External Validation of Schizotypic Clusters

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The naturalness of two clusters of schizotypic subjects identified in a previous study (Propper et al., 1987) was evaluated by comparing the clusters on a variety of clinically relevant variables. The clusters were formed by a centroid clustering of 10 schizotypy scales. Cluster 1 was characterized by distrust, social fear, and magical ideation and Cluster 2 by anhedonia and low scores on the other schizotypy measures. The clinical variables in the current study were derived from information from a structured diagnostic interview. Cluster 1 subjects reported more auditory hallucinations, social discomfort, social avoidance, and distrust than Cluster 2 subjects.

Bleuler (1911/1950) first coined the term schizophrenia as a plural noun. Since then, heterogeneity within schizophrenia has been taken for granted by most researchers, and many attempts have been made to identify subgroups of schizophrenics. Over the years, distinctions such as paranoid versus nonparanoid, process versus reactive, and the currently popular positive versus negative symptomatology have been suggested as meaningful subtypes of schizophrenia. This study described a new effort to identify subgroups of schizophrenics based on the model of schizophrenia proposed by Paul Meehl (1962).

The diathesis/stress model of Paul Meehl (1962) has been one of the most influential models of schizophrenia. Meehl proposed a genetic diathesis (labeled schizotaxia), which was a necessary but not sufficient condition for the development of schizophrenia. Anyone possessing the diathesis would, according to Meehl, develop a specific personality organization, which he labeled schizotypy. Only a portion of these schizotypes, however, would actually develop schizophrenia. Based on this model, a method for identifying people at risk for schizophrenia has been developed, which relies on a behavioral measurement of schizotypic characteristics (Chapman, Chapman, Raulin, & Edell, 1978). Self-report behavioral measures have been developed for many of the schizotypic signs described by Meehl, including Physical and Social Anhedonia (Chapman, Chapman, & Raulin, 1976), Perceptual Aberration (Chapman, Chapman, & Raulin, 1978), Somatic Symptoms (Raulin, Chapman, & Chapman, 1978), Magical Ideation (Eckblad & Chapman, 1983), Intense Ambivalence (Raulin, 1984), Schizotypic Ambivalence (Raulin, 1986), Social Fear (Raulin & Wee, 1984), Rage (Raulin, 1982), Distrust (Raulin, 1982), and Cognitive Slippage (Miers & Raulin, 1985). These scales are briefly described in Table 1. The scales were developed to have high reliability and minimal method variance. All of the scales that have been evaluated with schizophrenic subjects have shown a significantly higher mean score in schizophrenics than in normal controls, although high scores are not characteristic of all schizophrenics. Test-retest reliability suggests that these traits are stable in psychiatric populations and show almost no relationship to the level of current symptomatology (Mahler, Raulin, O'Gorman, & Furash, 1987). Furthermore, college students who scored high on one or more of these scales

display mild forms of a variety of symptoms found in schizophrenic populations. [See Mahler et al. (1987) for a review.]

Table 1
Brief Descriptions of the Schizotypy Scales

Physical Anhedonia - inability to experience physical pleasure

Perceptual Aberration - perceptual distortions especially of body image

Somatic Symptoms - a collection of symptoms thought to be indicative of mild neurological impairment

Intense Ambivalence - strong simultaneous or rapidly fluctuating positive and negative feelings

Somatic Symptoms - a collection of symptoms thought to be indicative of subtle neurological dysfunction

Social Fear - strong fear of people and/or social interactions

Magical Ideation - a general belief in causal connections between behavior and events which are objectively unrelated

Cognitive Slippage - a subtle form of thought disorder

Distrust - a strong distrust of the motives of other people

Rage - characterized by strong, periodic, uncontrolled, angry outbursts

These measures have shown considerable promise in a search for subtypes of schizophrenia. Propper, Raulin, Lowrie, Trigoboff, Henderson, and Watson (1987) conducted a cluster analysis of 73 psychiatric patients who scored at least one standard deviation above the mean on at least one schizotypy scale. This was a mixed group of patients which included schizophrenics, schizoaffective patients, hospitalized alcoholics, and outpatient clinic clients. This mixed group was used for the Propper et al. study because it was expected that schizotypes would be found in many different patient groups (since only a portion of schizotypes develop schizophrenia), and compensated schizotypes might represent a different mix of schizotypes. Subjects with normal scores on all of the schizotypy scales were dropped from the cluster analysis to avoid a the formation of a large cluster of nonschizotypic subjects. A centroid method of clustering resulted in six clusters, although three clusters contained only a single subject each and a fourth cluster contained only three subjects. The first cluster consisted of subjects who typically scored high (at least one standard deviation above the mean) on Distrust, Social Fear, and Magical Ideation. The second cluster consisted of subjects who typically scored high on Anhedonia and generally below the mean on all the other scales. These two major clusters are summarized in Table 2. These clusters represent the focus of the current study.

Aldenderfer and Blashfield (1984) point out that, while the strategy of cluster analysis is structure-seeking, its operation is structure-imposing. The various algorithms for clustering will eventually cluster any sample of subjects on the basis of a set of scores, including scores that are simply random numbers. Therefore, the formation of clusters by a clustering program does not indicated that the clusters are valid groups of subjects. Techniques are needed to determine the most natural

groups in a data set. One such technique is external validation, where the clusters are compared on variables NOT used to generate the cluster solution.

Table 2

Summary of Six Cluster Solution

Cluster	N	Elevated Scales	Number of Schizophrenics[1]	Alcoholics
1	43	Distrust Social Fear Magical Ideation	26	5
2	24	Physical Anhedonia	10	4

[1]Includes both schizophrenic and schizoaffective patients.

This study extends the efforts of Propper et al. (1987) by conducting an independent validation of the two major clusters found in the original study. These clusters were expected to show natural differences on clinically meaningful variables. We had hypothesized that Cluster 1 patients would be more likely to report manic symptomatology, hallucinations, alcoholism, social discomfort and avoidance, the desire to be alone, suicidal tendencies, and distrust than Cluster 2 patients and less likely to report having a close friend or a good premorbid adjustment. No strong hypotheses were advanced for the variable of age at first treatment.

METHOD

SUBJECTS

The study included 45 patients from a VA Medical Center with a hospital diagnosis of schizophrenia, schizoaffective disorder, or alcoholism. These patients came from several treatment programs, including an inpatient psychiatric unit, a partial hospitalization program, and an inpatient alcohol treatment program. These patients were part of the Propper et al. (1987) cluster analysis study and were all the patients in the two major clusters (See Table 2) on whom interview data were available. The outpatient clients included in the Propper et al. (1987) study were not included here because interview data were not available for these subjects. The average age of this sample was 36.9. The average education level was 12.8. All of the patients were male. Ten of the 45 patients were married.

PROCEDURES

Each patient was given a test protocol containing screening versions of the ten schizotypy scales used in the Propper et al. (1987) cluster analysis (see Table 1). To verify the hospital diagnosis and to determine the current type and level of symptomatology, each patient was interviewed using the *Schedule for Affective Disorders and Schizophrenia - Lifetime Version* (*SADS-L*; Spitzer & Endicott, 1977). The *SADS-L* was modified slightly be including more extensive sections on schizotypal symptomatology and premorbid adjustment. In addition, long, complicated questions in the *SADS-L* were broken into a series of simpler questions.

The external validation of the clusters was based on symptomatology and adjustment ratings that were made by raters who were blind to the cluster

membership of each patient. The Harris (1975) Premorbid Adjustment Scale was used to access premorbid sexual and social adjustment.

RESULTS

Table 3 presents a summary of the results for the combined group of schizophrenic and alcoholic patients. Cluster 1 patients (characterized by high scores on distrust, social fear, and magical ideation) were more likely than cluster 2 patients (characterized by high scores on physical anhedonia) to report auditory hallucinations [X^2 (1, N = 45) = 4.93, $p < .05$], social discomfort [X^2 (1, N = 45) = 7.79, $p < .005$], social avoidance [X^2 (1, N = 45) = 10.16, $p < .001$], and distrust [X^2 (1, N = 45) = 4.05, $p < .05$]. The difference between Cluster 1 and Cluster 2 patients on manic symptomatology approached significance ($p = .09$), with Cluster 1 patients more frequently reporting mania. None of the other variables differentiated the two groups including the premorbid adjustment ratings.

Separate analyses of cluster differences were conducted on the subsamples of schizophrenics and alcoholics. For the schizophrenics (N = 36), Cluster 1 patients were more likely than Cluster 2 patients to report alcoholism [X^2 (1, N = 36) = 3.97, $p < .05$], social discomfort [X^2 (1, N = 36) = 9.56, $p < .002$], and auditory hallucinations [X^2 (1, N = 36) = 4.24, $p < .05$]. There was also a strong trend for Cluster 1 patients to report more social avoidance than Cluster 2 patients [X^2 (1, N = 36) = 3.64, $p = .056$]. None of the other variables differentiated Cluster 1 schizophrenic patients from Cluster 2 schizophrenic patients. Perhaps due to the small sample size, only one cluster difference was found in the alcoholic patients (N = 9); Cluster 1 alcoholics were more likely to report social avoidance than Cluster 2 alcoholics (Fisher's Exact Test $p = .04$).

Table 3

Naturalness of the Two Major Clusters

Differences	Direction[1]	p value
Premorbid social adjustment	1 = 2	.45
Premorbid sexual adjustment	1 = 2	.67
Amount of work missed	1 = 2	.56
Age at first treatment	1 = 2	.18
Manic symptoms present	1 > 2	.09
Auditory hallucinations	**1 > 2**	**.03**
Other hallucinations	1 = 2	.33
Alcoholism	1 = 2	.17
Suicidal tendencies	1 = 2	.22
Social discomfort	**1 > 2**	**.005**
Social avoidance	**1 > 2**	**.001**
Have close friend(s)	1 = 2	.32
Desire to be alone	1 = 2	.24
Reporting distrust	**1 > 2**	**.04**

[1]Differences are reported for all comparisons in which at least a trend ($p < .10$) is noted. Cluster 1 is characterized by high scores on Distrust, Social Fear, and Magical Ideation. Cluster 2 is characterized by high scores on Physical Anhedonia and generally low scores on all the other scales.

DISCUSSION

The current data suggest that there are some clinically meaningful differences between the two major clusters identified in the Propper et al. (1987) study, including presence of auditory hallucinations, social discomfort and avoidance, and distrust. These results are consistent with previous findings, where anhedonic subjects consistently show less behavioral symptomatology (Chapman, Chapman, Raulin, & Edell, 1978; Chapman, Edell, & Chapman, 1980), even while they show underlying deficits on the Rorschach (Edell & Chapman, 1979) and on psychophysiological measures (Simons, 1981, 1982). Of particular interest is the fact that premorbid adjustment did not differentiate the clusters. Since premorbid adjustment has been used extensively in the past to identify more homogeneous subgroups of patients, it would appear that the two clusters studied in this project are independent of the process/reactive (poor premorbid/good premorbid) distinction and may provide a new basis for the differentiation of subgroups.

The power of external validation is that it directly tests the "naturalness" of a cluster solution against relevant criteria. It is not often used due to cost factors and the difficulty of defining a set of relevant criteria. Yet, it is a critical step in any search for meaningful subgroups of subjects. The value of a cluster solution that has successfully passed an external validation is much greater than a solution that has not (Aldenderfer & Blashfield, 1984).

External validation used in this study supports the naturalness of two schizotypic clusters. Validation showing meaningful differences on other dimensions such as family history, course, and outcome would lend more evidence to the identification of subgroups of schizophrenics.

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Poster Presented at the
APA Convention
Atlanta, Georgia
August 12, 1988