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Factor Structure of the Brief Psychiatric Rating Scale in Schizophrenia

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The authors report the results of a confirmatory factor analysis of symptoms assessed with the Brief Psychiatric Rating Scale (BPRS) in a sample of 474 patients with schizophrenia, replicated in an independent sample of 327 patients. The most commonly used 5-factor solution for the BPRS fit the data poorly. Exploratory factor analyses performed on the first sample led to the specification of a 4-factor model that included Thought Disturbance, Anergia, Affect, and Disorganization. Confirmatory factor analyses on both samples indicated that the 4-factor model fit the data better than the previously proposed factor structure for the BPRS. Future research on the BPRS in schizophrenia should use the 4-factor model identified in this study.

Since Crow (1980, 1985) and Andreasen (1982, 1985) proposed their respective two-factor theories of symptoms in schizophrenia (i.e., positive and negative), considerable debate has focused on evaluating these and other models of symptom structure (deLeon, Simpson, & Peralta, 1992). Although some studies have reported support for two-factor models (Gibbons, Lewine, & Davis, 1985; Lenzenweger, Dworkin, & Wethington, 1989), most research indicates that the dimensionality of symptoms is best captured by at least three factors (Arndt, Alliger, & Andreasen, 1991; Bassett, Bury, & Honer, 1994; Kay & Sevy, 1990). The three factors that are most commonly found correspond to negative, positive, and disorganization symptoms (Gur et al., 1991; Liddle, 1987; Liddle & Barnes, 1990), with other symptom factors related to depression (Van der Does et al., 1993) or relational impairment (Peralta, Cuesta, & deLeon, 1994).

Progress in understanding the dimensionality of symptoms in schizophrenia has been limited by several methodological shortcomings. First, the sample sizes of most studies in this area have been quite small (usually of less than 100), thereby placing constraints on the reliability of the different factors that are identified. Second, the vast majority of studies have used a range of exploratory factor analytic techniques, with only a few studies conducting more rigorous confirmatory factor analysis (CFA; Gibbons et al., 1985; Lenzenweger et al., 1989; Lenzenweger, Dworkin, & Wethington, 1991; Peralta et al., 1994). Third, prior research has been limited by the absence of attempts to replicate symptom structures, and no studies using confirmatory factor analysis have replicated a factor structure across more than one sample.

The goal of the present study was to examine the factor structure of symptoms in schizophrenia using the Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962). Because of the widespread use of the BPRS (Bech et al., 1993), a number of studies have examined its factor structure in mixed diagnostic samples of psychiatric patients by using exploratory factor analytic techniques (Dingemans, Frohn-de Winter, Bleeker, & Rathod, 1983; Overall, Hollister, & Pichot, 1967). In the present study, we evaluated whether these factor structures based on

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The Treatment Strategies in Schizophrenia Cooperative Agreement Program was a multicenter clinical trial carried out by five research teams in collaboration with the Division of Clinical Research of the National Institute of Mental Health (NIMH), Rockville, Maryland. The NIMH principal collaborators were Nina R. Schooler, Samuel J. Keith, Joanne B. Severe, and Susan M. Matthews. The principal investigators at the five sites and grant numbers were John M. Kane, Albert Einstein School of Medicine and Hillside Hospital—Long Island Jewish Medical Center (Grant UO1-MH39992); Alan S. Bellack, Medical College of Pennsylvania and Eastern Pennsylvania Psychiatric Institute (Grant UO1-MH39998), Ira D. Glick, Cornell University Medical College and Payne Whitney Clinic (Grant UO1-MH40007); William A. Hargreaves, University of California at San Francisco and San Francisco General Hospital (Grant UO1-MH40042); and Philip T. Ninan, Emory University and Grady Memorial Hospital (Grant UO1-MH40597).

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mixed samples of psychiatric patients provide a good fit for the structure of symptoms in patients with schizophrenia as determined by confirmatory factor analysis.

Method

Participants

The participants were drawn from two sources: the Treatment Strategies for Schizophrenia study and three studies conducted by the New Hampshire–Dartmouth Psychiatric Research Center. All patients provided written informed consent to participate in the studies.

Treatment Strategies for Schizophrenia (TSS) study. The patients in this study were 473 persons with diagnoses of schizophrenia, schizoaffective disorder, or schizophreniform disorder based on the criteria of the *Diagnostic and Statistical Manual of Mental Disorders (DSM–III–R,* American Psychiatric Association, 1987), as determined by the Structured Clinical Interview for *DSM–III–R* (SCID; Spitzer, Williams, Gibbon, & First, 1988), who were participants in a multicenter collaborative investigation involving five different sites. Interviewers received training on the SCID prior to conducting study assessments. Patient inclusion criteria were (a) age between 18 and 55 years; (b) willingness to take fluphenazine decanoate injections and not receive (or willing to be withdrawn from) other major psychotropic medications; (c) being in contact with his or her family of origin (or legal guardian) for a minimum of 4 hr per week; (d) willingness to provide consent to participate in dosage maintenance part of study and family intervention and willingness of at least one relative to participate in the family treatments; and (e) a psychiatric hospitalization or symptom exacerbation within the past 3 months. Exclusion criteria were (a) current pregnancy; (b) current hospitalization or relapse precipitated by alcohol or drug abuse; (c) current or recent (within past 3 months) dependence on alcohol, barbiturates, stimulants, or narcotics; and (d) epilepsy or organic brain syndrome. The patient characteristics for the TSS sample are summarized in Table 1.

Table 1
Demographic and Clinical Characteristics of Treatment Strategies for Schizophrenia (TSS) and New Hampshire–Dartmouth Psychiatric Research Center (PRC) Samples

Variable	TSS Time 1 (n = 473)	TSS Time 2 (n = 454)	PRC (n = 327)
Age			
M	29.50	29.30	34.70
SD	7.38	7.35	7.86
Sex			
Men	316	311	201
Women	157	143	126
Ethnicity			
White	196	186	214
African American	233	229	106
Asian	7	6	1
Hispanic	11	12	0
Native American	0	0	4
Other	26	21	2
Marital status			
Married	18	17	23
Widowed/divorced/separated	58	55	96
Never married	397	382	208
Diagnosis			
Schizophrenia	366	348	238
Schizoaffective	80	78	89
Schizophreniform	27	28	

New Hampshire–Dartmouth Psychiatric Research Center (PRC) studies. Patients in this sample were 327 patients with *DSM–III–R* diagnoses of schizophrenia or schizoaffective disorder, as determined by SCID, who were participants in one of three controlled studies conducted by the PRC. Interviewers received training on the SCID prior to conducting study assessments. Participants in all three studies met the following two criteria: (a) age between 18 and 60 years; and (b) no organic brain syndrome or other major physical illness that would preclude participation in a long-term treatment study. In addition to these criteria, patients in the first study (of vocational rehabilitation) met the following criteria: (a) not competitively employed at baseline; (b) interest in competitive employment; and (c) attendance at four research introduction groups in which the purposes and procedures of the study were explained (Drake, Becker, & Anthony, 1994). In addition to the criteria of age between 18 and 60 and no organic brain syndrome, patients in the second and third studies (of treatment of comorbid substance use disorders) also met criteria for a *DSM–III–R* substance use disorder (abuse or dependence) within the past 6 months, based on the SCID. The patient characteristics of this sample are also summarized in Table 1.

Instruments

Two slightly different versions of the BPRS (Overall & Gorham, 1962) were used in the two samples. In the TSS sample, the "anchored" version of the BPRS was used (Woerner, Mannuzza, & Kane, 1988) to rate symptoms over the previous week. Each item is rated on a 7-point scale based on behavioral anchors developed specifically for each point of each item.

In the PRC sample, the "expanded" version of the BPRS was used to rate symptoms over the previous 2 weeks (Lukoff, Nuechterlein, & Ventura, 1986). This version contains the same 18 items as the anchored version as well as six additional items. Similar to the anchored version, the expanded version of the BPRS contains behaviorally based anchor points for each level of each 7-point scale, although the anchors differ somewhat between the two versions. Only the 18 items from the expanded version of the BPRS were used in the statistical analyses.

Procedure

TSS studies. TSS was a clinical trial that examined the effects of three neuroleptic medication maintenance strategies and two different approaches to family treatment in a 3 × 2 factorial design. Patients were recruited following a symptom exacerbation and treated with fluphenazine decanoate and supplemental medications as indicated for a stabilization phase of the study that usually lasted 3 to 6 months (Schooler et al., 1997).

BPRS assessments were conducted in a clinical interview along with the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1984a), with all information obtained in the interview used to complete both scales. BPRS ratings were made by patients' treating psychiatrist in the study. All psychiatrists received training using videotaped interviews prior to the assessment of study patients and participated in regular reliability checks and conference calls with National Institute of Mental Health (NIMH) project staff throughout the study. Two BPRS assessments were used for analyses in the present study: one conducted at baseline, usually within 2 weeks of signing consent, and one conducted at the end of the "stabilization" period, approximately 3 to 6 months later. As the first assessment was conducted soon after a symptom exacerbation and the second followed a period of pharmacological stabilization, these two evaluation points represent somewhat different stages of the illness. Any factor structure that would fit the data from both the

baseline and follow-up assessments would have higher generalizability, considering the different stages of the illness in which the BPRS was administered.

Formal interrater reliabilities based on the same BPRS interview were not available for the TSS study. However, at baseline (and other times throughout the study) independent BPRS interviews were performed by separate interviewers (who had no knowledge of the other interviewer's ratings), usually on the same day. To evaluate the reliability of BPRS ratings across these independent interviews, we computed intraclass correlation coefficients (ICCs) for the baseline ratings (*ns* = 182–191). All ICCs were statistically significant. With the exception of disorientation (ICC = .12), the ICCs ranged from .34 (uncooperativeness) to .68 (hallucinatory behavior), with a median of .53. Considering that these ICCs are based on independent interviews, rather than the conventional approach of conducting interrater reliability assessments using ratings based on the same interview, these significant ICCs indicate that the BPRS ratings were reliable.

PRC studies. The first study involved a comparison of two approaches to vocational rehabilitation for persons with severe mental illness (Drake, McHugo, Becker, Anthony, & Clark, 1996). This study was conducted at two sites in New Hampshire. The second study was a controlled comparison of two different approaches to case management for patients with severe mental illness and comorbid substance use disorders. This study was conducted at seven sites in New Hampshire (Mueser, Drake, & Miles, 1997). The third study was a controlled investigation of two different treatment programs for homeless persons with severe mental illness and comorbid substance use disorders (Drake et al., 1993). This project was conducted at one site in Washington, D.C. BPRS assessments were made by clinical interviewers in the context of a larger interview involving a variety of other measures (e.g., quality of life, substance abuse, etc.). Clinical interviewers received training on the BPRS prior to conducting study interviews. Assessments conducted at the baseline for each PRC study were included in the analyses.

Interrater reliabilities for BPRS ratings were available for only a small sample of patients from the PRC study of case management for severe mental illness and comorbid substance use disorders in New Hampshire. For this study, 33 patients were rated on the BPRS by two interviewers on the basis of the same interview. Although ICCs were high for most of the BPRS items, nonsignificant ICCs were found for five items, mostly because of low variances: uncooperativeness (ICC = .00), disorientation (ICC = .00), tension (ICC = .06), and motor retardation (ICC = .15). ICCs for the remaining 13 items ranged from .56 (excitement) to .98 (depressive mood, hostility), with a median of .78.

Data Analyses

The principal method for testing models of the structure of BPRS symptoms was confirmatory factor analysis (CFA). CFA provides a test of whether the data fit a specified model by determining whether observed deviations from a model are greater than would be expected by chance alone. By evaluating a restricted model that has been specified in advance, CFA provides a more rigorous test of structure than the less restrictive exploratory factor analytic (EFA) techniques. All models were estimated, using *EOS Version 3.0* (Bentler, 1989), on the basis of the observed covariance matrix. Model fit was evaluated using the chi-square test statistic, the Tucker-Lewis fit index (TLI; Tucker & Lewis, 1973), the comparative fit index (CFI, Bentler, 1990), the root mean squared error of approximation (RMSEA; Steiger & Lind, 1980; Browne & Cudeck, 1993), and Lagrange multiplier tests (Bentler, 1989). Nonsignificant chi-square tests indicate a good fit for a model. However, in large samples of participants, such as in the study reported here, statistically significant chi-squares may be found for models that, according to other indices, provide an adequate fit for the data. The TLI and CFI both range from 0.0 to 1.0 with high numbers corresponding to a better fit; values over .90 are thought to reflect a good fit of the model to the data (Bentler & Bonett, 1980). The RMSEA is bounded between 0 and infinity, where 0 indicates perfect model fit, but values falling below .08 are thought to indicate "close" fit (Browne & Cudeck, 1993). The presence of significant Lagrange multipliers indicates potential specification errors in the solution, such as cross-loadings and correlated measurement errors. Because chi-square tests are strongly influenced by sample size, whereas other indices of fit are less so, we emphasize the other indices of fit in interpreting how well different solutions fit the data.

In addition to using CFA to evaluate the structure of symptoms, EFAs were also performed to identify alternative testable structures. Earlier EFAs of the BPRS used principal-components analysis with varimax rotation, which imposes zero measurement error and orthogonal factors. It has been argued that this approach is not suitable for many areas of behavioral research, given the correlations of latent factors and imperfect measurement of constructs, and that it may artificially inflate the latent factor loadings (Bentler & Kano, 1990; Snook & Gorsuch, 1989; Widaman, 1993). Thus, for the EFAs we used maximum likelihood with squared multiple correlations as initial communality estimates, and the final solution was rotated using an oblique promax rotation. This allowed for the estimation of errors of measurement as well as latent factor correlations. EFA models were estimated with SAS PROC FACTOR (SAS Institute, 1990). The optimal number of factors to extract was determined by scree plots, eigenvalues, and simple structure (Loehlin, 1992).

The testing and respecification of the EFA and CFA models was primarily guided by the theory of simple structure or parsimony. That is, we attempted first to extract the smallest number of possible factors and, once extracted, estimated the smallest number of nonzero factor loadings (Loehlin, 1992). Under parsimony, the ideal goal is for each indicator to load on one, and only one, latent factor. However, this approach can be criticized for being overly restrictive, especially when modeling complex and highly interrelated factor structures. For example, one might argue that it is unrealistic for a measure of hostility to be associated with only one underlying dimension of schizophrenia. Although the estimation of cross-loadings (where a single item loads on multiple factors) does directly result in a better fit of the model to the observed data, this also introduces increased ambiguity about the measurement of the underlying factor structure. If the goal of the factor model is to identify a group of items that can be combined into a measure of some underlying theoretical construct, it is not desirable to have a condition in which one item is used in the computation of multiple scales. This results in increased measurement overlap and decreased discriminant validity. Because of this, we chose to pursue the more restrictive goals of simple structure in an attempt to identify more independent and discriminating underlying factors of schizophrenic symptomatology.

Results

Overview

The analyses were guided by the goal of identifying a factor structure of the BPRS that adequately fit both the TSS and PRC data, using CFA procedures. This was accomplished by first evaluating whether the factor structure based on the NIMH Early Clinical Drug Evaluation Units (ECDEU) factor analysis (Guy, 1976) provided a satisfactory fit for the TSS data, which it did not. Second, to identify another more suitable factor structure, we conducted an EFA on the TSS data at Time 1. A four-factor solution was extracted as the most parsimonious. However, a CFA testing the same model with the same data resulted in a poor fit. Third, to evaluate whether instability of items contrib-

uted to error variance, and hence a poor fit, we performed an EFA on the Time 2 TSS data. This EFA was similar to the EFA from Time 1, except for two items that loaded on different factors. When these two items were dropped, a four-factor CFA provided a good fit of the TSS data at Time 1 and Time 2. Fourth and last, we conducted a CFA on the independent PRC sample using the same structure that fit the TSS data. This CFA also fit the data well, thereby providing cross-validation for the factor structure.

Confirmatory Factor Analysis of the ECDEU Structure

The means and standard deviations for the 18 BPRS items for Time 1 and Time 2 in the TSS study and for the baseline assessment in the PRC sample are presented in Table 2. The correlation matrices are available on request from Kim T. Mueser.

ECDEU factor structure. The first goal was to test the existing factor structure thought to underlie the BPRS using CFA. The most widely cited structure of the BPRS is the five-factor solution described by Guy in the *ECDEU Assessment Manual for Psychopharmacology* (Guy, 1976), referred to here as *the ECDEU solution.* These factors are commonly referred to as Anxiety–Depression, Anergia, Thought Disturbance, Activation, and Hostile–Suspiciousness (see Table 3). To evaluate whether this model adequately reproduced the observed data, it was tested using CFA based on the 473 participants at Time 1.

Table 2
Means and Standard Deviations of BPRS Items for TSS and PRC Samples

	Sample					
	TSS					
	Time 1 (n = 473)		Time 2 (n = 454)		PRC (n = 327)	
BPRS item	*M*	*SD*	*M*	*SD*	*M*	*SD*
1. Somatic concern	2.41	1.62	1.94	1.32	2.47	1.46
2. Anxiety	3.06	1.66	2.35	1.49	2.86	1.66
3. Emotional withdrawal	2.23	1.28	1.84	1.07	1.91	1.19
4. Conceptual disorganization	2.24	1.33	1.63	1.04	1.39	0.90
5. Guilt feelings	1.81	1.26	1.53	1.01	2.51	1.41
6. Tension	2.08	1.16	1.91	1.10	1.58	0.94
7. Mannerisms/posturing	1.56	1.02	1.50	0.90	1.08	0.41
8. Grandiosity	2.00	1.63	1.45	1.12	1.95	1.83
9. Depressive mood	2.25	1.41	2.03	1.40	2.56	1.72
10. Hostility	2.00	1.35	1.71	1.16	1.98	1.47
11. Suspiciousness	3.04	1.85	2.01	1.55	2.56	1.79
12. Hallucinatory behavior	2.58	1.86	1.76	1.41	2.77	2.07
13. Motor retardation	1.86	1.17	1.91	1.20	1.40	0.82
14. Uncooperativeness	1.65	1.09	1.40	0.86	1.10	0.50
15. Unusual thought content	3.33	1.83	2.14	1.55	2.11	1.69
16. Blunted affect	3.05	1.42	2.70	1.36	2.17	1.29
17. Excitement	1.28	0.73	1.23	0.67	1.29	0.71
18. Disorientation	1.16	0.45	1.11	0.36	1.27	0.83

Note. BPRS = Brief Psychiatric Rating Scale; TSS = Treatment Strategies for Schizophrenia study; PRC = New Hampshire–Dartmouth Psychiatric Research Center studies.

Table 3
ECDEU and Trimmed BPRS Factor Solutions

ECDEU solution	Trimmed BPRS solution
1. Thought Disturbance	Thought Disturbance
4. Conceptual disorganization	8. Grandiosity
8. Grandiosity	11. Suspiciousness
12. Hallucinatory behavior	12. Hallucinatory behavior
15. Unusual thought content	15. Unusual thought content
2. Anergia	Anergia
3. Emotional withdrawal	3. Emotional withdrawal
13. Motor retardation	13. Motor retardation
16. Blunted affect	14. Uncooperativeness
18. Disorientation	16. Blunted affect
3. Anxiety–Depression	Affect
1. Somatic concern	1. Somatic concern
2. Anxiety	2. Anxiety
5. Guilt feelings	5. Guilt feelings
9. Depressive mood	9. Depressive mood
	10. Hostility
4. Activation	Disorganization
6. Tension	4. Conceptual disorganization
7. Mannerisms and posturing	6. Tension
17. Excitement	7. Mannerisms and posturing
5. Hostile–Suspiciousness	Trimmed Items
10. Hostility	17. Excitement
11. Suspiciousness	18. Disorientation
14. Uncooperativeness	

Note. ECDEU = National Institute of Mental Health Early Clinical Drug Evaluation Units; BPRS = Brief Psychiatric Rating Scale.

Although this model successfully converged to a final solution, it fit the observed data poorly: null model, $\chi^2(153, N = 473) = 2{,}144.8$; tested model, $\chi^2(125, N = 473) = 559.9$, $p < .000$, TLI = .73, CFI = .78; RMSEA = .09. A large number of highly significant Lagrange multipliers suggested the existence of multiple specification errors in the five-factor solution. We concluded that the ECDEU five-factor structure did not adequately fit the observed data.[1]

Time 1 exploratory factor analysis. Given the poor fit of the two existing factor structures, we proceeded with an unrestricted EFA of the 18 BPRS items at Time 1. Our goal was to use EFA to identify the most parsimonious factor structure at Time 1 and then to cross-validate this EFA solution using a CFA at Time 2 and with the PRC sample. The scree plot was somewhat ambiguous in identifying the number of factors to extract, and thus we extracted three-, four-, and five-factor solutions. The three models were then examined to identify the best solution. The three-factor solution was discarded because of the large number of items with cross-loadings in excess of .40. The five-factor solution was discarded because of a large number of cross-loadings in excess of .40 as well as one factor being defined by only two items. On the basis of these findings, we concluded that a four-factor solution best characterized the observed data. Table 4 presents the final rotated factor pattern matrix and interfactor correlations.

[1] We present detailed model information (estimates, standard errors, etc.) for only the final factor model. Detailed results from the remaining models can be obtained from Patrick J. Curran, Department of Psychology, Duke University, Durham, North Carolina 27708-0085.

Table 4
Rotated Factor Pattern Matrix and Interfactor Correlations: Time 1 Exploratory Factor Analysis

Item	Factor 1. Thought Disturbance	2. Anergia	3. Affect	4. Disorganization	Communality
1. Somatic concern	.04	.12	**.41**	.05	.19
2. Anxiety	.11	.05	**.60**	.10	.46
3. Emotional withdrawal	−.03	**.65**	−.02	.26	.44
4. Conceptual disorganization	−.14	.00	.30	**.51**	.50
5. Guilt feelings	.03	−.11	**.53**	−.01	.29
6. Tension	−.14	.00	.29	**.51**	.32
7. Mannerisms/posturing	−.04	.11	.00	**.50**	.24
8. Grandiosity	**.47**	−.04	−.15	.25	.35
9. Depressive mood	−.05	.01	**.62**	−.07	.36
10. Hostility	.09	.00	**.37**	.19	.23
11. Suspiciousness	**.62**	.03	.24	.06	.60
12. Hallucinatory behavior	**.55**	.03	.13	−.08	.34
13. Motor retardation	−.11	**.66**	.06	−.22	.55
14. Uncooperativeness	.03	**.51**	−.12	.22	.28
15. Unusual thought content	**.97**	−.02	−.01	−.06	.89
16. Blunted affect	.09	**.77**	.02	−.22	.70
17. Excitement	.06	−.11	.03	**.53**	.34
18. Disorientation	.06	**.15**	.05	.06	.04
Intercorrelations					
Factor 1	—				
Factor 2	.11	—			
Factor 3	.35	.10	—		
Factor 4	.41	−.13	.12	—	

Note. Analyses are based on $N = 473$. The highest factor loading for each item is in boldface type.

Time 1 confirmatory factor analysis. Next, the EFA four-factor solution derived from the Time 1 sample was estimated as a CFA model on the same Time 1 sample. This was done so that formal measures of model fit could be computed at Time 1 for comparison to the CFA cross-validation solution at Time 2 and the independent PRC data. Whereas in an EFA model all items load on all factors, the CFA model was defined such that each item loaded only on its primary factor (i.e., a restricted factor analysis). This model was estimated using *EQS* and was found to fit the data poorly: null model, $\chi^2(153, N = 473) = 2144.8$; tested model, $\chi^2(129, N = 473) = 510.0$, $p < .000$, TLI = .77, CFI = .81; RMSEA = .08. The lack of fit was surprising given that this model was a test of the EFA solution derived from the same Time 1 sample, and it raises a complex issue in EFA and CFA model estimation. We concluded that a four-factor EFA solution best represented the data at Time 1 on the basis of scree plots, eigenvalues, cross-loadings, and simple structure. However, when this unrestricted EFA model was tested as a restricted CFA model on the same sample, all of the CFA fit indices indicated a poor fit of the model to the data. This poor fit indicates that although the four-factor solution was the most parsimonious available, this factor structure still did not adequately reproduce the observed data. An added complexity in interpretation is that the model chi-square test statistic is directly dependent on sample size when the null hypothesis is false. Given our large sample size, and correspondingly high statistical power, the null hypothesis will likely be rejected with even minor errors in model specification (e.g., with a very large sample, the model might be rejected because several factor loadings constrained to zero may instead take on statistically significant but not substantively meaningful nonzero values). Thus, we concluded that this four-factor solution was not suitable to examine using CFA with the Time 2 data or the independent PRC data.

Time 2 exploratory factor analysis. To explore whether the discrepancy between the EFA and CFA models was also present at the follow-up assessment, we next estimated an EFA of the sample at Time 2. Three-, four-, and five-factor solutions were again extracted, and examination (based on the same previous criteria) again revealed that a four-factor solution best characterized the data. The pattern of factor loadings for this solution was identical to that found for Time 1, with two exceptions: Item 17 (excitement) and Item 18 (disorientation) both moved from Factor 2 and Factor 4 at Time 1, respectively, to Factor 1 at Time 2. All other items loaded on the same factors at both Time 1 and Time 2.

Trimmed BPRS. Items 17 and 18 were not a part of the original BPRS developed by Overall and Gorham (1962). Because of this and the inconsistent loadings of these two items on the EFAs, we next dropped Items 17 and 18 and reestimated the four-factor CFA model using the remaining 16 BPRS items (see Table 3). This "trimmed" BPRS model was first estimated using the Time 1 sample and was found to fit the observed data rather poorly: null model, $\chi^2(120, N = 473) = 1945.4$; tested

model, $\chi^2(98, N = 473) = 411.5$, $p < .001$, TLI = .79, CFI = .83, RMSEA = .08. Lagrange multipliers were examined to assess potential model specification error ($p < .01$); the three largest values were associated with correlated errors: Item 4 (conceptual disorganization) with Item 8 (grandiosity); Item 13 (motor retardation) with Item 16 (blunted affect); and Item 6 (tension) with Item 7 (mannerisms/posturing). All three correlated errors were positive and consistent with theoretical expectations and thus were freely estimated. The final model was found to fit the data moderately well: null model, $\chi^2(120, N = 473) = 1945.5$; tested model, $\chi^2(95, N = 473) = 272.6$, $p < .001$, TLI = .88, CFI = .90, RMSEA = .06. Next, this same model was estimated using the sample at Time 2 and was also found to fit the data slightly better: null model, $\chi^2(120, N = 454) = 2156.8$; tested model, $\chi^2(95, N = 454) = 266.2$, $p < .001$, TLI = .89, CFI = .92, RMSEA = .06.

Although still not an ideal fit, we concluded that the four-factor structure of the trimmed BPRS provided the best fit of all alternative models. Although these models were tested using CFA, the same participants were included as in the EFAs, which we had used to specify the model. To make a stronger confirmatory statement about the adequacy of the four-factor solution, we cross-validated this final model on the independent PRC sample.

Cross-validation of trimmed BPRS. The four-factor trimmed BPRS model (described in Table 3) was estimated using CFA based on the PRC sample. This model was estimated (allowing no correlated errors) and was found to fit the data moderately well: null model, $\chi^2(120, N = 327) = 1252.3$; tested model, $\chi^2(98, N = 327) = 194.6$, $p < .001$, TLI = .90, CFI = .92, RMSEA = .06. The final results of the CFA are presented in Table 5. Although Lagrange multipliers indicated that freeing several correlated errors would modestly improve the fit of the model, we chose not to include these post hoc model modifications in order to maintain a true a priori cross-validation of the four-factor structure based on an independent sample.[2] Close examination of the model parameters indicated that Item 14 (uncooperativeness) failed to significantly load on its corresponding factor. Examination of the raw data revealed that 95% of the responses for this indicator were coded as "not present," and thus there was little variance to explain in the measurement model. From the adequacy of the indices of model fit for the cross-validation sample, we concluded that much greater confidence can be placed in the validity of the four-factor structure identified in the EFA presented earlier.

Discussion

Our attempt to fit the BPRS data obtained from the TSS study to the ECDEU factor structure using CFA was unsuccessful. The ECDEU five-factor solution resulted in a poor fit and was flawed by multiple specification errors (e.g., numerous cross-loadings) that could not be corrected by allowing correlated error terms. Thus, the ECDEU factor structure, which was derived using EFA techniques on mixed samples of psychiatric diagnoses, did not adequately fit the BPRS data obtained from large samples of patients with schizophrenia. These findings suggest that the factor structure of the BPRS may differ in patients with schizophrenia-spectrum disorders from that for the broader population of psychiatric patients.

Identifying a factor structure that fit the BPRS data proved no easy feat. Even when we attempted to fit a factor structure using CFA that was identified by EFA on the exact same data, a rather poor fit was obtained. We were only able to identify a satisfactory model after conducting two EFAs on the TSS data, one for each assessment point, and deleting two items (excitement and disorientation) that were inconsistent in their factor loadings. It is interesting to note that these two items were not part of the original BPRS developed by Overall and Gorham (1962).

However, the final four-factor model did adequately fit both the Time 1 and Time 2 TSS data using CFA. Furthermore, the validity of this trimmed BPRS factor structure was cross-validated by the good fit for the same CFA model on the independent sample of patients assessed in the PRC studies. The fact that the four-factor solution developed with the data from the TSS study was cross-replicated with the data from the three PRC studies provides especially strong support for this model considering the differences in the BPRS, procedures, and patients across the two data sets. The TSS study used the 18-item version of the BPRS (Woerner et al., 1988), was administered by treating psychiatrists, evaluated symptoms over the previous week, and included patients who had recently had a symptom exacerbation. The PRC studies used the 24-item version of the BPRS (Lukoff et al., 1986), which has slightly different anchor points, was administered by clinical interviewers, evaluated symptoms over the previous 2 weeks, and included patients who were either interested in competitive employment (one study) or who had a comorbid substance use disorder (two studies). These findings provide strong evidence that a four-factor model is a more parsimonious solution for the factor structure of the 18-item BPRS with schizophrenia-spectrum patients than the five-factor solution suggested by the ECDEU EFA.

The four factors identified in the CFA are similar, but not identical, to other factor solutions proposed for the BPRS. Factors 1 through 4 could be labeled Thought Disturbance, Anergia, Affect, and Disorganization (or Activation; Table 3). The Thought Disturbance factor differs from the ECDEU solution by its inclusion of suspiciousness and omission of conceptual disorganization. Anergia differs by its inclusion of uncooperativeness and omission of disorientation. Affect differs from the Anxiety–Depression factor only in its inclusion of hostility. The Disorganization factor differs from Activation in its inclusion of conceptual disorganization and omission of excitement. Finally, the four-factor solution does not include a Hostile–Suspiciousness factor, as each of these items (hostility, suspiciousness, uncooperativeness) loaded on another factor. Our four-factor solution is quite similar to the four-factor solution for the BPRS described by Van der Does, Dingemans, Linszen, Nugter, and Scholte (1995), although there are several differences between the solutions. For example, Van der Does et al. (1995) found that mannerisms and posturing loaded on the Anergia factor, whereas we found that it loaded on the Disorganization

[2] Although a complete cross-validation would have included the three correlated errors, to retain parsimony we chose not to estimate these in the PRC sample.

Table 5
Final Standardized Parameter Estimates and Z Ratios From Cross-Validation of the Trimmed Brief Psychiatric Rating Scale

Item	1. Thought Disturbance		2. Anergia		3. Affect		4. Disorganization		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	r^2
Thought Disturbance									
8. Grandiosity	.55	9.4							.30
11. Suspiciousness	.63	10.9							.40
12. Hallucinatory behavior	.53	8.9							.28
15. Unusual thought content	.76	13.4							.58
Anergia									
3. Emotional withdrawal			.81	14.8					.66
13. Motor retardation			.51	9.2					.26
14. Uncooperativeness			.03	.45					.01
16. Blunted affect			.91	16.8					.83
Affect									
1. Somatic concern					.49	8.3			.24
2. Anxiety					.72	13.2			.52
5. Guilt feelings					.56	9.9			.31
9. Depressive mood					.79	14.6			.62
10. Hostility					.49	8.5			.24
Disorganization									
4. Conceptual disorganization							.37	4.9	.14
6. Tension							.42	5.6	.18
7. Mannerisms and posturing							.69	7.4	.48
	Intercorrelations								
1. Thought Disturbance	—								
2. Anergia	.22	3.3	—						
3. Affect	.46	7.4	.16	2.5	—				
4. Disorganization	.44	5.5	.21	2.7	.16	1.9	—		

factor; Van der Does et al. reported that hostility loaded on the Disorganization factor, whereas we found that it loaded on the Affect factor.

Each of the four factors supported by the present analysis is consistent with dimensions of symptoms of schizophrenia identified by other studies, most of which used a different instrument than the BPRS. The majority of studies have identified three common factors similar to those proposed by Liddle (1987), corresponding to positive symptoms (Thought Disorder), negative symptoms (Anergia), and Disorganization (Arndt et al., 1991; Bassett et al., 1994; Dollfus, Petit, Lesieur, & Menard, 1991; Gur et al., 1991; Johnstone & Frith, 1996; Lenzenweger et al., 1991; Liddle & Barnes, 1990; Malla, Norman, Williamson, Cortese, & Diaz, 1993; Peralta et al., 1994; Peralta, deLeon, & Cuesta, 1992; Van der Does et al., 1993). In addition, several studies have identified affect or depression as another dimension (Bell, Lysaker, Beam-Goulet, Milstein, & Lindenmayer, 1994; Czobor & Volavka, 1996; Kawasaki et al., 1994; Kay & Sevy, 1990; Lindenmayer, Bernstein-Hyman, & Grochowski, 1994; Van der Does et al., 1993, 1995; White et al., 1994). Other dimensions have also been proposed as relevant symptom factors for schizophrenia, including excitement or activation.

How many factors are needed to account for the diverse symptomatology of schizophrenia? One important source of variation across studies is the instrument or instruments used to assess symptoms. Studies using the Scale for the Assessment of Negative Symptoms (Andreasen, 1984a) and the Scale for the Assessment of Positive Symptoms (Andreasen, 1984b) have failed to identify a depression or anxiety factor (Arndt et al., 1991; Kulhara, Kota, & Joseph, 1986; Malla et al., 1993; Minas, Klimidis, Stuart, Copolov, & Singh, 1994; Peralta et al., 1992, 1994; Silver et al., 1993), because such symptoms are not assessed on these instruments. However, studies using either the BPRS or the Positive and Negative Syndrome Scale (Kay, Fiszbein, & Opler, 1987), which incorporates the 18-item version of the BPRS, have identified a factor corresponding to negative affect (Czobor & Volavka, 1996; Kawasaki et al., 1994; Kay & Sevy, 1990; Lépine, Piron, & Chapatot, 1989; Lindenmayer et al., 1994; Van der Does et al., 1993, 1995; White et al., 1994), including this study, because such symptoms are assessed on these instruments.

Another source of variation across studies is the method used to establish the factor structure. Most studies have used EFA techniques (Arndt et al., 1991; Bassett et al., 1994; Kawasaki et al., 1994; Kay & Sevy, 1990; Kulhara et al., 1986; Lépine et al., 1989; Liddle, 1987; Lindenmayer et al., 1994; Peralta et al., 1992; Van der Does et al., 1993), which do not provide a direct "test" of a hypothesized factor structure, in the inferential sense of the term. Fewer studies have used the more rigorous CFA techniques (Lenzenweger et al., 1989, 1991; Peralta et al., 1994), in which the adequacy of an a priori model is formally tested using inferential statistics. The present study suggests that four factors are needed to summarize the structure of symptoms assessed on the 18-item BPRS.

In conclusion, this study indicates that a four-factor model best explains the factor structure of symptoms in schizophrenia on the BPRS. Although the four-factor solution fit the data moderately well, the fit was still not optimal. A particular limitation of the model is the Disorganization factor, which included only three items. The addition of more items to this factor might improve the overall fit of the four-factor model. Of course, we are not arguing that there are only four dimensions of psychopathology underlying schizophrenia; other items could be added to test the presence of still more dimensions, such as social competence. As no other study has examined the factor structure of the BPRS in schizophrenia using CFA techniques, nor have other studies replicated a factor structure across independent samples of patients, these findings have unique importance. The findings suggest that researchers using the BPRS in schizophrenia should consider using the factors identified here rather than the ECDEU factor solutions.

References

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., rev.). Washington, DC: Author.

Andreasen, N. C. (1982). Negative symptoms in schizophrenia: Definition and reliability. *Archives of General Psychiatry, 39,* 784–788.

Andreasen, N. C. (1984a). *Scale for the Assessment of Negative Symptoms (SANS).* Iowa City: University of Iowa.

Andreasen, N. C. (1984b). *Scale for the Assessment of Positive Symptoms (SAPS).* Iowa City: University of Iowa.

Andreasen, N. C. (1985). Positive vs. negative schizophrenia: A critical evaluation. *Schizophrenia Bulletin, 11,* 380–389.

Arndt, S., Alliger, R. J., & Andreasen, N. C. (1991). The distinction of positive and negative symptoms: The failure of a two-dimensional model. *British Journal of Psychiatry, 158,* 317–322.

Bassett, A. S., Bury, A., & Honer, W. G. (1994). Testing Liddle's three-syndrome model in families with schizophrenia. *Schizophrenia Research, 12,* 213–221.

Bech, P., Malt, U. F., Dencker, S. J., Ahlfors, U. G., Elgen, K., Lewander, T., Lundell, A., Simpson, G. M., & Lingærde, O. (Eds.). (1993). Scales for assessment of diagnosis and severity of mental disorders. *Acta Psychiatrica Scandinavica, 87*(Suppl. 372).

Bell, M. D., Lysaker, P. H., Beam-Goulet, J. L., Milstein, R. M., & Lindenmayer, J. P. (1994). Five-component model of schizophrenia: Assessing the factorial invariance of the Positive and Negative Syndrome Scale. *Psychiatry Research, 52,* 295–303.

Bentler, P. M. (1989). *EQS: Structural equations program manual.* Los Angeles: BMDP Statistical Software.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107,* 238–246.

Bentler, P. M., & Bonett, G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 88,* 588–606.

Bentler, P. M., & Kano, Y. (1990). On the equivalence of factors and components. *Multivariate Behavioral Research, 25,* 67–74.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. Bollen & K. Long (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park, CA: Sage.

Crow, T. J. (1980). Molecular pathology of schizophrenia: More than one disease process? *British Medical Journal, 280,* 66–68.

Crow, T. J. (1985). The two-syndrome concept: Origins and current status. *Schizophrenia Bulletin, 11,* 471–486.

Czobor, P., & Volavka, J. (1996). Dimensions of the Brief Psychiatric Rating Scale: An examination of stability during Haloperidol treatment. *Comprehensive Psychiatry, 37,* 205–215.

deLeon, J., Simpson, G. M., & Peralta, V. (1992). Positive and negative symptoms in schizophrenia: Where are the data? (editorial). *Biological Psychiatry, 31,* 431–434.

Dingemans, P. M., Frohn-de Winter, M. L., Bleeker, J. A. C., & Rathod, P. (1983). A cross-cultural study of the reliability and factorial dimensions of the Brief Psychiatric Rating Scale (BPRS). *Psychopharmacology, 80,* 190–191.

Dollfus, S., Petit, M., Lesieur, P., & Menard, J. F. (1991). Principal-component analysis of PANSS and SANS–SAPS global ratings in schizophrenic patients. *European Psychiatry, 6,* 251–259.

Drake, R. E., Bebout, R. R., Quimby, E., Teague, G. B., Harris, M., & Roach, J. P. (1993). Process evaluation in the Washington, D.C. dual diagnosis project. *Alcoholism Treatment Quarterly, 10,* 113–124.

Drake, R. E., Becker, D. R., & Anthony, W. A. (1994). A research induction group for clients entering a mental health research project. *Hospital and Community Psychiatry, 45,* 487–489.

Drake, R. E., McHugo, G. J., Becker, D. R., Anthony, W. A., & Clark, R. E. (1996). The New Hampshire study of supported employment for people with severe mental illness. *Journal of Consulting and Clinical Psychology, 64,* 391–399.

Gibbons, R. D., Lewine, R. R. J., & Davis, J. M. (1985). An empirical test of a Kraepelinian versus a Bleulerian view of negative symptoms. *Schizophrenia Bulletin, 11,* 390–396.

Gur, R. E., Mozley, P. D., Resnick, S. M., Levick, S., Erwin, R., Saykin, A. J., & Gur, R. C. (1991). Relations among clinical scales in schizophrenia. *American Journal of Psychiatry, 148,* 472–478.

Guy, W. (1976). *ECDEU assessment manual for psychopharmacology, revised* (DHEW Publication No. ADM 76-338). Rockville, MD: U.S. Department of Health and Human Services.

Johnstone, E. C., & Frith, C. D. (1996). Validation of three dimensions of schizophrenic symptoms in a large unselected sample of patients. *Psychological Medicine, 26,* 669–679.

Kawasaki, Y., Maeda, Y., Sakai, N., Higashima, M., Urata, K., Yamaguchi, N., & Kurachi, M. (1994). Evaluation and interpretation of symptom structures in patients with schizophrenia. *Acta Psychiatrica Scandinavica, 89,* 399–404.

Kay, S. R., Fiszbein, A., & Opler, L. A. (1987). The Positive and Negative Syndrome Scale (PANSS) for schizophrenia. *Schizophrenia Bulletin, 13,* 261–276.

Kay, S. R., & Sevy, S. (1990). Pyramidical model of schizophrenia. *Schizophrenia Bulletin, 16,* 537–545.

Kulhara, P., Kota, S. K., & Joseph, S. (1986). Positive and negative subtypes of schizophrenia: A study from India. *Acta Psychiatrica Scandinavica, 74,* 353–359.

Lenzenweger, M. F., Dworkin, R. H., & Wethington, E. (1989). Models of positive and negative symptoms in schizophrenia: An empirical evaluation of latent structures. *Journal of Abnormal Psychology, 98,* 62–70.

Lenzenweger, M. F., Dworkin, R. H., & Wethington, E. (1991). Examining the underlying structure of schizophrenic phenomenology: Evidence for a three-process model. *Schizophrenia Bulletin, 17,* 515–524.

Lépine, J. P., Piron, J. J., & Chapatot, E. (1989). Factor analysis of the PANSS in schizophrenia patients. In C. N. Stafanis, C. R. Soldator, & A. D. Rabavilas (Eds.), *Psychiatry today: Accomplishments and promises* (p. 828). Amsterdam: Excerpta Medica.

Liddle, P. F. (1987). The symptoms of chronic schizophrenia: A re-examination of the positive–negative dichotomy. *British Journal of Psychiatry, 151,* 145–151.

Liddle, P. F., & Barnes, T. R. E. (1990). Syndromes of chronic schizophrenia. *British Journal of Psychiatry, 157,* 558–561.

Lindenmayer, J. P., Bernstein-Hyman, R., & Grochowski, S. (1994). Five-factor model of schizophrenia: Initial validation. *Journal of Nervous and Mental Disease, 182,* 631–638.

Loehlin, J. C. (1992). *Latent variable models: An introduction to factor, path, and structural analysis* (2nd ed.). Hillsdale, NJ: Erlbaum.

Lukoff, D., Nuechterlein, K. H., & Ventura, J. (1986). Manual for expanded Brief Psychiatric Rating Scale (BPRS). *Schizophrenia Bulletin, 12,* 594–602.

Malla, A. K., Norman, R. M. G., Williamson, P., Cortese, L., & Diaz, F. (1993). Three syndrome concept of schizophrenia: A factor analytic study. *Schizophrenia Research, 10,* 143–150.

Minas, I. H., Klimidis, S., Stuart, G. W., Copolov, D. L., & Singh, B. S. (1994). Positive and negative symptoms in the psychoses: Principal components analysis of items from the Scale for the Assessment of Positive Symptoms and the Scale for the Assessment of Negative Symptoms. *Comprehensive Psychiatry, 35,* 135–144.

Mueser, K. T., Drake, R. E., & Miles, K. M. (1997). The course and treatment of substance use disorder in persons with severe mental illness [National Institute of Drug Abuse (NIDA) Research Monograph 172]. *Treatment of Drug-Dependent Individuals With Comorbid Mental Disorders,* 86–109.

Overall, J. E., & Gorham, D. R. (1962). The Brief Psychiatric Rating Scale. *Psychological Reports, 10,* 799–812.

Overall, J. E., Hollister, L. E., & Pichot, P. (1967). Major psychiatric disorders: A four dimensional model. *Archives of General Psychiatry, 16,* 146–151.

Peralta, V., Cuesta, M. J., & deLeon, J. (1994). An empirical analysis of latent structures underlying schizophrenic symptoms: A four-syndrome model. *Biological Psychiatry, 36,* 726–736.

Peralta, V., deLeon, J., & Cuesta, M. J. (1992). Are there more than two syndromes in schizophrenia?: A critique of the positive–negative dichotomy. *British Journal of Psychiatry, 161,* 335–343.

SAS Institute. (1990). *SAS/STAT user's guide: Vol. 1.* Cary, NC: Author.

Schooler, N. R., Keith, S. J., Severe, J. B., Matthews, S. M., Bellack, A. S., Glick, I. D., Hargreaves, W. A., Kane, J. M., Ninan, P. T., Frances, A., Jacobs, M., Lieberman, J. A., Mance, R., Simpson, G. M., & Woerner, M. G. (in press). Relapse and rehospitalization during maintenance treatment of schizophrenia: The effects of dose reduction and family treatment. *Archives of General Psychiatry.*

Silver, H., David, D., Kaplan, M., Hadjez, J., Tubi, N., Darnel, A., Calev, A., & Lerer, B. (1993). Factor analysis of schizophrenic symptoms and comparison of different rating scales. *Schizophrenia Research, 10,* 67–75.

Snook, S. C., & Gorsuch, R. L. (1989). Component analysis versus common factor analysis: A Monte Carlo study. *Psychological Bulletin, 106,* 148–154.

Spitzer, R. L., Williams, J. B. W., Gibbon, M., & First, M. B. (1988). *Structured Clinical Interview for DSM-III-R (SCID).* New York: New York State Psychiatric Institute Biometrics Department.

Steiger, J. H., & Lind, J. M. (1980). *Statistically based tests for the number of common factors.* Paper presented at the annual meeting of the Psychometric Society, Iowa City, IA.

Tucker, L. R., & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika, 38,* 1–10.

Van der Does, A. J. W., Dingemans, P. M., Linszen, D. H., Nugter, M. A., & Scholte, W. F. (1995). Dimensions and subtypes of recent-onset schizophrenia: A longitudinal analysis. *Journal of Nervous and Mental Disease, 183,* 681–687.

Van der Does, A. J. W., Linszen, D. H., Dingemans, P. M., Nugter, M. A., & Scholte, W. F. (1993). A dimensional and categorical approach to the symptomatology of recent-onset schizophrenia. *Journal of Nervous and Mental Disease, 181,* 744–749.

White, L., Harvey, P. D., Parrella, M., Sevy, S., Knobler, H., Powchik, P., & Davidson, M. (1994). Empirical assessment of the factorial structure of clinical symptoms in schizophrenic patients: Symptom structure in geriatric and nongeriatric samples. *New Trends in Experimental and Clinical Psychiatry, 10,* 75–83.

Widaman, K. F. (1993). Common factor analysis versus principal component analysis: Differential bias in representing model parameters. *Multivariate Behavioral Research, 28,* 263–311.

Woerner, M. G., Mannuzza, S., & Kane, J. M. (1988). Anchoring the BPRS: An aid to improved reliability. *Psychopharmacology Bulletin, 24,* 112–117.

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