Symptom segregation in chronic schizophrenia: the significance of thought disorder

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Forty-two schizophrenics in chronic stages were evaluated using the standard and modified SANS for negative symptoms, and the SADS for positive symptoms. The results of principal components analysis of the two scales were then compared. Analysis of the modified scale scores showed that thought disorder belonged to a unique syndrome orthogonal to both the positive and negative syndromes, which was designated disorganization syndrome. Cluster analysis of the modified scores revealed two major clusters, one of which consisted of the subjects with high disorganization syndrome scores. This subgroup was not identified using the standard SANS scores for analysis. The disorganization syndrome included thought disorder, bizarre behavior, and attentional impairment. Similarities between Hecker's hebephrenia and the disorganization syndrome detected in the present study were noted.

INTRODUCTION

The clinical diversity of schizophrenia has prompted numerous attempts to define the basic syndromes of this disorder. Among these attempts, the positive–negative dichotomy has gained prominence. However, the definitions of positive and negative syndromes are somewhat confusing, and formal thought disorder has been variously assigned to positive syndrome (Andreasen, 1982b), to negative syndrome (Lewine, 1983), or to other syndromes which are not definable as either positive or negative syndromes (Bilder et al., 1985; Andreasen et al., 1986; Liddle, 1987; Liddle et al., 1990, 1992; Kulhara et al., 1990; Arndt et al., 1991; Gur et al., 1991; Pantelis et al., 1991). Since at least some cases of schizophrenia appear to be progressive, as Kraepelin insisted, the basic syndromes might be revealed more clearly in the terminal stage than in other stages of this disorder.

The present study was undertaken to delineate the segregation of symptoms within a sample of terminal stage schizophrenic inpatients.

Although the reliability of the Scale for the Assessment of Negative Symptoms (SANS) is quite high, its validity has yet to be established. Moreover, several problems remain unsolved in applying the SANS to deteriorated schizophrenics. In the present study, the authors performed principal components analysis of two sets of data, i.e., the exact SANS scores and modified SANS scores. The assignment of thought disorder by these two methods was then compared. A subgroup of subjects with similar characteristics to hebephrenia, described by Hecker, was indicated by the modification of the SANS subscales.

METHODS

The subjects were recruited from a group of chronic schizophrenic inpatients at a general acute

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and chronic psychiatric hospital in Osaka, Japan. It was required that the subjects had to be suffering from schizophrenia for more than 15 years and had to fulfill the Feighner's criteria. The subject group consisted of 42 chronic schizophrenics (36 males and 6 females) with a mean age of 51.2 ± 9.8 years. The mean duration of their illness was 26.7 ± 7.8 years, and the mean period of hospitalization was 24.4 ± 8.6 years. The subjects were on medication, and most of them had been treated by the raters for over a decade.

Negative symptoms were rated using the SANS (Andreasen, 1982a), a 30-item scale composed of 5 empirically chosen subscales: affective flattening, alogia, avolition–apathy, anhedonia–asociality, and attentional impairment. The positive symptoms of delusions, hallucinations, bizarre behavior, and formal thought disorder were rated using the Schedule for Affective Disorders and Schizophrenia (SADS; Endicott and Spitzer, 1978). The first three of these symptoms were measured as single items from the SADS (severity of delusions, severity of hallucinations, and bizarre behavior). Formal thought disorder was assessed by summing the raw scores on three items from the SADS (ununderstandability, loosening of associations, and illogical thinking).

Several problems remain unsolved with regard to the validity of individual subscales or items of the SANS when it is applied to deteriorated schizophrenics in terminal stages. For example, one of the subjects habitually loitered in the ward, and spoke incoherently to other patients and nursing staff. In such a case, it was difficult to decide whether the subscale scores for asociality should be low or high. Another severely incoherent schizophrenic was talkative, but did not communicate with others. Again, it was difficult to decide whether the subscale scores for alogia should be low or high. Moreover, it is of doubt that item 10 (poverty of speech) and item 11 (poverty of content of speech) should be on the same SANS subscale. Therefore, two modified subscales were adopted in this study. The first subscale was social withdrawal, which focussed only on the amount of objective contacts with others, regardless of the level of communication. The second subscale was poverty of the amount of speech, which focussed only on the amount of speech, regardless of the understandability. Talkative but incoherent subjects were assigned low scores in this subscale.

These two modified subscales were graded as follows: 0, no evidence; 1, questionable; 2, mild; 3, moderate; 4, marked; and 5, severe.

In analyzing the data, principal components analysis was performed first using the original SANS and SADS scores. Secondly, two SANS subscales (alogia and anhedonia–asociality) were exchanged for poverty of the amount of speech and social withdrawal, respectively. Principal components and cluster analysis of these scores were then performed. The Ward method using standardized squared Euclidean distance was adopted for cluster analysis.

RESULTS

The results of principal components analyses of the original and modified scores are shown in Tables 1 and 2, respectively. Using the original scores, three factors were extracted which explained about 81% of the total variance. The first factor, which explained about 43% of the variance, had large positive loadings (> 0.3) on five negative symptoms and thought disorder. The second factor, which explained about 21% of the variance, had large positive loadings on thought disorder and bizarre behavior, and large negative

TABLE 1

Eigenvectors obtained by principal components analysis of the exact SANS and SADS scores

	Factor 1 (Prin 1)	Factor 2 (Prin 2)	Factor 3 (Prin 3)
Affective flattening	0.38	−0.35	−0.04
Alogia	0.43	−0.23	0.10
Avolition/apathy	0.41	−0.18	−0.05
Anhedonia/Asociality	0.35	−0.34	−0.19
Attentional impairment	0.44	0.25	0.08
Hallucinations	−0.08	−0.16	0.67
Delusions	−0.02	−0.13	0.68
Bizarre behavior	0.24	0.59	0.05
Thought disorder	0.34	0.48	0.16
Eigenvalue*	3.82	1.93	1.57
% Variance explained	42.5	21.4	17.4
% Cumulated variance	42.5	63.9	81.4

Prin, principal component.
*Eigenvalue of factor 4 is 0.54.

TABLE 2

Eigenvectors obtained by principal components analysis of the modified SANS and SADS scores

	Factor 1 (Prin 1)	Factor 2 (Prin 2)	Factor 3 (Prin 3)
Affective flattening	−0.03	0.58	0.05
Poverty of amount of speech	−0.43	0.32	−0.02
Avolition/apathy	0.12	0.53	0.03
Withdrawal	−0.40	0.34	−0.03
Attentional impairment	0.39	0.37	0.08
Hallucinations	−0.08	−0.10	0.69
Delusions	−0.06	−0.01	0.71
Bizarre behavior	0.48	0.01	−0.02
Thought disorder	0.49	0.14	0.12
Eigenvalue*	3.52	2.46	1.51
% Variance explained	39.1	27.4	16.8
% Cumulated variance	39.1	66.5	83.3

*Eigenvalue of factor 4 is 0.57.

loadings (< -0.3) on affective flattening and anhedonia–asociality. The third factor, which explained about 18% of the variance, had large positive loadings on hallucinations and delusions.

Using the modified scores, three factors were extracted which explained about 83% of the total variance. The first factor, which explained about 39% of the variance, had large positive loadings on thought disorder, bizarre behavior, and attentional impairment, and large negative loadings on poverty of the amount of speech and withdrawal. This group of five symptoms was designated disorganization syndrome. The second factor, which explained about 27% of the variance, had large positive loadings on all items of the negative symptom complexes. This factor was supposed to correspond to the negative syndrome. The third factor, which explained about 17% of the variance, had large positive loadings on hallucinations and delusions. This factor was supposed to correspond to the positive syndrome.

Cluster analysis using the modified scores revealed two major clusters, one of them consisting of subjects with severe disorganization syndrome, indicated by high factor 1 scores (Fig. 1). This did not occur when the exact SANS scores were used, and the scatter diagram did not identify a separate subgroup in this case (Fig. 2).
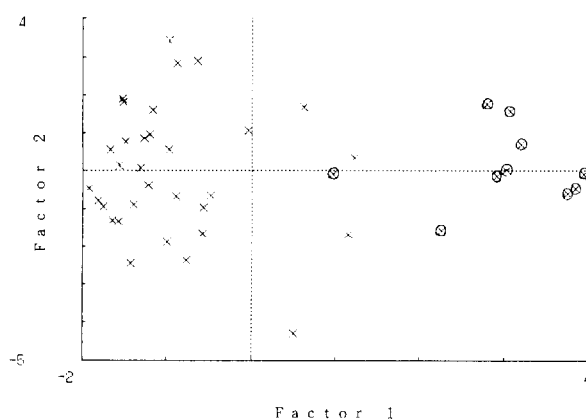
Between the severe disorganization subgroup

Fig. 1. Scatter diagram of principal components analysis of the modified SANS and SADS scores. ⊗ Subjects assigned to the cluster of severe disorganization syndrome by cluster analysis of the modified SANS scores.
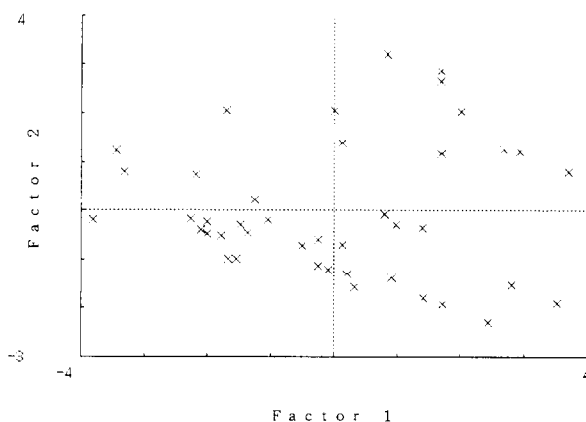

Fig. 2. Scatter diagram of principal components analysis of the exact SANS and SADS scores.

classified by cluster analysis ($n = 10$) and the subgroup comprising the remaining subjects, significant score differences were found for formal thought disorder (Mann-Whitney $U = 316$, $z = 4.640$, $p < 0.0001$, two-tailed), bizarre behavior ($U = 319$, $z = 4.928$, $p < 0.0001$), withdrawal ($U = 365$, $z = -3.743$, $p < 0.001$), and poverty of the amount of speech ($U = 195$, $z = -4.242$, $p < 0.0001$).

DISCUSSION

In order to define the attribution of thought disorder to positive or negative syndromes, the authors

performed two assessments, one using the original SANS scale, and the other using a modified scale. Although the modification of the SANS in the present study is simple and robust, it is based on our multivariate study reported elsewhere (Sarai et al., 1992). When principal components analysis was performed using the original scores, the loadings of thought disorder were divided into two factors, and the attribution of thought disorder to these factors was still undefined. On the other hand, principal components analysis using the modified scores demonstrated that thought disorder belonged to a unique syndrome which was orthogonal to both the positive (factor 3) and the negative (factor 2) syndromes. This unique syndrome, designated disorganization syndrome, included thought disorder, bizarre behavior, absence of poverty of the amount of speech, absence of withdrawal, and impaired attention. The small change in two negative symptom items resulted in a substantial change in the factor structure of schizophrenic symptoms.

In both assessments, three factors had eigenvalues greater than unity, suggesting that a three-components model fits the data. The cumulated variance explained by the three factors were greater than 80%.

Several caveats must be borne in mind. First, the results of two principal components analyses were compared qualitatively, not statistically. Second, the present study was conducted with a small number of subjects, and this kind of multivariate analysis might be unstable. Third, the item 'illogical thinking' from SADS, which is rarely reported, and often unreliable, is included in the formal thought disorder assessment. Since infrequent and unreliable items can reduce the effect of a subscale, it may be better to analyse the data without this item. Fourth, most of the subjects in the present study had protracted poor courses with long periods of hospitalization.

Several investigators (Bilder et al., 1985; Kulhara et al., 1990; Arndt et al., 1991; Gur et al., 1991; Pantelis et al., 1991; Liddle et al., 1992) have reported unique syndromes orthogonal to both the positive and negative syndromes, corresponding to the disorganization syndrome in the present study. Using oblique rotation, Liddle (1987) and Liddle et al. (1990) have reported the disorganization syndrome which included inappropriate affect, and

not absence of withdrawal. Formal thought disorder was common among these syndromes, though the combinations of other symptoms varied.

If the segregation of symptoms demonstrated by principal components analysis is substantial, the subjects with high disorganization syndrome scores might be expected to converge into one cluster on cluster analysis. As expected, those subjects who had high disorganization syndrome scores formed a separate subgroup on cluster analysis, except one who became incoherent intermittently. In contrast, when the original SANS scores were used for principal components analysis, the distribution of the subjects on the scatter diagram formed a continuum.

The clinical features of subjects with high disorganization syndrome scores included severe incoherence and/or perseveration of speech, bizarre behavior, absence of withdrawal, absence of poverty of the amount of speech. Among other clinical features of these patients were peculiar thinking and absence of Schneider's first rank symptoms, though statistical data on these items were not available in the present study. They often complained of bizarre ideas, which were vague and transient. Their delusions and hallucinations were too fragmentary to meet Schneider's first rank symptoms.

The validity of the modified SANS scores in the present study has been endorsed by the similarities between a disorder described in the classic literature and the subjects with high disorganization syndrome scores in the present study. In 1871, Hecker reported hebephrenia, a disorder characterized by rapid progression into severe deterioration. The clinical feature of the deteriorated stage of this disorder includes incoherence of speech, bizarre behavior, peculiar thinking, and the absence of Schneiderian first-rank symptoms. Neither withdrawal, nor poverty of the amount of speech, is prominent except in the 'melancholic stage' of hebephrenia. The delusions are vague, transient, and poorly systematized. The similarities between Hecker's hebephrenia and the subjects of our study with high disorganization syndrome scores are shown in Table 3. Hecker's hebephrenia was the original type of 'läppische Verblödung' described by Kraepelin, which was supposed to be the core type of dementia praecox. Hebephrenia, however, disappeared from the literature of psychi-

TABLE 3

The similarities between Hecker's Hebephrenia and subjects with high disorganization scores in the present study

	Disorganization syndrome	Hecker's hebephrenia
Stage of observation	Terminal stage	Deteriorated stage
Speech and writings	Incoherent and not understandable	Incoherent and not understandable
Thought disorder	Severe	Severe
Schneiderian FRS*	Absent	Probably absent

*Schneiderian first-rank symptoms.

atry, especially after Schneider established the first-rank symptoms and devalued the diagnostic value of incoherence.

The present study indicates that the segregation of symptoms in a multivariate study of schizophrenia depends on the selection and definition of the items or subscales. This suggests that reconsideration of the validity of some SANS subscales, especially alogia and anhedonia–asociality, might be necessary.

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