

The results are interpreted in terms of process-reactive theory (levels of personality development) and the consistancies between present results and other research.

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APPENDIX

TABLE A

CLASSIFICATION OF 82 SCHIZOPHRENIC PATIENTS ACCORDING TO ELGIN PROGNOSTIC SCALE SCORES

Patient	Rater #1 Elgin Score	Rater #2 Elgin Score	Average Score for 2 raters	Classification or Disposition
1. HG	--	--	18.0*	Reactive (R-1)
2. ME	--	23	23.0	Reactive (R-2)
3. GT	--	27	27.0	Reactive (R-3)
4. RJ	29	28	28.5	Reactive (R-4)
5. LJ	--	29	29.0	Reactive (R-5)
6. PJ	--	29	29.0	Reactive (R-6)
7. DH	--	29	29.0	Reactive (R-7)
8. HF	--	--	30.5*	Reactive (R-8)
9. JG	--	31	31.0	Reactive (R-9)
10. KJ	--	32	32.0	Reactive (R-10)
11. HC	--	34	34.0	Reactive (R-11)
12. CL	--	--	34.5*	Reactive (R-12)
13. HJ	35	34	34.5	Reactive (R-13)
14. GH	34	38	36.0	Reactive (R-14)
15. LD	37	39	38.0	Reactive (R-15)
16. LF	--	38	38.0	Reactive (R-16)
17. GW	--	38	38.0*	Reactive (R-17)
18. SB	--	38	38.0	Reactive (R-18)
19. TM	--	39	39.0	Reactive (R-19)
20. SE	38	40	39.0	Reactive (R-20)
21. HG	--	41	41.0	Middle Grp. (Not used)
22. LD	--	41	41.0	"
23. GJ	42	41	41.5	"
24. CA	38	46	42.0	"
25. MP	48	36	42.0	"
26. ME	43	46	44.5	"
27. JG	45	45	45.0	"
28. PR	--	47	47.0	"
29. WG	--	47	47.0	"
30. HC	--	47	47.0	"
31. BJ	--	49	49.0	"
32. HH	--	50	50.0	"
33. HL	--	50	50.0	"
34. WJ	52	51	51.5	"
35. HH	54	49	51.5	"
36. MP	--	52	52.0	"
37. HT	54	52	53.0	"
38. FT	--	53	53.0	"
39. TH	--	53	53.0	"
40. LC	52	55	53.5	"
41. WG	49	61	55.0	"

Continued

TABLE A - Continued

Patient	Rater #1 Elgin Score	Rater #2 Elgin Score	Average Score for 2 raters	Classification or Disposition
42. DD	53	57	55.0	Middle Group. (Not used)
43. CJ	55	55	55.0	"
44. CJ	--	56	56.0	"
45. CR	--	56	56.0	"
46. CC	55	58	56.5	"
47. NP	55	61	58.0	"
48. MW	--	58	58.0	"
49. RL	56	61	58.5	"
50. ZE	59	58	58.5	"
51. HJ	59	59	59.0	"
52. RG	59	59	59.0	"
53. HE	58	60	59.0	"
54. BA	63	57	60.0	"
55. GA	57	66	60.0	"
56. AV	62	58	60.0	"
57. SK	60	60	60.0	"
58. MC	61	60	60.5	"
59. CM	65	56	60.5	"
TH	--	53	53.0	" } These scores are out of the proper sequence, but fall within the middle range.
MC	--	46	46.0	"
GT	--	52	52.0	"
63. PL	62	60	61.0	Process (P-20)
64. RL	61	62	61.5	Process (P-19)
65. DD	64	60	62.0	Process (P-18)
66. ML	61	63	62.0	Process (P-17)
67. BD	64	60	62.0	Process (P-16)
68. WP	64	61	62.5	Process (P-15)
69. DJ	61	64	62.5	Process (P-14)
70. AR	65	60	62.5	Process (P-13)
71. AT	60	66	63.0	Process (P-12)
72. WW	--	63	63.0	Process (P-11)
73. AS	--	63	63.0	Process (P-10)
74. SD	63	63	63.0	Process (P-9)
75. BJ	--	64	64.0	Process (P-8)
76. AJ	66	63	64.5	Process (P-7)
77. BF	68	67	67.5	Process (P-6)
78. LE	69	66	67.5	Process (P-5)
79. KW	67	68	67.5	Process (P-4)
80. LE	--	68	68.0	Process (P-3)
81. ZE	70	66	68.0	Process (P-2)
82. BC	71	77	74.0	Process (P-1)

*Averages obtained by McDonough and Smith.

TABLE B

DISTRIBUTION OF THE TOTAL NUMBER OF NEW PATTERNS, UNIQUE PATTERNS, CATEGORY 1 AND 2, CATETORY 5 FOR THE 20 REACTIVE PATIENTS

Patient	Total New Patterns	Unique Patterns	Category 1 and 2	Category 5
R- 1	64	14	1	50
R- 2	57	12	5	40
R- 3	64	13	1	52
R- 4	42	16	0	60
R- 5	48	6	17	46
R- 6	46	12	2	47
R- 7	55	18	6	40
R- 8	15	0	42	18
R- 9	50	11	25	35
R-10	61	50	0	75
R-11	67	14	4	60
R-12	33	7	9	42
R-13	57	23	12	49
R-14	60	21	3	61
R-15	68	31	4	65
R-16	42	10	29	28
R-17	62	9	3	52
R-18	67	36	2	69
R-19	64	17	5	58
R-20	49	1	11	38

TABLE C

DISTRIBUTION OF THE TOTAL NUMBER OF NEW PATTERNS, UNIQUE PATTERNS, CATEGORY 1 AND 2, CATEGORY 5 FOR THE 20 PROCESS PATIENTS

Patient	Total New Patterns	Unique Patterns	Category 1 and 2	Category 5
P- 1	16	0	5	42
P- 2	23	17	51	24
P- 3	18	0	50	23
P- 4	62	7	14	47
P- 5	66	23	3	55
P- 6	9	0	7	51
P- 7	12	0	27	25
P- 8	10	0	52	8
P- 9	62	14	0	51
P-10	5	0	28	37
P-11	8	0	57	7
P-12	54	14	11	46
P-13	45	3	11	37
P-14	22	2	39	27
P-15	22	0	18	34
P-16	56	18	11	52
P-17	69	21	1	49
P-18	10	0	6	44
P-19	7	0	58	1
P-20	64	12	2	31

TABLE D

DISTRIBUTION OF THE NUMBER OF NEW PATTERNS, UNIQUE PATTERNS, CATEGORY 1 AND 2, AND CATEGORY 5 FOR 29 NON-PSYCHOTIC PATIENTS

Patient	Total New Patterns	Unique Patterns	Category 1 and 2	Category 5
1. MM	56	18	4	39
2. PL	51	15	3	51
3. PC	64	14	1	56
4. ZE	56	11	5	51
5. BC	30	0	13	23
6. KJ	59	14	3	55
7. CC	69	18	3	55
8. BM	56	14	3	49
9. MW	58	10	4	57
10. CW	21	1	39	29
11. AJ	55	13	12	58
12. PM	44	6	24	24
13. MH	66	10	1	40
14. MF	48	6	3	29
15. SW	14	2	31	44
16. MH	74	60	0	74
17. KA	47	7	19	43
18. PA	61	7	2	57
19. GL	71	37	1	61
20. EJ	64	15	43* (11)	17* (?)
21. CH	50	24	25	43
22. HR	18	9	55	15
23. GW	56	9	5	34
24. PM	44	10	29	39
25. BR	64	26	2	45
26. RH	63	16	2	38
27. HR	54	16	9	59
28. CP	40	9	22	33
29. MU	72	4	3	29

*The entries in columns 3 and 4 for subject #20 are incorrect. The maximum possible entry in columns 3 is 11, whereas entry for column 4 should be higher. The original data from which these were computed is not available, as the mistake was in transcription from the Esterline recorder. Data for columns 1 and 2 is correct. Despite the errors in columns 3 and 4 the statistical results do not lose in significancy, conversely, the obtained differences would have become more pronounced.

TABLE E

DISTRIBUTION OF THE TOTAL NUMBER OF NEW PATTERNS, UNIQUE PATTERNS, CATEGORY 1 AND 2, AND CATEGORY 5 FOR THE 50 NORMAL CONTROLS

Subject	Total New Patterns	Unique Patterns	Category 1 and 2	Category 5
1.	62	9	4	51
2.	55	9	4	42
3.	44	1	9	40
4.	61	22	4	30
5.	64	15	5	49
6.	56	11	6	56
7.	55	18	2	45
8.	46	17	2	47
9.	59	17	2	25
10.	59	6	4	48
11.	54	41	5	58
12.	59	8	5	62
13.	66	55	0	68
14.	52	14	8	57
15.	63	15	5	51
16.	66	24	3	55
17.	53	13	9	56
18.	57	14	14	41
19.	62	26	6	57
20.	44	9	5	15
21.	55	12	3	48
22.	56	48	1	68
23.	44	15	4	34
24.	45	6	22	34
25.	39	3	6	51
26.	28	3	12	47
27.	73	19	0	67
28.	67	7	2	37
29.	70	15	2	45
30.	66	14	1	42
31.	49	11	4	40
32.	54	15	4	40
33.	36	22	11	41
34.	63	10	2	45
35.	20	2	5	31
36.	28	3	8	58
37.	52	5	6	31
38	23	2	15	35
39.	32	1	9	21
40.	46	14	5	32

Continued

TABLE E - Continued

Subject	Total New Patterns	Unique Patterns	Category 1 and 2	Category 5
41.	36	1	10	55
42.	44	3	22	35
43.	54	20	6	51
44.	48	2	4	37
45.	63	18	3	55
46.	43	8	7	44
47.	3	0	12	10
48.	69	41	6	56
49.	49	20	9	47
50.	49	7	10	40

Becker's Revision-Elgin Prognostic Scale

The definitions for the subscales of the Elgin Prognostic Scale and modified by the writer for use in this study are given below. Items A through O are rated on the basis of anamesis data. Items P through T are rated on the basis of the presenting clinical symptoms.

A. Defects of interest versus definite display of interest.

0. Keen ambitious interest in some of the following: Home, family, friends, work, sports, arts, pets, gardening, social activities, music, dramatics.

2. Moderate degree in several activities including social gatherings, sports, music, opposite sex, etc.

4. Mild interest in a few things such as job, family, quiet social gatherings. The interest is barely sustaining.

6. Withdrawn and indifferent toward life interests of average individual. No deep interests of any sort.

B. Insidious versus acute onset.

0. Development over a period of 0-1 months with sudden, dramatic divorcement from more or less commonplace living.

1. Development over a period of 2-4 months with marked personality changes from relatively commonplace living.

2. Development over a period of 5-7 months with moderate personality changes. May be some accenting of previous trends, but changes also.

3. Changes have taken place over a period of 8-12 months with noticeable personality modifications, but primarily an accenting of existing trends.

4. Slow development of symptoms but possible to detect personality changes in the 2 years prior to onset.

6. Very slow development of symptoms so that the final disorder appears as an exaggeration of already strongly accentuated personality traits. Indications even prior to adolescence.

C. Shut-in-personality.

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

5. Very much as described above.

3. Moderately the picture described above.

1. Only mildly this way, but some resemblence to pattern.

0. Apparently normal childhood, little evidence of shyness, unusual difficulty or else unusual behavior is attributable to environmental factors.

D. Schizothymic versus syntonic personality.

0. Very sociable, fond of people and social gathering; many friends, active in groups and sports, participates in life of his community.

2. Moderately sociable, likes people and social gatherings, but doesn't go far out of way to meet people.

3. Mildly shy, mildly sociable. Will interact when the situation presents itself. Prefers association in family group as a rule.

4. Moderately shy, retiring, etc. More concerned with ideas than people.

6. Very seclusive, shy, retiring,mixes little with others. Few if any close friends. Interested in ideas rather than people. Passive onlooker at life rather than an active participant. Poor "bite on life."

E. Range of interests.

0. Wide and varied interest, keen bite on life and its opportunities, forward and interested in making adaptation to daily life in many spheres.

2. Moderate breadth of interest, interested in making adaptations to daily life, but does not go out of way to seek new opportunities.

4. Moderate restriction of interests. Narrow goals, but some detectable variety of interests within a narrow orientation.

6. Inadequate interest in varied problems of life, rigid, narrow goals or interests, circumscribed activities because of the narrow range of interests.

F. Constitutional bias.

0. A healthy, strong energetic physical and mental makeup that makes the interplay between heredity and environmental influence during childhood a satisfactory one.

2. Suggestions of defects in physical and mental stamina occasionally observed. Not at all marked. Perhaps proneness to repeated illnesses in childhood.

4. Regarded from early childhood as different, queer or odd: perhaps associated with some real defect or handicap-physical such as deformity, or speech defect, but more often only an imaginary defect of personality.

G. Low energy tone.

0. Very strong drive, keen active and alert interest and ambition shown in school, social and work spheres. Good grasp on life, liked life and had energy enough to enjoy it. Outgoing and adequate in meeting life.

2. Moderately adequate drive, interest, energy as described above.

4. Moderately inadequate energy tone. Tends toward submissive, passive reactions. Shows some potential to face life's problems, but would rather avoid them than expend the necessary energy.

6. Submissive, inadequate passive reactions, weak grasp on life, does not go out to meet life's problems, does not participate actively but passively, accepts his lot without having the energy to help himself.

H. Asthenic build.

0. Large, barrel-shaped trunk, with relatively short legs and arms; shield shaped face, short broad head upon a thick neck, set well down between shoulders.

2. Athletic build. Balanced weight, good musculature, head shape, etc.; intermediate to 0 and 4.

4. Long, slender extremities with relatively small, narrow trunk. Egg-shaped face; elongated narrow head on a tall, slender neck.

I. Heterosexual contact.

0. Purposefully contacts the other sex, dates frequently, makes successful effort to be attractive in manner, dress, accessories, etc. so as to be popular with girls (boys).

2. Dates when situation affords. Maybe married, but has difficulties in compatibility. Wants to interact with other sex, has some techniques, but not completely successful.

3. If married, apt to divorce or separate. Generally this is rated as a midpoint between 2 and 4.

4. Moderate lack of heterosexual contact. Tends to avoid dates, dances, but has on occasion participated in same. Might think he (she) would like to marry some day, but little enthusiasm for it.

6. No association with the opposite sex. Never had any dates. Avoids dances and social gatherings which require the intermingling of boys and girls.

J. Marked academic interests versus active interest in sports.

0. An active interest in sports, participates in baseball, basketball, tennis, football, or other sports. A solitary sport such as swimming or golf is not so important unless the patient plays or swims with others rather than self.

1. Moderate interests in sports, and other interests.

2. Mild interest in sports, mild interest in study.

3. Moderate interest in study--without other interests.

4. Fond of study, worked diligently at school and excels in this field associated with inadequacy in sports and social field, a grind without the ambition or drive in work and play to equal his achievements as a student.

K. Careless indifference versus worrying, self-conscious type.

0. Subjectively sensitive, critical of self, preoccupied with own conflicts, but shows little of the extreme, bizarre, unusual, mysterious or socially unacceptable behavior.

2. Some concern and preoccupation with difficulties--a moderate position to 0 or 4.

4. Withdrawal and disinterest in social surroundings, careless of social requirements, given to day-dreaming and excentricity, dirty, disheveled appearance, profane language, unacceptable habits.

L. Exclusive stubborn traits versus insecurity and inferiority feelings.

0. Timid, lacks self confidence, feels insecure and inferior. Very sensitive and critical of self; feels certain problems in life but participates and does not accept his lot passively or without regret and struggle.

1. Moderately like 0.

2. Neither timid nor stubborn.

3. Moderately stubborn.

4. Complete withdrawal from surroundings and interest, inadequate in meeting life but stubborn and opinionated, refuses to change, even if suggested, to achieve a more adequate adjustment. Opinionated and egocentric.

M. Toxicity or exhaustion.

0. History of illness, disease or exhaustion closely associated with the onset of psychotic symptoms.

1. Illness present, not severe, but related to onset. Less severe exhaustion.

2. Poor health--but not requiring bed.

3. Fair health--a little run down.

4. Excellent health history. Health in no sense an etiologic factor in the development of psychosis.

N. Precipitating conditions. (Situational reaction)

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

1. Marked stresses related to onset, but not as severe as 0.

2. Moderate stresses related to onset such as financial problems, interpersonal discord, etc. which would cause considerable worry to the average individual.

3. Mild stresses that the average person would react to in some way but would not usually lead to a breakdown.

4. Onset of psychotic symptoms not related to any disturbance or difficulty in the patients situation- or a disturbance of such a trivial nature that it would be ignored or quickly forgotten by the average person.

O. Duration of psychosis.

0. Under 2 months
1. 2-4 months
2. 4-6 months
3. 6-8 months
4. 10-12 months.

5. 1-2 years
6. 2-3 years
7. Over 3 years.

The following scales are rated from the presenting clinical picture.

P. Inadequate affect versus emotional instability of appropriate effect.

0. Adequate or overly demonstrative affective expression. This includes appropriate expression and manic depressive aspects in which there is a facile display of emotion.

2. Moderately inadequate affect. Trends to be rigid, dull, or slightly inappropriate. Only moderate responsiveness to emotional stimulation.

4. Markedly inadequate, inappropriate, rigid or dull affect. Emotional life expressed is at odds with behavior or strikingly inappropriate. Little reaction to stimulation of any strength.

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

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

R. Ideas of influence; patient feels that someone or something is directing his actions, thoughts, or speech. Some outside influence forces him to do things even against his own will.

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

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

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

T. Atypical symptoms. Manic or depressive feature mixed with the schizophrenic picture. Display of appropriate affect, over-talkative, distractive, facetious, display of interest in other patients, desire to help humanity in general, depression, feelings of sin or guilt, psychomotor retardation, anxiety, crying.

0. Very markedly atypical picture, shows many of the above features with considerable strength of affect.

1. Markedly atypical picture.

2. Moderately atypical picture, less intensity of features shown.

3. Mildly atypical picture, unusual features are minimal or lacking in intensity.

4. Lacking atypical features.