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**Sensitivity to Change of the Brief Psychiatric Rating Scale—Extended (BPRS-E):
An Item and Subscale Analysis**

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Abstract

The Brief Psychiatric Rating Scale—Extended (BPRS-E) is a commonly used outcome measure for the Severely and Persistently Mentally Ill (SPMI) population with good inter-rater reliability, good concurrent validity and a strong factor structure. The purpose of this study is to examine the item, factor and diagnosis-specific sensitivity to change of the BPRS-E. 786 symptom ratings were collected at 90-day intervals from 201 adult psychiatric inpatients at the Utah State Hospital. Of note were that BPRS-E ratings of patients were conducted by independent assessors who were blind to the treatment status of patients. All but 2 of the 24 BPRS-E items, all four factors, and the BPRS-E total score were found to be sensitive to change when comparing patients' admission and discharge scores. Patient diagnosis did not affect item, factor, or total score sensitivity to change. These provide further support for the psychometric value of the BPRS-E for research and practice with SPMI patients.

Introduction

Robust assessment of patient outcome is essential to the evidence-based treatment protocols that are emerging from professional, governmental and third-party payors (Lambert & Ogles, 2003). In some cases, the lack of consensus regarding efficacious treatments for particular patient populations may be due, in part, to the psychometric features of the measures used to assess patient outcomes rather than treatment effectiveness per se. For instance, tracking the effectiveness of the long-term care for a severely and persistently mentally ill (SPMI) patient population in a psychometrically sound way has traditionally been difficult. Time constraints within the health care settings treating chronic populations require that administration and scoring of measures be brief. Since SPMI patients are often in the same care setting for extended periods of time, outcome measures must be valid with repeated use. Due to the variety of patients and diagnoses in such a setting, multitrait measures that are applicable to a wide variety of symptoms are most appropriate. Due to the chronic nature of many of the symptoms experienced by this population, measures must be sensitive enough to detect changes in the course and recurrence of clients' illnesses.

Outcome assessment in the SPMI population also requires careful consideration of the source of outcome ratings. Self-report scores may appear meaningless, or may fluctuate greatly, depending on the current condition of

the patient. Likewise, therapist report measures can be a cause for concern. Lambert and Hill (1994) report that therapists consistently rate SPMI patients as having more severe symptomology than equally disturbed patients in acute-care settings. If this is the case, such biased ratings are not helpful when assessing the actual progress or deterioration of a patient over time, as improvements will be depressed and deterioration will be magnified. Such biases in measurement may be due to the patient's fluctuations seen on a continual basis, or on the stigma and expectations attached to the population. Given the biases of both patient self-report and therapist report, surveyors who are independent from daily treatment and case management may be the most reliable source of information about patient change.

The Brief Psychiatric Rating Scale (BPRS) is one commonly used independent evaluator instrument that has been noted for its high resolution, flexibility and simplicity as a general rating scale, as well as for its usefulness as a repeat measure in an SPMI population (Lukoff, Lieberman, & Nurchterlein, 1986; Morlan & Tan, 1998; Rhoades & Overall, 1988). The BPRS was first designed for use in 1962 (Overall and Gorham) to be an efficient, rapid evaluation of change due to treatment, as well as to give an overall description of major symptom characteristics. Since then, the BPRS has been revised to include 24 items and is referred to as the Brief Psychiatric Rating Scale—Extended (BPRS-E) (BPRS; Dingemans et al., 1995).

The BPRS-E is one of the most commonly used measures in the SPMI

population (Burlingame, Dunn, Chen, Lehman, Dunn, & Axman, 2004). In addition, studies examining this instrument have generally found it to have the psychometric properties necessary for valid and reliable measurement with SPMI clients. In addition to basic questions of reliability and validity (Hedlund & Vidweg, 1980; Newcomer, Faustman, Yeh, & Csernansky, 1990; Rhoades & Overall, 1988; Thieman, Csernansky & Berger, 1987), factor analytic studies have shown the BPRS to have a fairly consistent factor structure in general clinical patient populations (Burlingame & Lee, in press; Burger, Calsyn, Morse, Klinkenberg, & Trusty, 1997; Dingemans, Linszen, Lenior, & Smeets, 1995; Long & Brekke, 1999; Mueser, Curran, & McHugo, 1997; Morlan & Tan, 1998; Ownby & Seibel, 1994). However, while the BPRS meets the criteria for brief administration and scoring, validity with repeated use (Inch, Crossley, & Keegan, 1997; Packer, Husted, & Cohen, 1997; Sweet, 1994; Varner, Chen, Swann, & Moeller, 2000), multitrait content applicable to a wide variety of symptoms and independent observer ratings (Linszen, Dingemans, & Lenior, 1994; Marder, et al., 1991; Subotnik & Nuechter, 1988; Van der Does, Linszen, Dingemans, Nugter, & Scholte, 1993). However, surprisingly little is known about its sensitivity to change other than that extrapolated from randomized trials where it has served as one of several outcome measures.

In psychotherapy outcome assessment, sensitivity to change can be viewed as the degree to which a measure is likely to reflect changes that occur following participation in therapy

(Lambert & Hill, 1994). Sensitivity to change of an outcome measure is directly related to the ability of the instrument to do what it purports to do, which is to measure individual change over time. Therefore, the concept of change sensitivity is best conceptualized as an issue of construct validity, and the most convincing evidence of construct validity is documentation of longitudinal within-subject changes on the measure of interest after an effective intervention (Kirshner & Guyatt, 1985).

Although many psychometric evaluations have been performed on the BPRS-E, few studies have focused on the measure's sensitivity to change, especially on an item-by-item or factor-by-factor level. Without this information, those using the BPRS-E in clinical settings cannot be certain that it will reflect real changes in the course and recurrence of clients' illnesses and actual treatment effects.

The purpose of this study is to examine the clinical utility and psychometric soundness of the BPRS-E to detect treatment effects by evaluating: 1) the sensitivity to change of each individual item, including identification of items that do not reflect changes in symptom status, 2) the usefulness of previously identified factors as general indicators of change (i.e., their sensitivity to change), and 3) the usefulness of those factors as indicators of change for clients with specific diagnoses (i.e., diagnosis-specific sensitivity to change).

Method

Participants

A total of 786 symptom ratings were obtained from a database for 201 adult psychiatric inpatients at the Utah State Mental Hospital (USH) in the Intermountain West. Subject ratings were drawn from a set of patients who received services at the hospital between 1999 and 2001 and who met criteria for at least one major Axis I disorder as classified by the *Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition* (DSM-IV; American Psychiatric Association, 1994). Subjects' data were accepted into the study based on the following three criteria: (1) the patient was administered both an admission and a discharge Brief Psychiatric Rating Scale—Extended (BPRS-E) by a trained independent rater; (2) subsequent administrations occurred at 90 day intervals (plus or minus one week); and (3) no more than one item per BPRS subscale factor was missing and no more than two of the total 24 BPRS-E items were missing.

This adult psychiatric sample had a mean age of 39 ($SD = 14.57$) with a range of 16 to 84 years of age and consisted of 131 (53%) males and 116 (47%) females. The ethnic/racial distribution was 87% Caucasian, 15% African-American, 5% Hispanic, 3% American-Indian and 2% other. Fifty-seven percent of the sample had never married, 26% were divorced, 11% were married and 6% were separated, widowed, or married by common law. Patient diagnoses from this sample were grouped into the following five major categories for analysis purposes and appear to be consistent with the general population census: (1) schizophrenia (all subtypes including schizo-affective disorder), 58 %; (2) bipolar disorder, 13

%; (3) mood and anxiety disorders, 17 %; and (4) psychotic and delusional disorders, .07 %. Due to the limited number of personality disorders and to the fact that these typically occurred as secondary diagnoses, personality disorder diagnoses were dropped from the analyses. The mean number of hospitalizations for this sample was 1.6 ($SD = 1.05$; range = 1-13) with an average length of stay of 172 days ($SD = 26.8$; range = 3-926).

Instruments

The outcome measure utilized in the study was the Brief Psychiatric Rating Scale-Extended (BPRS; Dingemans, et al., 1995). The BPRS-E includes 24 items addressing somatic concern, anxiety, emotional withdrawal, conceptual disorientation, guilt feelings, tension, mannerisms and posturing, grandiosity, depressive mood, hostility, suspiciousness, hallucinatory behavior, motor retardation, uncooperativeness, unusual thought content, blunted affect, excitement, disorientation, bizarre behavior, suicidality, self-neglect, motor hyperactivity, distractibility and elevated mood. The scale is widely adaptable to a variety of treatment settings (Bech, Larsen, & Andersen, 1988) and patient populations, including schizophrenic (Borison, Sinha, Haverstock, McLavarnon, & Diamond, 1992; Gur, et al., 1991), and depressed (Feighner, Merideth, & Claghorn, 1984) patients.

Scoring of the BPRS is based on a 30 minute assessment performed by a trained independent rater (Raskin, 1988). Each BPRS item is scored on a 7-point scale ranging from 1 to 7, with 1 being “not present” and 7 being “extremely severe.” A total score is derived by adding the scores for all items. Many

item scores are based on the use of “nondirective interaction” to elicit information about the presence of symptoms (Overall and Gorham, 1962; Rhoades & Overall, 1988). However, several items (mannerisms and posturing, motor retardation, tension, emotional withdrawal, uncooperativeness, blunted affect and excitement) are scored based completely on the clinician’s impression of observable symptoms during the interview.

Inter-rater reliability on the BPRS has ranged between .67 and .88 in recent studies (Bech, et al., 1988; Morlan & Tan, 1998; Tarcell & Schulz, 1988). Long-term reliability (i.e., test-retest) is not of interest since the BPRS tracks patient change. The BPRS has also achieved high concurrent validity when compared to other widely accepted tests measuring depressive, negative, and thought disorder symptoms (Bell, Milstein, Beam-Goulet, Lysaker, & Cicchetti, 1992; Faustman, 1994). The method used to administer the BPRS-E in this study is an interviewing technique developed by the UCLA Department of Psychiatry and Biobehavioral Sciences and Mental Health Clinical Research Center (Ventura, Green, Shaner, & Libermann, 1993).

Procedure

This study was conducted at Utah State Hospital. All patients who received services there were assessed using the BPRS-E within 72 hours of admission, again at subsequent 90-day intervals (within a seven day window), and finally just prior to discharge. USH psychology interns administered the BPRS-E via a 30-minute structured interview. BPRS-E raters were trained

using consensus-coded tapes in order to achieve a median intra-class correlation coefficient of .80 or higher across using ratings from the UCLA Department of Psychiatry and Biobehavioral Sciences and Mental Health Clinical Research Center as our criterion (Ventura, Green, Shaner, & Libermann, 1993). Ratings reflected the patient’s psychiatric symptoms over the previous two weeks. The assessors were blind to the patient’s treatment status after admission, and were not aware of previous BPRS-E scores or the patient’s length of stay in the hospital. When no more than one item per BPRS-E subscale factor was missing and no more than two of the total 24 items from the BPRS-E were missing, the rounded average of the remaining items in the missing item’s factor was used as a substitute value. Finally, an intake interview with the unit psychiatrist provided an opportunity to either assign a diagnosis for those not previously diagnosed or re-evaluate extant diagnoses.

Design and Analysis

Individual item sensitivity to change. The two criteria for evaluating the degree of sensitivity of individual test items are (1) that the items change in the theoretically proposed direction following intervention, and (2) that the changes measured are significantly greater than changes in treated than untreated individuals (Vermeersch, Lambert, & Burlingame, 2000). Criteria (1) was established using the SAS MIXED procedure (SAS Institute Inc., 1996; Vermeersch et. al), a multilevel linear modeling approach. In essence, this procedure allows for the statistical analysis of time series, repeated measures data via the generation of an

individual slope and y-intercept for each individual subject on the items and total score of the BPRS-E. This procedure demonstrates whether or not the change is in the desired direction (i.e., a negative slope indicates patient improvement over time) and whether each individual item's slope is significantly different from zero (no change). As Vermeersch, et al. point out, this methodology is not suggested as a means to evaluate patient change using single test items, but rather as a way of selecting items that will enhance the sensitivity to change of the entire measure. For a more thorough explanation, see Vermeersch, et al. (2000).

Criteria for sensitivity to change (change in treatment significantly greater than change without treatment) is typically assessed by including a non-treatment control group when assessing normal and less severe clinical populations (Veermersch, et al., 2000). In the present study a control group was not employed because the BPRS is a measure of *severe* psychopathology intended for assessing highly distressed psychiatric populations. A non-psychiatric sample is expected to obtain a BPRS-E Total Score of approximately zero (Ventura, et al., 1993), given the type of symptoms assessed (e.g., hallucinations, paranoid ideation, psychomotor retardation, etc.). Therefore, it was not deemed necessary to include a control group as a comparison to the psychiatric sample in these analyses.¹

Factor sensitivity to change. Factor analytic studies have shown that the BPRS-E consistently loads to four or five different factors when used with a general clinical patient population

(Burger, et al., 1997; Dingemans, et al., 1995; Long & Brekke, 1999; Meuser, et al., 1997; Morlan & Tan, 1998; Ownby & Seibel, 1994). The most commonly cited factors are Thought Disturbance, Anxiety-Depression, Withdrawal, Hostile-Suspicious and Activity/Mania (see Table 1). A recent study by Donell (2001), using patient data from the USH database revealed that 16 of the 24 BPRS-E items for this specific population loaded on the following four factors: Thought disturbance, Animation, Mood disturbance and Apathy (see Table 2). Because of the similarity of these factors to those found in previous studies (Table 1) and to provide the best match to the USH population, the Donell factors were used in this study. As with the individual item sensitivity analyses, we evaluated these four factors and the BPRS total score direction of change and non-zero slopes.

Diagnosis-specific sensitivity to change. The BPRS-E total score, the factor scores, and the scores for the eight items that were not found to load significantly on any of the four factors were tested to see if they were more sensitive to change for one diagnosis versus another (i.e., Schizophrenia versus Major Depression). A hierarchical linear modeling procedure similar to the one used for the individual item sensitivity and the factor sensitivity analyses described above was utilized. The four diagnostically grouped categories (i.e., Schizophrenia, Bipolar, Mood/Anxiety and Psychotic/Delusional) were evaluated in six comparisons using the Bonferroni correction ($p < .008$) for each factor, item and the Total Score.

Results

Individual item sensitivity to change. Results of the data analysis for the psychiatric hospital population indicated that all 24 BPRS-E item slopes met the first criterion for change sensitivity in that change in the theoretically proposed direction (i.e., a negative slope suggested patient improvement over time) was established. Of these 24 items, 22 demonstrated a slope that was significantly different from zero (see Table 3). Only two items (Items 7 and 24) failed to meet the first criterion for change sensitivity. It is possible that Items 7 and 24 represent a floor effect in that their average intercept scores (1.4241 and 1.2067 respectively) were significantly lower than the other 22 items at intake. In effect, there was very little room for patients to improve over the course of their hospitalization and treatment given the lowered ratings received initially on these two items.

Factor sensitivity to change. As expected from the results of the item sensitivity analysis, each of the four factors demonstrated both change in the theoretically proposed direction and slopes that were significantly different from zero. The total BPRS-E score also evidenced both change in the expected direction and a significant slope as compared to zero. The latter suggested that over a 90-day period there was an average change of nine total score points. Table 4 contains the slope estimates (i.e., average growth rate) for each factor and for the total BPRS score.

Diagnosis-specific sensitivity to change. Factor, item and total score sensitivities to change were not found to vary significantly across diagnostic

groups in any case (see Table 5). This finding indicates that the BPRS-E Total Score, factor scores, and the eight items not included in the four factors were *not* better predictors of overall patient change for one diagnosis as opposed to another. In other words, the rate of patient improvement did not appear to be associated with or differentiated by diagnostic information.

Discussion

Results of this study suggest that 22 of the 24 items on the BPRS-E, each of the four factors, and the BPRS Total Score is sensitive to change. None of the factors or items tested were found to be differentially sensitive to change by diagnostic category. These findings round out the empirical picture of the BPRS-E as having strong psychometric properties, and underscore its usefulness as a repeat measure in an SPMI population (Lukoff, et al., 1986; Morlan & Tan, 1998; Rhoades & Overall, 1988; Burlingame & Lee, in press). Specifically, in addition to being reliable, valid, having a fairly consistent factor structure and being relatively easy to use, these results suggest that the BPRS-E is sensitive to change in an SPMI population. This allows the many clinicians and researchers who use the BPRS-E to be more confident that it is capable of reflecting reliable treatment effects.

One of the strengths of this study is the high degree of interrater reliability achieved by the raters. Their high level of agreement with the “gold standard” (the UCLA Department of Psychiatry and Biobehavioral Sciences and Mental Health Clinical Research Center; Ventura, et al., 1993) suggests that the

BPRS-E ratings provided in this study are both true to the intent of the measure and are reasonably similar to the ratings that would have been provided by clinicians trained on the BPRS-E at other sites across the country.

A limitation of this study is the confounding of the constructs of actual change and measurement sensitivity. In other words, we assumed, but had no way of confirming, that a reduction in the BPRS-E score reflected an actual change in patient status rather than something else (i.e., we assumed treatment was working). This confound would have been more problematic if more of the items and factors had not been sensitive to change. In that case, it would have been difficult to tell if the items were not sensitive to change or if the patients were not changing in that area. As it is, the improvement in BPRS scores over time seems likely to be due to accurately reflection of treatment effects, but is also possibly due to other factors (such as bias about the condition of patients who have been in treatment longer).

Another potential limitation of this study is that it is possible that the results are sample-specific to Utah State Hospital. While we have no reason to believe that Utah State Hospital differs in any important demographic respect from many state hospitals, these results would be more generalizable if replicated using another sample. This would be an important next step for future research. This replication could empirically evaluate the aforementioned limitations of the present study and also be used to begin to estimate the *average* BPRS-E item, factor, and total score sensitivity to change. If our estimates

were replicated, a logical next step might be the use of longitudinal factor analytic procedures to test for factors related to patient change. More specifically, the focus of longitudinal factor analysis is to determine if there is a common structure to the change exhibited across a particular cluster of patients. If found, these factors might vary from what is currently available for the BPRS-E, which, in turn could have research and clinical implications.

Several other directions for future research are suggested by the results of this study. Our most recent work has indicated that a very small number of outcome instruments are recurrently used in the literature to assess change in the SMPI population (e.g., Global Assessment of Function, Positive and Negative Symptoms, Scale for the Assessment of Negative Symptoms; Burlingame, et al., 2004). A useful next step would be to empirically evaluate each of the most commonly used instrument in a similar manner to determine if differential sensitivity of change exists. If one instrument were found to be superior in capturing the limited change produced from the treatment provided to this population obvious clinical, administrative and research implications would follow.

If reliable estimates and models for average change were available for the BPRS-E, one could use these to track patient change at an aggregate level. More specifically, a very recent trend in outcome research is to establish average change trajectories for patient populations using instruments with well known psychometric populations and large change samples (Lambert, Gregerson, & Burlingame, 2004).

Knowledge of average change trajectories allows one to determine when symptom deviation (e.g., deterioration vs. improvement) is within allowable clinical limits and when the clinician should be concerned (Finch, Lambert, & Schaalje, 2001; Lambert, et al., 2002). Such information is currently being used by some managed care companies to calibrate outpatient care on a session by session basis (Brown, Burlingame, Lambert, Jones, Vacarro, 2001). The utility of this method for inpatient care has yet to be assessed.

Finally, most of the extant BPRS-E change studies focus upon the

inpatient status of a SMPI patient. Given the high financial, personal and societal cost of relapse, change trajectories on the BPRS-E (or other instruments with empirically established sensitivity to change) could be extended to the discharge status of the SPMI population. Our own clinical work in this area has convinced us of the difficulty in tracking this patient population after discharge. Nonetheless, it behooves researchers to tackle this challenging problem given the costs associated with the “revolving door” phenomena with this patient population.

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Footnotes

1. We are currently collecting normative BPRS data from community normals to assess this assumption. Preliminary data support the procedure.

Table 1

Common Factor Dimensions of the BPRS

Factor	BPRS Items
Thought Disturbance/ Positive Symptoms	8 Grandiosity (9 Suspiciousness) 10 Hallucinations 11 Unusual Thought Content 15 Conceptual Disorganization
Anxiety-Depression	1 Somatic Concern 2 Anxiety 3 Depression 5 Guilt
Withdrawal, Negative symptoms	14 Disorientation 16 Blunted Affect 17 Emotional Withdrawal 18 Motor Retardation
Hostile Suspicious/ Paranoid	6 Hostility (9 Suspiciousness) (20 Uncooperativeness)
Activity/ Mania	19 Tension (20 Uncooperativeness) 21 Excitement 24 Mannerisms and Posturing

Note: Items enclosed in parentheses were grouped with different factors in other studies

Table 2

Utah State Hospital Factors (Donell, 2001)

Factor Name	BPRS item number
Thought Disturbance	11, 8, 9, 10
Animation	23, 21, 19, 7,
Mood Disturbance	3, 4, 5, 2
Apathy	17, 16, 18, 13

Table 3

Average Slopes of Change for BPRS Items

	Item	Slope
1	Somatic Concern	-0.0019**
2	Anxiety	-0.0025**
3	Depression	-0.0041**
4	Suicidality	-0.0036**
5	Guilt	-0.0013**
6	Hostility	-0.0021**
7	Elevated Mood	-0.0003
8	Grandiosity	-0.0021**
9	Suspiciousness	-0.0044**
10	Hallucinations	-0.0031**
11	Unusual Thought	-0.0069**
12	Bizarre Behavior	-0.0029**
13	Self-Neglect	-0.0021**
14	Disorientation	-0.0021**
15	Conceptual Disorganization	-0.0032**
16	Blunted Affect	-0.0021**
17	Emotional Withdrawal	-0.0018**
18	Motor Retardation	-0.0010**
19	Tension	-0.0008**
20	Uncooperativeness	-0.0014**

21	Excitement	-0.0020**
22	Distractibility	-0.0010**
23	Motor Hyperactivity	-0.0010**
24	Mannerisms and Posturing	-0.0004

* $p < .05$. ** $p < .01$.

Table 4

Average Slopes of Change for BPRS Factors and Total Score

Factor	Slope
Thought Disturbance	-0.0217**
Animation	-0.0005**
Mood Disturbance	-0.0169**
Apathy	-0.0097**
Total Score	-0.0935**

* $p < .05$. ** $p < .01$.

Table 5

Differences in Sensitivity to Change by Diagnosis¹

	Schiz ²	Schiz	Schiz	Bipolar	Bipolar	Mood/Anx
	vs.	vs.	vs.	vs.	vs.	vs.
	Bipolar	Mood/Anx	Delusional	Mood/Anx	Delusional	Delusional
Total	1.67	0.78	0.33	-0.86	-0.99	-0.25
Score						
TD ³ factor	0.96	-0.86	-0.09	-1.39	-0.79	0.51
AN factor	2.00	-0.06	1.24	-1.74	-0.63	1.07
MD factor	0.44	2.49	0.89	1.38	0.36	-0.94
AP factor	0.51	0.97	-0.29	0.23	-0.60	-0.91
Item 1	2.15	-0.75	0.22	-2.31	-1.47	0.69
Item 6	-1.19	-0.59	0.74	0.63	1.44	1.01
Item 12	-0.91	0.01	1.21	0.77	1.59	1.01
Item 14	0.18	1.76	0.76	1.01	0.42	-0.56
Item 15	1.47	-0.96	0.16	-1.89	-0.98	0.79
Item 20	-0.65	-0.60	-0.11	0.15	0.40	0.30
Item 22	0.55	0.75	0.91	-0.00	0.24	0.28
Item 24	0.04	-0.76	0.61	-0.54	0.42	1.03

1. t-values are reported; n = 271.

2. Patient diagnoses are abbreviated. Schiz = schizophrenia. Mood/Anx = mood or anxiety disorders. Delusional = psychotic/delusional disorders.

3. BPRS factor names are abbreviated. TD = Thought Disorder factor. AN = Animation factor. MD = Mood Disturbance factor. AP = Apathy factor.

* $p < .008$ (Bonferoni corrected).