

Psychometric Properties of the Positive and Negative Syndrome Scale (PANSS) in Schizophrenia

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Abstract. We analyzed the psychometric properties of the Positive and Negative Syndrome Scale (PANSS) in a sample of 100 *DSM-III-R* schizophrenic patients. Our findings coincided with the results of Kay's group in the following points: (1) the PANSS scores were normally distributed; (2) the positive and negative scales showed good interrater reliability; (3) positive and negative syndromes are independent constructs; (4) the positive and negative scales held a high concurrent validity in relation to the Scale for the Assessment of Positive Symptoms and the Scale for the Assessment of Negative Symptoms; and (5) although positive and negative syndromes showed factorial validity, they were not sufficient to account for the whole of the schizophrenic symptoms. Unlike Kay's group, we found a modest internal consistency of the positive scale, indicating that it is composed of several independent components. The data suggest that the distinction between positive and negative symptoms is an oversimplification, and that schizophrenic symptoms can be better conceptualized as composed of, at least three dimensional syndromes: positive, disorganized, and negative.

Key Words. Reliability, validity, positive symptoms, negative symptoms.

Research into schizophrenia has suggested that this disorder may comprise at least two distinct phenomenological clusters that reflect separate pathological processes: the positive and negative symptoms, and syndromes (Strauss et al., 1974; Crow, 1980). As a consequence of this conceptualization of schizophrenic phenomenology, various scales for the assessment of the positive and negative dimensions have also been developed (Krawiecka et al., 1977; Angrist et al., 1980; Lewine et al., 1983; Andreasen, 1984a, 1984b). However, these scales (perhaps with the exception of the Andreasen scales) have not been subjected to the rigors of psychometric standardization (Sommers, 1985), and problems in some aspects of validity have been pointed out (de Leon et al., 1989).

Kay et al. (1987) developed the Positive and Negative Syndrome Scale (PANSS) in an attempt to overcome the problems of validity that other scales posed, and to provide a "well-researched psychometric instrument" for evaluating positive and negative schizophrenic symptoms and syndromes. The rationale behind the creation of the PANSS was to include items that best represented positive and negative

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features and to exclude others, such as attentional disorders, which may actually be secondary to other symptoms. The PANSS has been thoroughly studied from the psychometric point of view by Kay's research group in a number of publications. For these authors, the PANSS has psychometric properties that make it a more valuable instrument than other positive-negative scales for clinical research in schizophrenia (Kay, 1990). The Kay group has reported that the PANSS has good interrater reliability (Kay et al., 1988), adequate construct validity (Kay et al., 1987, 1988), and high internal reliability (Kay et al., 1987), appropriate test-retest reliability (Kay et al., 1987), and external validity (Kay et al., 1986b, 1987; Kay and Singh, 1989). In a recent study of 200 schizophrenic outpatients, the Kay group (Opler et al., submitted for publication) replicated their findings on the internal reliability of the PANSS, reporting α coefficients for the positive, negative, and general psychopathology scales of 0.80, 0.82, and 0.82, respectively.

Subsequently, Kay and Sevy (1990) reported a principal components analysis (PCA) conducted on 240 schizophrenic patients showing that the positive/negative distinction has factorial validity but is insufficient to accommodate the full range of schizophrenic symptoms. Seven factors were obtained, the first four (negative, positive, excited, and depressive) having eigen values >2 and embracing a substantial set of symptoms. In addition, three other significant components were cognitive dysfunction, suspiciousness, and stereotypic thinking factors.

Studies by research groups not directly involved in the development of the scale are scarce. Bell et al. (1992) applied the PANSS to a sample of chronic *DSM-III-R* schizophrenic patients from a rehabilitation program. They reported that the PANSS items had excellent interrater reliability. The internal consistency coefficients for the positive, negative, and general psychopathology scales were 0.74, 0.69, and 0.64, respectively. To our knowledge, only two studies have been published that report on the psychometric properties of the PANSS and were conducted outside the USA. In Sweden, von Knorring and Lindström (1992) conducted a study in 88 *DSM-III-R* chronic schizophrenic patients. They reported normal distribution for all subscales and good interrater reliability for most items. The internal reliability analysis showed moderate α coefficients for the positive and general psychopathology scales (0.58 and 0.63, respectively) and a good α coefficient for the negative subscale (0.81). A PCA conducted in France on 331 schizophrenic patients (Lepine, 1991) resulted in five factors: negative, excited, cognitively dysfunctional, depressive, and positive.

Given the lack of studies on the PANSS by independent research groups, the psychometric properties of the PANSS, including its cross-cultural validation, remain to be confirmed. The present study was conducted to study interrater reliability and some aspects of the validity of the PANSS in a sample of Spanish schizophrenic patients.

Methods

The sample comprised 100 schizophrenic patients admitted consecutively to a psychiatric inpatient unit of a general hospital due to an exacerbation of illness. Patients were diagnosed using *DSM-III-R* criteria (American Psychiatric Association, 1987) and a semistructured interview designed for schizophrenic patients (Landmark, 1982).

Schizophrenic symptoms were assessed by means of the PANSS (Kay et al., 1986a). To study the concurrent validity of the PANSS in relation to other positive/negative symptom scales, the Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1984a) and the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1984b) were also administered. The PANSS items were evaluated by means of the PANSS interview and rated according to the definitions and criteria provided in the manual. Scale ratings were done during the first 5 days after admission. The only divergence from the rating procedure recommended in the PANSS manual was that we collected the information from the previous month before admission (in the PANSS manual, the information is restricted to the previous week). The SAPS and the SANS were completed on the basis of the PANSS interview supplemented by the exploration of those SAPS-SANS symptoms (i.e., bizarre behavior, inappropriate affect, and blocking) not included in the PANSS. Information to rate all scales was obtained from a formal clinical interview, nurses' reports of patients' behavior in the ward, and reports from the patient's family.

To study the interrater reliability of the PANSS, the authors examined jointly (but rated independently) a subsample of 27 patients. Two-thirds of the patients (69%) were male, and 86% single. The mean age was 35.8 years ($SD = 12.7$; range 16-76). The mean educational level was 8.8 years ($SD = 3.6$; range 3-18). The mean age of onset was 25 years ($SD = 8.2$; range 13-61), and the mean duration of illness was 10.4 years ($SD = 8.9$; range 0-46). The mean number of hospitalizations was four ($SD = 3.4$; range 1-23), and the mean duration of hospitalizations was 12 months ($SD = 44.8$; range 0-348). This was the first hospitalization for one-fifth of the patients. The frequency of schizophrenia subtypes defined by *DSM-III-R* criteria was 3% catatonic, 17% disorganized, 58% paranoid, 16% undifferentiated, and 6% residual.

All patients received neuroleptic medication, with the mean dosage in chlorpromazine equivalents being 1290 ($SD = 1034$; range 250-7200). In addition, 68 patients were treated with biperiden due to extrapyramidal symptoms. Twelve patients had never taken neuroleptics, 61 had not taken them regularly during the month before admission, and 27 were taking them as recommended.

The *Statistical Package for Social Sciences* (Norusis, 1986) was used for the statistical analysis. Interrater reliability was examined through the intraclass correlation coefficient (ICC) as recommended by Bartko and Carpenter (1976). The internal consistency and the contribution of the component items were examined with Cronbach's α coefficient. A PCA with varimax rotation was carried out to study the factor structure of the PANSS.

Results

The distribution characteristics of the PANSS (mean, median, SD , range, skewness, and kurtosis) were as follows. Positive scale: 25.9, 26, 7.4, 7-41, -0.21, -0.37. Negative scale: 26.2, 24, 10.7, 7-49, 0.14, -0.81. Composite scale: -0.29, 1, 13.6, -38-24, -0.48, -0.10. General psychopathology scale: 44.8, 45, 9.6, 23-69, 0.10, -0.26. The values of the Shapiro-Wilks test of normality were 0.959 ($p = 0.194$) for the positive scale, 0.974 ($p = 0.518$) for the negative scale, 0.961 ($p = 0.236$) for the composite scale, and 0.983 ($p = 0.849$) for the general psychopathology scale. According to the composite scale, 53 patients were classified as having a positive type of schizophrenia and 47 patients as having a negative type.

Table 1 presents the interrater reliability results. Agreement on individual items was variable with interclass correlation coefficients (ICC) ranging from 0.31 (poor impulse control) to 0.93 (poor attention). Positive and negative scales showed a good interrater reliability (ICC = 0.72 and 0.80, respectively), and the general psychopathology scale resulted in a moderate agreement (ICC = 0.56) with considerable item variability.

Internal consistency of the PANSS was examined through α coefficients and the corrected item-total correlation (Table 2). The positive scale displayed moderate internal consistency (global $\alpha = 0.62$) with the conceptual disorganization item having a nonsignificant item-total correlation. The negative scale showed a very high internal consistency (global $\alpha = 0.92$), and all items had high item-total correlations ($p \leq 0.001$). The general psychopathology scale revealed modest internal consistency, producing a global α coefficient of 0.55. The individual items contributed heterogeneously to the scale.

Table 1. Interrater reliability of the Positive and Negative Syndrome Scale

	ICC	<i>p</i>
Positive scale (ICC = 0.72)		
Delusions	0.91	0.001
Conceptual disorganization	0.75	0.001
Hallucinatory behavior	0.82	0.001
Excitement	0.62	0.01
Grandiosity	0.42	NS
Suspiciousness	0.70	0.001
Hostility	0.56	0.05
Negative scale (ICC = 0.80)		
Blunted affect	0.75	0.001
Emotional withdrawal	0.61	0.01
Poor rapport	0.86	0.001
Passive-apatetic social withdrawal	0.61	0.01
Difficulty in abstract thinking	0.76	0.001
Lack of spontaneity & flow of conversation	0.90	0.001
Stereotyped thinking	0.59	0.01
General psychopathology scale (ICC = 0.56)		
Somatic concern	0.79	0.001
Anxiety	0.57	0.05
Guilt feelings	0.67	0.01
Tension	0.41	NS
Mannerisms & posturing	0.73	0.001
Depression	0.74	0.001
Motor retardation	0.89	0.001
Uncooperativeness	0.65	0.01
Unusual thought content	0.53	0.05
Disorientation	—	—
Poor attention	0.93	0.001
Lack of judgment & insight	0.56	0.05
Disturbance of volition	0.78	0.001
Poor impulse control	0.31	NS
Preoccupation	0.37	NS
Active social avoidance	0.62	0.01

Note. ICC = intraclass correlation coefficient. The interrater reliability of disorientation cannot be calculated due to insufficient variance.

Table 2. Internal reliability analysis of the Positive and Negative Syndrome Scale

	Mean	SD	Corrected item-total correlation	<i>p</i>	α if item deleted
Positive scale ($\alpha = 0.62$)					
Delusions	5.05	1.84	0.49	<0.001	0.51
Conceptual disorganization	3.39	2.18	0.05	NS	0.66
Hallucinatory behavior	3.93	2.16	0.30	<0.001	0.57
Excitement	3.90	1.88	0.34	<0.001	0.56
Grandiosity	2.76	1.95	0.28	<0.01	0.58
Suspiciousness	3.67	1.81	0.47	<0.001	0.51
Hostility	3.24	1.81	0.39	<0.001	0.54
Negative scale ($\alpha = 0.92$)					
Blunted affect	3.75	1.74	0.85	<0.001	0.90
Emotional withdrawal	4.44	1.78	0.80	<0.001	0.90
Poor rapport	4.20	1.85	0.83	<0.001	0.90
Passive-apathetic social withdrawal	4.91	1.84	0.65	<0.001	0.92
Difficulty in abstract thinking	3.24	1.91	0.73	<0.001	0.91
Lack of spontaneity & flow of conversation	2.67	1.93	0.72	<0.001	0.91
Stereotyped thinking	3.01	2.01	0.70	<0.001	0.91
General psychopathology scale ($\alpha = 0.55$)					
Somatic concern	2.49	1.95	0.08	NS	0.58
Anxiety	2.99	1.80	0.33	<0.001	0.53
Guilt feelings	1.29	1.01	0.01	NS	0.58
Tension	2.94	1.63	0.07	NS	0.58
Mannerisms & posturing	1.61	1.28	0.11	NS	0.57
Depression	1.37	0.88	0.17	<0.05	0.56
Motor retardation	1.69	1.46	0.18	<0.05	0.56
Uncooperativeness	3.55	1.83	0.31	<0.001	0.53
Unusual thought content	5.32	1.52	0.05	NS	0.58
Disorientation	1.04	0.32	0.08	NS	0.57
Poor attention	2.23	1.72	0.36	<0.001	0.53
Lack of judgment & insight	4.13	1.85	0.37	<0.001	0.52
Disturbance of volition	3.83	1.92	0.28	<0.01	0.54
Poor impulse control	2.52	1.74	0.27	<0.01	0.54
Preoccupation	3.29	1.84	0.24	<0.01	0.55
Active social avoidance	4.47	2.03	0.28	<0.01	0.54

Positive and negative scales were uncorrelated ($r = 0.09$, NS). The general psychopathology scale was weakly correlated with the positive scale ($r = 0.20$, $p \leq 0.05$) and highly correlated with the negative scale ($r = 0.55$, $p \leq 0.001$).

To study the PANSS concurrent validity, we compared it with the Andreasen scales (SAPS and SANS). Both positive scales and both negative scales showed a high correlation coefficient ($r = 0.70$ and $r = 0.81$, respectively).

Table 3 presents the results of the PCA (with varimax rotation). Since the

Table 3. Principal components analysis of the Positive and Negative Syndrome Scale

	Factors							
	I	II	III	IV	V	VI	VII	VIII
Delusions		0.81						
Conceptual disorganization			0.82					
Hallucinatory behavior		0.72						
Excitement				0.66	0.40			
Grandiosity					-0.43			-0.47
Suspiciousness		0.61						
Hostility				0.82				
Blunted affect	0.84							
Emotional withdrawal	0.88							
Poor rapport	0.77							
Passive-apathectic social withdrawal	0.77							
Difficulty in abstract thinking	0.65		0.40					
Lack of spontaneity & flow of conversation	0.79							
Stereotyped thinking	0.68							
Somatic concern								0.76
Anxiety					0.79			
Guilt feelings							0.83	
Tension					0.80			
Mannerisms & posturing						-0.50		
Depression							0.62	
Motor retardation	0.55						0.52	
Uncooperativeness				0.43				
Unusual thought content		0.55				0.49		
Poor attention			0.78					
Lack of judgment & insight			0.70					
Disturbance of volition	0.43							
Poor impulse control				0.66				
Preoccupation						0.80		
Active social avoidance	0.67							
Variance explained (total = 69.9%)	24.1	12.0	8.1	6.9	5.7	5.2	4.4	3.5

Note. Only factor loadings > 0.40 are represented. Factors' description: I = negative. II = positive. III = disorganized. IV = excited. V = anxious. VI = preoccupied. VII = depressive. VIII = somatization.

disorientation symptom was present in only two patients, it was excluded from the PCA to avoid misleading results. All other symptoms were present in at least 10% of the patients. Eight factors (eigen values > 1) accounted for 69.9% of the total variance. The first three extracted factors (negative, positive, and disorganized) had eigen values > 2, and they accounted for the greatest variance (44%).

Discussion

In the present study, we examined a number of psychometric properties of the PANSS. The four PANSS scales displayed a normal distribution pattern without

substantial skewness or kurtosis, indicating that the constructs assessed by PANSS represent typical psychopathological continua. The means and medians of the positive and negative scales were strikingly close, showing that the two dimensions were represented almost equally. The composite scale reflected this distribution pattern and allowed us to classify schizophrenia as positive and negative in equal proportions.

Positive and negative scales displayed good interrater reliability, but reliability was modest for the general psychopathology scale. Internal reliability for the negative scale was very high, but only modest for the positive and general psychopathology scales. Conceptual disorganization was not correlated with the positive scale total score, suggesting that it is not a positive symptom.

The lack of correlation between positive and negative scales suggests that they represent separate psychopathological domains, so that the presence of one does not imply the presence or absence of the other. The concurrent validity of the PANSS in relation to the SAPS/SANS was high, suggesting that the two methods tend to agree in what they measure.

Although the sample was broad, the interpretation of the PCA is problematic because of the low individuals/variables ratio. Thus, our PCA must necessarily be seen as a preliminary and tentative approach to the validation of the PANSS factors. Symptoms of negative and positive subscales emerged as components 1 and 2, respectively. All items from the negative scale loaded on the negative factor. Items of the positive scale were loaded on the positive, disorganized, and excited components. The multivocal nature of the positive scale is in accordance with its fair internal consistency. Taken together, data from the internal reliability analysis and the PCA suggest that, in contrast to the negative scale, the positive scale does not represent a unitary construct, but comprises a number of independent components.

Our findings are in broad agreement with those reported in the validation study by Kay et al. (1987) in the following features: (1) normal distribution of PANSS scores, (2) good interrater reliability for positive and negative scales, (3) independence of the positive and negative scales, and (4) high concurrent validity in relation to SAPS/SANS. Although the small patients/variables ratio on which the PCA is based requires that the results be interpreted with caution, our data confirm the existence of domain-specific groups of symptoms that are similar to those reported by Kay and Sevy (1990) and Lepine (1991). As in the study of Kay and Sevy, in our PCA, symptoms of negative and positive subscales emerged as components 1 and 2, respectively, and accounted for exactly the same share of the variance (36.1%). Other components similar to those obtained by Kay and Sevy were the disorganized component (which they termed "cognitive dysfunction"), the excited component, and the depressive component. Like Kay and Sevy, we found that symptoms of the positive scale split into several different components. Our data are certainly in accordance with the view of Kay (Kay and Sevy, 1990; Kay, 1991) that a two-factor model of positive and negative symptoms is insufficient to accommodate the whole gamut of schizophrenic symptomatology.

The major disagreement with Kay's validation study was the modest internal reliability found in the positive and general psychopathology scales. Other authors

have reported α coefficients around 0.60 for the positive (von Knorring and Lindström, 1992) and general psychopathology (Bell et al., 1992; von Knorring and Lindström, 1992) scales. Another major difference with the results of Kay et al. (1987) was the rather modest correlation that we found between the positive and general psychopathology scales.

To interpret our results adequately, the extent to which our sample differed from that in Kay's validation study must be taken into consideration. Our sample was made up of acute patients, 20% of whom were being hospitalized for the first time. In contrast, Kay's population was biased toward a more chronic group of patients drawn from long-term psychiatric units, 67% of whom had required continuous hospitalization over the previous year and a half. Our patients had a lower educational level and a lower duration of illness. We considered the month before admission to assess the symptoms; in addition, the study was conducted in Spain. In spite of these sample differences, it is clear that our results, as a whole, are very similar to those reported by the Kay group. It is possible that the discordant internal reliability coefficients may be due, at least in part, to the difference between samples rather than to the psychometric properties of the PANSS. In our study, the mean scores of the PANSS subscales were higher than those reported in the PANSS validation study. These higher scores may be attributed to the exacerbation status of our patients or also to our assessment method since it included the month before admission to the hospital. All previous studies reporting internal reliability analyses were conducted on chronic, highly stabilized patients. Therefore, in the absence of other studies conducted on acute schizophrenic patients, it is difficult to say whether patient status influences the PANSS internal reliability. It is worth noting that the greatest PANSS α coefficients (with the sole exception of the negative subscale in the present study) have been reported by the Kay group (Kay et al., 1987; Opler et al., submitted for publication). This may suggest that the PANSS is being applied by other research groups in a way that is different from that employed by the Kay group. In addition, the lowest internal reliabilities of the positive scale were reported in studies conducted outside the USA. If this pattern has some significance, further cross-cultural studies should help to clarify it.

It is doubtful whether the relatively low internal reliability coefficients of the positive and general psychopathology scales in our study are entirely attributable to sample differences and/or PANSS assessment methods. The lack of significant item-total correlations in a number of items from the general psychopathology scale may also reflect its being composed of very heterogeneous symptoms that contribute differently to the severity of the illness. Our failure to find a significant correlation between conceptual disorganization and the positive scale score is consistent with both our PCA and the PCA of Kay and Sevy.

Factor analyses conducted on other positive/negative symptom scales have also shown that conceptual disorganization (or positive formal thought disorder) is independent of positive and negative symptoms (Liddle and Barnes, 1990; Arndt et al., 1991; Peralta et al., 1992). There is a growing body of evidence that conceptual disorganization may form an essential part of a disorganized dimension in schizophrenia (Carpenter and Buchanan, 1989; Andreasen and Carpenter, 1993).

Although the positive, disorganized, and negative clusters of symptoms seem to be the most important phenomenological dimensions in schizophrenia, other domains such as those resulting from the PANSS factor analysis should be considered. A multidimensional approach to schizophrenic psychopathology may be more appropriate than the positive/negative dichotomy, which is an oversimplification of clinical reality (de Leon et al., 1992). The multidimensional approach allows us to cluster most schizophrenic symptoms into groups that are statistically valid and that make clinical sense. This approach might enhance our understanding of the pathological processes underlying the clinical manifestations and allow us to study the interrelationships among dimensions.

The PANSS appears to be a useful instrument to address these questions since it comprises a broad range of schizophrenic symptoms, and it moreover seems to have adequate psychometric properties. However, more intercenter and international studies at different phases of illness are needed to confirm its validity.

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