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Measuring outcomes of multiple diagnosis groups in residential treatment using the brief psychiatric rating scale for children (BPRS-C)

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ABSTRACT

Treatment organizations are being placed under increased pressure to quantitatively demonstrate the efficacy of their programs. Demonstrations of treatment effectiveness are often necessary regardless of the treatment setting. This study was conducted to determine if a valid measure, the BPRS-C, would be able to detect symptom reduction in a population that was less acute than the hospitalized adolescent. The BPRS-C is administered by trained staff and contains subscales for seven constructs: behavior problems, depression, thinking disturbance, psychomotor, withdraw/retardation, anxiety and organicity. A total score for the tool, while reported in the literature, has never been validated for use.

Four diagnosis groups were tested with the tool after a suitable observation period after admission and then again at the time of discharge. These diagnosis groups were Conduct Disorder ($n=87$), Bipolar disorder ($n=39$), Depression ($n=53$) and Intermittent Explosive Disorder ($n=109$). The results indicated that the BPRS-C was able to detect improvement in client condition on several subscales within each of the diagnosis groups.

The conclusions from this research are that the BPRS-C is a tool that has application in the adolescent residential setting. The diagnosis groups could be reflective of the client diagnosis mix that might be encountered in other similar institutions.

1. Introduction

Organizations that provide psychiatric care to adolescents are finding increased pressure to measure the effectiveness of their treatments. This pressure comes from a variety of sources that can include private funding agencies or insurance companies that demand to see proof of treatment effectiveness. This proof is most likely to benefit the organization if it is quantitative in nature (Lachar et al., 2001). Governmental organizations can require outcomes data, especially in the psychiatric setting, from providers, that accept state or federal money (Plante, Couchman & Hoffman, 1998).

There are also needs, internal to the organization, for collecting outcomes data. These may include proof of program effectiveness, the development of marketing materials, dissemination of research results in professional or academic meetings including the peer reviewed literature. Importantly, proactive organizations use outcomes data as a way to determine the level of efficacy of evidence based practices used in the various therapeutic settings. Employee or staff evaluation objectives can be determined by the collection of outcomes data as well.

Data that organizations collect, in order to monitor outcomes, need to meet several criteria. First, the data must be accurate. In measurement terminology it needs to be valid and reliable. The tools that are used to monitor outcomes must measure what they purport to measure and they must yield consistent results regardless of who completes the measure (Hughes, Rintelmann, Emslie, Lopez & MacCabe, 2001). Second, and most practicably, they can not cost the organization a great deal of money to implement, train and maintain. And lastly, they have to be recognized by other professionals in the field. Tools that are created internal to the organization and are inexpensive to implement and use, may not be sufficient for payers of the organization if they can not be proven to be the best available.

One tool with broad application in adolescent settings is the Brief Psychiatric Rating Scale for Children (Overall, & Pfefferbaum, 1981; Overall, & Pfefferbaum, 1982). The Brief Psychiatric Rating Scale for Children (BPRS-C) is being used across all spectrums of adolescent psychiatric care (Hughes et al., 2001).

While the original work on the BPRS-C (Overall, & Pfefferbaum 1981) validate the tool using seven subscales several other studies have combined subscale scores to make aggregate scores of various types. (Delbello et al., 2005; Gordon et al., 1994, and many others) the methodology for doing this, is not clearly defined and may not be valid.

A review of the literature demonstrates that most applications of the BPRS-C have been in the acute-hospitalized cohort, or in various clinical

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trials. An early trial on 21 children with schizophrenia compared Clozapine against Haloperidol (Kumra et al., 1996) used the BPRS-C as one of several outcomes measures. The Clozapine cohort showed significant improvement on three subscales (depression, social withdrawal and thinking disturbance) and a trend significance on another (behavioral problems). The BPRS-C, in this application, was used as a repeated measures assessment with the follow-up assessment occurring six weeks after baseline. Using the BPRS-C in this acute group of hospitalized clients as an outcomes measure was instrumental in demonstrating the superiority of Clozapine over Haloperidol.

A larger trial completed on 56 adolescents with Bipolar disorder (Delbello, 2005), used the BPRS-C as a sequential measure, using the measure at baseline and at weekly intervals. Two flaws are identified in this study. First, the use of an overall total score in the BPRS-C has not yet been validated and secondly, the manual describing the proper use of the BPRS-C calls for a monthly reassessment of symptoms and behaviors as the minimum interval. The BPRS-C was not validated for weekly, repeated measures use, as was defined in this study. It is doubtful that the symptoms of bipolar clients would respond weekly and this could be one of the reasons that this study failed to find that Topiramate would not out perform placebo in symptom reduction of bipolar clients.

Another study (Sikich, Hamer, Bashford, Sheitman, & Lieberman, 2004) that used a total score for the BPRS-C measured efficacy of risperidone, olazapine and haloperidol through the use of a double blind, randomized clinical trial. The study cites three other papers that have used the total score, but none of these articles cite a validation of a total score for the BPRS-C, rather that these studies used the total score. Clients for this study were both in-patient and out-patient with acute exacerbation of symptoms within the previous two week period. Clients were assessed at baseline, and again at eight weeks.

Other problematic issue with the use of the BPRS-C, other than short observational periods between administrations of the tool, is no observational period (time) prior to assessment. A study of psychotropic medications in youths housed in therapeutic foster care settings (Breland-Noble et al., 2004) used the BPRS-C as a severity measure for a logistic regression analysis even though the assessments were made at entry into the therapeutic program. Since the BPRS-C is a staff administered tool to be used by those who have been trained to recognize child behaviors (Hughes et al., 2001).

A more appropriate use of the BPRS-C measured early onset symptoms in three different diagnostic groups of both hospitalized and residential clients with: bipolar, schizophrenia or psychosis (McClellan, McCurry, Speltz, & Jones 2002). In the study, clients were measured at baseline and again at one and two years. In this application, the tool was able to detect positive symptoms associated with the Anxiety and Organicity scales of the BPRS-C. The study did not assess treatment efficacy but rather factors that were associated with early onset of psychiatric disorders.

One sound approach for using the BPRS-C when only certain symptoms, as monitored by subscales of the BPRS-C, were being addressed, was conducted by Nelson and Renzenbrink (1995). In their study of 25 hospitalized adolescents, these researchers used only the Anxiety and Depression subscales of the BPRS-C. In this study they correlated clinically derived ratings with adolescent self reports. This level of detail would have been lost if a total score was used.

Another study that appropriately used subscales of the BPRS-C and monitored clients over time (1-year) selected clients based on extreme behavior where subscale scores would have been expected to be high (Vance, Bowen, Fernandez & Thomposn, 2002). The study used the BPRS-C not as a difference measure for outcomes of treatment, but rather as a tool to see if changes in the subscales were associated (correlated) with behavioral functioning over time. In this highly diseased cohort, no association was seen on behavior markers one year after therapy. The lack of findings in this study would imply caution in the use of the tool in less diseased cohorts.

In a less symptomatic setting, as compared to the hospitalized setting, one study of note validated the use of the BPRS-C in the residential psychiatric setting. This study did not stratify clients by diagnostic groups (McIlhaney, Henderson, Gunn, & Wasser, 2007). Rather the tool was used as a pure program evaluation measure assessing clients at baseline (admission) and again at discharge. The study was notable and applicable to this research in that institutionalized clients that were in a residential facility, not a hospital, showed improvement in therapeutic condition in almost all of the seven subscales contained in the BPRS-C. Also, the study was able to demonstrate these gains in client condition with baseline means in the mid-point of the measurement scale. This is a relevant finding in that the gains were seemingly real improvement, and not due to some regression to the mean artifact.

The key objective promoting this research was to determine if the BPRS-C was able to detect treatment efficacy in a residential population, which does not have the high baseline acuity levels as we would expect in a hospitalized population.

2. Methods

2.1. Client population

The clients analyzed in this paper are admitted to residential treatment and must have a DSM IV-R diagnosis indicating the presence of a mental disorder that has a significant impact on the client's family, school, and/or social functioning. The primary referral states include Pennsylvania, New York, New Jersey, Delaware, West Virginia, and Connecticut. Clients may be accepted directly for placement based on the written referral packet. Pre-placement assessments are required if there is a question as to a client's suitability for treatment and to assess the client to determine the appropriate modality of treatment. On very few occasions are the rights of the birth parents terminated for residential placement. The parents under the advice of psychologists, psychiatrists, family social workers or other therapists place the vast majority of clients in the residential programs.

2.2. Residential treatment program description

The residential treatment programs that participated in this study were private, licensed, accredited, out-of-home placements. There were several levels of care within the residential treatment programs: Intensive, Specialized (which is Sexual Disorders and Behavioral Disorders), and Therapeutic (which consists of Transitional, Dual Diagnosis, Drug/Alcohol, MH/BH, Diagnostic, and Community Residential). Therefore, the client data in this study came from a variety of these levels. Residential treatment programs utilize various approaches to the treatment of emotional and behavioral problems. The program has on-site education, multi-disciplinary treatment teams, dining halls, dorm-like housing, and recreation facilities. All programs provide, group, individual, and family therapy and type of each are highly individualized. Each individualized treatment plan is designed to treat and meet the needs of youngsters who require or can benefit from a program offering clinical, recreational, educational services and ongoing supervision. During the program, clients progress through “The Step System” which is devised of two separate, but congruent parts: The “Steps” and The “Levels.” The “Steps” consist of ten systematic tiers that each outlines measurable expectations. With subsequent moves to each next step, the expectations of the client increase in regards to displaying learned skills. The “Levels” are the behavior modification procedures utilized to empower the clients to evaluate their own performance in the program on a daily basis while providing standard opportunities for clients based on their individual performances. The daily milieu is highly structured, with most time spent in school, groups, individual counseling, family therapy, or recreation. The residential treatment programs provide twenty-four hour care to males and females, ages six to 18. Program staff consists of social workers, mental health professionals,

Table 1
Demographic analysis between diagnostic groups. (Analysis of variance with Scheffe post-hoc tests unless otherwise noted.)

Variable	Conduct D/O	Bipolar	Depression	IED	*p*-value	Post-hoc differences (*p*-value)
Sample size	67	39	53	109	N/A	
Age	14.73 ± 2.42	15.13 ± 2.02	15.45 ± 2.36	15.04 ± 2.00	0.353	N/A
Gender	M = 35 (52%) F = 32 (48%)	M = 18 (46%) F = 21 (54%)	M = 23 (43%) F = 30 (57%)	M = 65 (60%) F = 44 (40%)	0.202[a]	N/A
Number of Axis I diagnosis	3.63 ± 1.45	3.21 ± 1.40	3.42 ± 1.46	4.15 ± 1.32	<0.001	IED/Bipolar ($p = 0.005$) IED/Depression ($p = 0.022$)
Number of psych med orders	6.06 ± 7.26	15.31 ± 16.23	10.79 ± 10.62	11.33 ± 11.42	0.001	Conduct/Bipolar ($p = 0.001$) Conduct/IED ($p = 0.030$)
Number of times restrained	3.91 ± 7.09	10.79 ± 21.78	4.21 ± 7.90	7.35 ± 14.70	0.041	Conduct/Bipolar (0.012)[b]
Length of stay (days)	214.09 ± 126.38	223.51 ± 138.38	199.55 ± 123.42	188.13 ± 132.27	0.408	N/A

[a] Chi-square test.
[b] Least squared difference post-hoc was used as Scheffe test did not identify any post-hoc difference.

childcare counselors, psychologists, teachers, nurses, and psychiatrists. The residential treatment programs vary widely in terms of size (8–22 beds), location (Pennsylvania, Maine, and Georgia), treatment modality (more clinical focus with severely impaired clients), and interventions provided (cognitive behavioral therapy, dialectic behavioral therapy, Applied Behavioral Analysis, vocational instruction, independent life skills, STRIDE (Sexual Treatment Rehabilitation Interventions to Develop and Educate).

2.3. Testing PROCEDURES

Forty-nine clinicians, who are trained on the use of the BPRS-C, independently rated each of the 918 clients. The BPRS-C training is taught either in a group or individual session, which primarily focuses on symptom observation and rating strategies. Clinicians were trained that external sources are not to be used as data sources. However, all of the raters have previous knowledge of the clients through the referral packets, which may have influenced their interpretation of symptom severity. For residential populations, the baseline BPRS-C is completed within 30 days after admission. Discharge BPRS-C is completed within seven days prior to discharge. Clinicians are instructed to include only those behaviors occurring within the last 30 days of admission. The BPRS-C is entered into the computer at the treatment location; the data is then processed at the Outcomes Department in a different location where the subscales are calculated.

2.4. Statistical analysis

Standard demographic analysis was conducted and reported as means and standard deviations for continuous data and frequency with percents for discrete data. For the continuous data Analysis of Variance was used across all groups. Significant tests were further analyzed with Scheffe post-hoc procedure unless otherwise noted. Discrete data were compared across diagnosis groups using chi-square test of association. Variables included in the demographic analysis within each diagnosis group were: age, gender, number of Axis I diagnosis, number of psychiatric medicine orders (an index of severity), number of times the patient was restrained, and length of stay in the residential treatment facility. For significance we used a *p*-value less than or equal to 0.05 for all analysis (chi-square, ANOVA and post-hoc measures).

Within diagnosis group analysis was conducted by paired *t*-test on each of the seven subscales. In order to correct for multiple comparisons significant *p*-values were considered if they were less than 0.008 (0.05 divided by 7). For those values between 0.05 and 0.008 we considered those to be trend significant.

3. Results

There were several diagnostic groups with small sample sizes were not included in this analysis. These included: Asperger/Autism/Tourette's syndrome clients ($n = 18$), Pervasive Developmental Disorder ($n = 6$), Anxiety Disorder ($n = 7$), Schizophrenia/Psychotic Disorder ($n = 6$) and Alcohol and Drug addictions ($n = 16$).

Included in this analysis were four diagnostic groups that had adequate sample sizes for admission versus discharge testing (pre–post). These diagnosis groups were Conduct Disorder ($n = 87$), Bipolar disorder ($n = 39$), Depression ($n = 53$) and Intermittent Explosive Disorder ($n = 109$).

The results of demographic significance testing between these groups can be found in Table 1. This includes analysis for variables including: age, gender, the number of Axis I diagnosis, Number of psychiatric medications orders used during the admission, the number of times the client required some level of restraint, and the length of stay.

3.1. Conduct disorder

Those clients with conduct disorder ($n = 87$) demonstrated significant gain in treatment for Behavior Problems ($p = 0.004$), Depression ($p < 0.001$) and Withdraw/Retardation ($p = 0.001$) subscales. Non-significant decreases in client symptoms were seen for Thinking Disturbance ($p = 0.194$), Psychomotor ($p = 0.371$) subscales. And small non significant increases in symptoms were observed for Anxiety and Organicity, ($p = 0.870$ and $p = 0.689$ respectively).

The increase in these scores were very small, both 0.02 hundredths of a point on the measurement scale. The Conduct Disorder clients had

Table 2
BPRS-C baseline and discharge comparisons for conduct disorder ($n = 67$).

BPRS-C subscale	Baseline	Discharge	*p*-value
	Mean ± standard deviation	Mean ± standard deviation	
Behavior problems	3.28 ± 1.35	2.56 ± 1.78	0.004
Depression	1.83 ± 1.14	1.16 ± 1.05	<0.001
Thinking disturbance	0.30 ± 0.61	0.21 ± 0.52	0.194
Psychomotor	1.64 ± 1.17	1.50 ± 1.22	0.371
Withdraw/retardation	1.00 ± 0.86	0.57 ± 0.67	0.001
Anxiety	1.31 ± 1.02	1.33 ± 1.01	0.870
Organicity	0.15 ± 0.37	0.17 ± 0.36	0.689

Table 3
BPRS-C baseline and discharge comparisons for bipolar disorder ($n = 39$).

BPRS-C subscale	Baseline	Discharge	*p*-value
	Mean ± standard deviation	Mean ± standard deviation	
Behavior problems	2.62 ± 1.69	1.81 ± 1.41	0.002
Depression	2.88 ± 1.55	1.32 ± 1.19	<0.001
Thinking disturbance	0.52 ± 0.96	0.23 ± 0.54	0.028
Psychomotor	1.32 ± 1.26	0.89 ± 0.78	0.012
Withdraw/retardation	1.56 ± 1.31	0.87 ± 0.93	0.006
Anxiety	1.72 ± 1.21	1.22 ± 0.87	0.025
Organicity	0.21 ± 0.43	0.07 ± 0.21	0.044

Table 4
BPRS-C baseline and discharge comparisons for depression disorder ($n=53$).

BPRS-C subscale	Baseline	Discharge	p-value
	Mean ± standard deviation	Mean ± standard deviation	
Behavior problems	2.70 ± 1.47	1.96 ± 1.56	<0.001
Depression	2.70 ± 1.24	1.60 ± 1.31	<0.001
Thinking disturbance	0.47 ± 0.80	0.15 ± 0.40	0.003
Psychomotor	1.54 ± 1.19	1.00 ± 1.08	0.001
Withdraw/retardation	1.64 ± 1.14	0.90 ± 0.86	<0.001
Anxiety	1.92 ± 1.05	1.45 ± 1.10	0.009
Organicity	0.19 ± 0.31	0.04 ± 0.13	<0.001

a higher baseline mean (3.28) than any other diagnostic group in this study. These data, means and standard deviations for both baseline and discharge can be found in Table 2.

3.2. Bipolar disorder

The most significant and trend significant results were found for Bipolar clients ($n=39$) made more remarkable by the small sample size, and in light of the statistical corrections for multiple comparisons. All subscales decreased for this cohort.

Statistically significant improvement in client condition was observed for Behavior Problems ($p=0.002$), Depression ($p<0.001$) and Withdraw/Retardation ($p=0.006$) subscales. Trend significant improvement in client condition was observed for all other subscales: Thinking Disturbance ($p=0.028$), Psychomotor ($p=0.012$), Anxiety ($p=0.025$), and Organicity ($p=0.044$).

Bipolar clients had a higher mean for Depression (2.88) than any other diagnostic group in this study. The data (means and standard deviations) for clients with bipolar disorder for baseline and discharge can be found in Table 3.

3.3. Depression

The depressed cohort had results similar to bipolar disorder in that all subscales of the BPRS-C declined from baseline to discharge, and all but one was statistically significant. Behavior Problems ($p<0.001$), Depression ($p<0.001$), Thinking Disturbance ($p=0.003$), Psychomotor ($p=0.001$), Withdraw/Retardation ($p<0.001$) and Organicity ($p<0.001$) were all highly significant after corrections to the p-value were made for multiple comparisons. Anxiety was trend significant after being corrected for multiple comparisons with a p-value of 0.009. The means and standard deviations for the baseline and discharge values for depression can be found in Table 4.

3.4. Intermittent Explosive Disorder — IED

The diagnosis group with the largest sample size in this outcomes study ($n=109$) was IED. The size of the sample as well as the drastic reduction in symptoms for all seven subscales of the BPRS-C led to highly statistically significant p-values. Even after corrections for multiple corrections all were less than ($p<0.001$). IED clients exhibited the highest baseline mean values than any of the other three diagnosis groups for five of the seven subscales of the BPRS-C (Thinking Disturbance, Psychomotor, Withdraw/Retardation, Anxiety and Organicity, Table 5).

Table 5
BPRS-C baseline and discharge comparisons for intermittent explosive disorder ($n=109$).

BPRS-C subscale	Baseline	Discharge	p-value
	Mean ± standard deviation	Mean ± standard deviation	
Behavior problems	3.26 ± 1.56	2.52 ± 1.58	<0.001
Depression	2.48 ± 1.49	1.44 ± 1.07	<0.001
Thinking disturbance	0.78 ± 1.08	0.33 ± 0.57	<0.001
Psychomotor	1.88 ± 1.30	1.29 ± 1.04	<0.001
Withdraw/retardation	1.75 ± 1.20	0.95 ± 0.94	<0.001
Anxiety	2.01 ± 1.35	1.50 ± 1.09	<0.001
Organicity	0.56 ± 1.02	0.24 ± 0.55	<0.001

4. Discussion

Studies that report total score statistics using the BPRS-C may be missing important detailed information on the condition of their clients. Total scores may under report (or fail to find significant condition improvement) treatment efficacy as subscale scores are averaged out across all symptoms. Using total scores may also over report (or find significant condition improvement) treatment efficacy as small gains in all subscales, when taken in total, indicate that an effect of therapy exists.

Never the less, many studies exist using the un-validated total score of the BPRS-C as an overall indicator of client progress. This total score might be suitable for monitoring clients, but should not be used in a more strict scientific application. The literature reveals, from those researchers that have used the BPRS-C or developed new validated applications, several nuggets of wisdom regarding the tools appropriate use. First, raters need to be trained, not only on the use of the tool but on the identification of symptoms measured by the tool. Before entering these scores into a computer system, raters need to demonstrate reliable understanding of the behaviors they are observing. Second, observers or raters need to have an adequate period of exposure to the client to have time to form an opinion on existence and magnitude of the behaviors they are rating. Third, if the tool is being used as a repeated measure, four or more weeks between ratings would be needed to evaluate the effects of therapy. This might be less if the treatment is a medication where treatment effects are expected in a short period of time. And lastly, the subscales should be calculated and used as described in the manual for use of the BPRS-C. The use of an overall total score is not recommended.

Other than a review of the current literature on the use and applications of the BPRS-C, this study was intended to determine the degree of applicability of the BPRS-C in a primarily residential setting. The research question was; can the BPRS-C (which is used in populations where the children being treated are very sick), be used in the residential setting among four diagnostic groups?

As suspected in a residential care setting, the magnitude of the symptoms, given a seven point scale, were not severe as measured by a tool that has broad application in hospitalized clients. However, given the moderate level of symptoms on admission, the symptoms of children in residential care do diminish over the time of their stay. Significant differences were observed among all diagnosis groups. This would demonstrate the ability of the tool in organizations that might treat any one of the diagnosis types tested as a part of this research.

It is important to note that the symptoms of residential clients did not ever reach the midway point of the rating scale. This is true for both baseline and discharge testing intervals. This is relevant for two reasons. First, the scale would seem to be functioning well in this less acute cohort (less acute than hospitalized clients). The authors would suspect that means for non hospitalized clients would be higher up the severity scale. Second, the scale is still sensitive enough to detect significant change even though sample sizes are small and the lower end of the severity distribution is seen in these children.

Some subscales were able to detect very small, subtle changes in patient condition when the baseline scores were very low. For example, in the bipolar cohort, a trend significant reduction of client symptoms was seen even when the baseline mean was 0.21.

One question that comes out of this research would be can the BPRS-C be used in a client population that is even less acute than the

residential setting? Children that are less acute would probably not enter the residential treatment system but might be more likely to be treated in a private one-on-one setting with school counselors or private psychologists, perhaps even foster care. The study conducted by McIlhaney (2007), did not find differences in the foster care setting with this tool, but there are of course other extensions to the foster care setting that are yet to be tested. Certainly researchers interested in using one instrument as short and easy to administer as the BPRS-C would be useful in this context, not to mention the established validity that the tool already has. Further research could be performed in more settings than the hospitalized client as well as residentially treated adolescents.

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