A confirmatory factor analysis of the Brief Psychiatric Rating Scale in a homeless sample

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ABSTRACT *This study used a confirmatory factor analysis procedure, the Oblique Multiple Group Method (OMG), with the Brief Psychiatric Rating Scale (BPRS) on a sample of homeless individuals who had both a severe mental illness and a substance use disorder. The hypothesized five-factor model of Guy (1976) accounted for 93% of the possible variance, and all the appropriate scales had their highest loading on their respective hypothesized factor. In addition, the Guy model accounted for more variance than did an alternative model. The five factors were labelled: thinking disorder, anergia, anxiety-depression, hostility-suspicion, and activity.*

Key words: BPRS, confirmatory factor analysis, homeless

The Brief Psychiatric Rating Scale (BPRS: Overall and Gorham, 1962, 1988) is a measure that is frequently employed to assess psychiatric symptoms in a variety of settings. Two comprehensive reviews of the BPRS (Faustman and Overall, 1990; Hedlund and Viewig, 1980) have summarized the psychometric properties of the instrument, and contain examples of how the BPRS may be used. Originally, the BPRS consisted of 16 items rating the degree to which various psychiatric symptoms were present in an individual. It was expanded to 18 items in 1966, and a 24-item version was introduced in 1986 (Lukoff, Nuechterlien, and Ventura, 1986). The 18-item version is most often employed, and it exists in a number of forms that differ in terms of the anchors that are used to define the various points along each of the seven point BPRS items.

One of the uses of the BPRS has been to evaluate the effect of interventions. For this purpose, the overall level of pathology (the total score over all the items) and scores on various subscales (the scores over subsets of the items) have often been employed

as dependent variables, rather than scores on individual items. These subscales, usually more reliable than the individual items and representing more broad dimensions of psychopathology, have typically been based upon factor analyses of the BPRS in a variety of clinical populations (Faustman and Overall, 1999; Lachar, Bailey, Rhoades, Espsdas, Aponte, Cowan, Gummattira, Kopecky and Wasseff, 2001). In particular, a good deal of interest has been shown in the factor structure of the BPRS in samples of people with schizophrenia (Faustman and Overall, 1999). There is some evidence that the BPRS factor structure varies with particular populations (Faustman and Overall, 1999). It is important that subscales of the BPRS, employed to measure treatment outcomes with various populations, be based on factors that are robust and have been cross-validated for those specific populations.

Based upon the five-factor model of Guy (1976), subscales of the BPRS had been isolated in an earlier study (Burger, Calsyn, Morse, Klinkenberg and Trusty, 1997). In another study (Burger, Calsyn,

Morse and Klinkenberg, 2000) these five subscales were used to develop prototypical BPRS profiles which described modal patterns of symptom clusters in a homeless sample and provided a way to analyse profile shape and elevation changes separately over the course of treatment. Given that previous research had found that the BPRS factor structure varied with particular populations, the authors realized that the five-factor model previously identified (Burger et al., 1997; Guy, 1976) could be altered as a function of substance use and/or homelessness. Thus, the purpose of this study is to perform an Oblique Multiple Groups (OMG) confirmatory factor analysis (CFA) of the BPRS in a sample of individuals with severe mental illness who also had a substance-use disorder and were homeless. Confirmation of this BPRS factor structure in a new dual diagnosed homeless sample would further validate the use of the BPRS subscales with this and similar populations for assessing both client outcomes on the BPRS subscales and change in profile shape and elevation.

Method

Sample

The data employed in this study were obtained from 199 homeless individuals who suffered from both severe mental illness and a substance use disorder. Participants' DSM-IV Axis I disorders included schizophrenia (47.8%), bipolar disorder (10.8%), recurrent depression (11.3%), atypical psychosis (11.8%), delusional or paranoid disorders (2%), schizoaffective disorder (15.8%), depression with psychotic features (3.9%), substance use disorder (62.6%), and substance dependence (47.3%). To be eligible for this study respondents had to be literally homeless at intake – staying in an emergency shelter or sleeping in a bus station, abandoned building, automobile, or outdoors. Individuals who were doubled-up, staying temporarily in a hotel or motel, incarcerated, or hospitalized were not considered 'homeless' for this study. Respondents had been homeless for an average of 35.8 days during the previous three months.

The average age of the sample was 39.8 years; 77% of the sample were men. African-Americans comprised 67% of the sample; 28% were Anglo-Americans and 2% other. Fifty-three per cent of the

respondents had never been married, and only 3% were currently married. Nearly 33% of the sample reported having some college education; 26% received a high school diploma or equivalent; and 41% had not completed high school.

Procedure

Respondents for the study were recruited from emergency shelters, hospitals, and other social service agencies that served the target population. Outreach workers conducted informal screening interviews with potential participants. Individuals who appeared to qualify for the project because of mental-health problems, substance-abuse problems, and homelessness were invited to engage in a formal screening interview. This interview involved questions about current living situation and a thorough diagnostic assessment using the Structured Clinical Interview for DSM-IV (SCID) developed by First, Gibbon, Spitzer, and Williams (1996). Respondents provided informed consent for the formal screening interview and were paid \$10 for their participation.

Participants who met the eligibility criteria were invited to participate in a longitudinal study that evaluated the effectiveness of three different interventions for helping the target population (Calsyn, Morse, Klinkenberg, Yonker, and Calsyn, 2000). After obtaining informed consent for the longitudinal study the interviewers administered the baseline interview for the longitudinal study. This baseline interview contained the BPRS items on which the current study is based.

Six different interviewers administered the BPRS for this study. Three of the interviewers had a master's degree in social work, and one interviewer had a master's degree in gerontology. Although the other two interviewers only had a bachelor's degree, both had over 10 years of experience interviewing individuals with severe mental illness. Each of the interviewers received 10 hours of training in administering the BPRS. This training included watching videotapes, watching an experienced interviewer, and conducting practice interviews under the supervision of an experienced interviewer. Previous research (Trusty, Burger, Calsyn, Klinkenberg, and Morse, 1996) has shown that, with the training procedures employed, raters are not a significant source of unreliability.

Analysis

The confirmatory factor analysis procedure employed was the Oblique Multiple Group (OMG) method (Bernstein, Garbin and Teng, 1988), using the computer program from that source. This procedure is similar to the group centroid method (Thurstone, 1947), and is an alternative to maximum likelihood procedures for smaller sample sizes. In this confirmatory method, factors are placed through groups of items that are hypothesized to load on particular factors. The variance accounted for by these factors is then first compared with the variance explained by the principal components solution. The principal components solution (for given number of factors) is the maximum amount of variance that can possibly be accounted for. Thus, the variance that the hypothesized factors explain (relative to the principal components solution) provides a measure of the adequacy of the hypothesized structure in accounting for the observed correlations among the items for a given number of factors. Secondly, the magnitude of the factor loadings of the items should be consistent with the overall hypothesis. That is, items hypothesized to load on a particular factor should have high loadings on that factor, and relatively low loadings on the other factors. The Guy (1976) model contains the following factors:

- *thinking disorder* (items – grandiosity, hallucinations, unusual thought content, and conceptual disorganization);
- *anergia* (items – disorientation, blunted affect, emotional withdrawal, and motor retardation);
- *anxiety-depression* (items – somatic concern, anxiety, depression, and guilt);
- *hostility-suspicion* (items hostility, suspicion, and uncooperativeness);
- *activity* (items – tension, excitement, and mannerisms and posturing).

Using the OMG procedure, five factors were placed through the sets of items hypothesized by the Guy (1976) model. (Although the 24-item Expanded BPRS was administered to this sample, preliminary analyses indicated that the six new items did not load significantly on any of the five original factors, consistent with the findings of Burger et al. (1997). Therefore, we only report on the CFA for the 18-item version of the BPRS.)

Results and discussion

Table 1 presents the factor pattern matrix obtained from the analysis. The highest loading for a particular item is underlined. These factors accounted for 93% of the variance possible for five factors (the principal components solution), and 58% of the total variance. All the eigenvalues of the first five factors were greater than 1, and all subsequent eigenvalues were less than 1. This indicates that the hypothesized model does a good job of accounting for the correlations among the items (relative to the maximum possible for five factors), and that the data suggest the presence of five factors. Inspection of the factor loadings shows that the items, with a single exception (disorientation), have factor loadings greater than 0.50 on their respective hypothesized factor and minimal loadings (in other words, < 0.30) on the other factors. Disorientation has its highest loading on its hypothesized factor (anergia), but it is 0.35. Overall, the results clearly support the model tested. The correlations among the factors averaged 0.24 (range = 0.01 to 0.45), with the highest correlations between the factors thinking disorder and hostility suspicion ($r = 0.45$) and hostility-suspicion and activity ($r = 0.40$).

Table 2 presents the means and standard deviations of the five BPRS factors by gender and age (39 and under; over 39). These may be useful in comparing this homeless sample with other samples.

By way of comparison, the fit of another BPRS factor model developed by Lachar et al. (2001) was tested using the OMG procedure. This model was developed in a sample of adult hospitalized patients, and contains four rather than the five factors of the Guy (1976) model. The percentage of variance (relative to the first four principal components) explained by the Lachar et al. (2001) model was 91% (52% of the total variance), and the percentage of variance accounted for relative to the first five principal components was 83%, indicating a poorer fit to the data than the Guy (1976) model. In addition, one item failed to load greater than 0.50 on the hypothesized (Lachar et al., 2001) factor. As indicated earlier, the eigenvalues of the correlation matrix indicate the presence of five rather than four factors in the present data. The kinds of samples of the Lachar et al. (2001) study and the present one clearly are different (for example, homeless versus hospitalized patients), and this may explain the

Table 1. BPRS factor pattern loadings

Item	Factor				
	Thinking disorder	Anergia	Anxiety-depression	Hostility-suspicion	Activity
Grandiosity	<u>0.73</u>	-0.17	-0.06	-0.02	-0.01
Hallucinations	<u>0.57</u>	0.12	0.17	0.05	-0.13
Unusual thought content	<u>0.84</u>	0.01	-0.01	0.04	-0.13
Conceptual disorganization	<u>0.67</u>	0.05	-0.09	-0.07	0.27
Disorientation	0.33	<u>0.35</u>	-0.09	-0.06	0.30
Blunted affect	-0.11	<u>0.84</u>	0.11	-0.05	-0.07
Emotional withdrawal	-0.13	<u>0.79</u>	0.02	0.00	-0.26
Motor retardation	-0.08	<u>0.74</u>	-0.04	0.11	0.04
Somatic concern	0.22	0.12	<u>0.54</u>	-0.08	0.09
Anxiety	0.07	-0.09	<u>0.78</u>	-0.02	0.03
Depression	-0.13	-0.01	<u>0.82</u>	0.00	-0.09
Guilt	-0.17	-0.01	<u>0.72</u>	0.10	-0.02
Hostility	-0.23	-0.16	0.21	<u>0.82</u>	-0.11
Suspiciousness	0.23	0.02	0.05	<u>0.65</u>	-0.08
Uncooperativeness	0.01	0.14	-0.26	<u>0.64</u>	0.19
Tension	-0.06	0.12	0.08	-0.04	<u>0.81</u>
Excitement	0.20	-0.26	0.01	0.04	<u>0.72</u>
Mannerisms and posturing	-0.14	0.14	-0.08	0.00	<u>0.81</u>

Note: Underlined entries indicate the highest factor loading for a given item.

Table 2. BPRS factor means by gender and age

	Males		Females	
	Age 39 and under	Over 39	Age 39 and under	Over 39
Thinking disorder	2.49 (1.17)	2.57 (1.23)	2.16 (.94)	2.63 (1.43)
Anergia	1.91 (0.75)	1.85 (.81)	1.71 (.80)	1.99 (.85)
Anxiety – depression	2.98 (1.22)	2.85 (1.10)	2.89 (0.85)	3.13 (0.98)
Hostility – suspicion	2.61 (1.11)	2.35 (0.98)	2.38 (0.88)	2.95 (1.02)
Activity	1.89 (0.96)	1.81 (0.73)	2.09 (0.60)	2.40 (1.15)
N	67	87	26	19

Note: values in parentheses are the standard deviations.

superior fit of the Guy (1976) model in this study. In any case, the hypothesized model fits the data of the present study well, and has a better fit than an alternative model that purports to describe the BPRS factors. This evidence suggests that the Guy (1976) factor model continues to be appropriate for homeless and similar samples.

Reliabilities (coefficient alpha) for the five factor scales were also computed. The respective values were: thinking disorder, 0.65; anergia, 0.61; anxiety-depression, 0.68; hostility-suspicion, 0.47; activity, 0.64. The

rather low reliability associated with the hostility-suspicion scale has been noted previously (Trusty et al., 1996), and researchers should probably consider this when employing that particular scale. Although the reliabilities of the other factor scales were somewhat lower than expected (Trusty et al., 1996), they are acceptable for scales with only three or four items.

In conclusion, the Guy (1976) factor model for the BPRS fits the data reasonably well for this sample of homeless individuals who were suffering from both severe mental illness and substance use

disorders. Moreover, the Guy (1976) model fits the study data better than an alternative model. This confirmation of the Guy (1976) factor model in this study and in Burger et al. (1997) indicates that this factor model has considerable utility in clinical practice and research. Clinicians and evaluation researchers working with individuals with severe mental illness should feel confident in using the BPRS factor scales identified by Guy (1976) in evaluating client outcomes, regardless of the living situation and/or substance abuse problems of their clients. Several studies now provide strong evidence supporting the factor model proposed by Guy (1976) for a wide range of individuals with severe mental illness.

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