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The Brief Negative Symptom Scale: Psychometric Properties

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The participants in the NIMH-MATRICS Consensus Development Conference on Negative Symptoms recommended that an instrument be developed that measured blunted affect, alogia, asociality, anhedonia, and avolition. The Brief Negative Symptom Scale (BNSS) is a 13-item instrument designed for clinical trials and other studies that measures these 5 domains. The interrater, test–retest, and internal consistency of the instrument were strong, with respective intraclass correlation coefficients of 0.93 for the BNSS total score and values of 0.89–0.95 for individual subscales. Comparisons with positive symptoms and other negative symptom instruments supported the discriminant and concurrent validity of the instrument.

Key words: schizophrenia/negative symptoms/rating scale

Introduction

Negative symptoms have long been recognized as an integral and clinically important part of schizophrenia. However, the concept has changed over time, from Kraepelin's early description of the destruction of the personality,[1] the domains concept of Strauss et al,[2] Crow's concept of Type II schizophrenia,[3] and the operationalization of negative symptoms in the Scale for the Assessment of Negative Symptoms (SANS), the Positive and Negative Syndromes Scale (PANSS), the Negative Symptom Assessment, and others.[4–7]

To encourage treatment development in this area, the National Institute of Mental Health organized the Consensus Development Conference on Negative Symptoms in Rockville, MD, January 26–27, 2005.[8] The participants in that conference issued a consensus statement that noted, "As currently understood, the domains of negative symptoms include blunted affect, alogia, asociality, anhedonia, and avolition. There are substantial correlations across these domains, but they may have separate neurobiological substrates and may represent separate therapeutic targets. The structure of relationships among these domains and their predictive validity require further study." The workgroup also concluded that, "Development of a new instrument that included the 5 agreed-upon domains would advance work in this area. Such an instrument needs to be applicable in both inpatient and outpatient clinical trials and needs to be sensitive to change. The negative symptom domains need to be clearly defined for the purposes of instrument development. This task is also essential to encourage development of preclinical models and laboratory-based, human assessments of negative symptoms and to stimulate translation from neuroscience to the clinical study of negative symptoms." An important additional impetus for instrument development was the view that some widely used negative symptom rating scales include items and domains other than the 5 listed above.

Following the Consensus Development conference, a workgroup was formed to develop this instrument. With time, it became clear that it was desirable to create 2 instruments: one that would address the essential elements of each domain but be concise enough to be practical for routine clinical use as well as large multicenter clinical trials and another that would cover each of the domains in extensive detail. As a consequence, the workgroup divided into 2 groups to accomplish these 2 different tasks.

In this article, we present the Brief Negative Symptom Scale (BNSS), a concise instrument intended for widespread use, notably but not exclusively in treatment trials.

Interview and rating materials are available as online supplementary material.

Methods

Scale Development

Scale development began at the Consensus Development Conference, when participants reviewed the psychometric performance of existing scales measuring negative symptoms and gave presentations on the measurement of negative symptoms, treatment trial methods, and related issues,[8] followed by discussion. A group dedicated to scale development was then formed, which reviewed additional literature and had multiple conversations on item development. An extensive review of this literature is beyond the scope of the current article. This workgroup subsequently divided into 2 groups, one focusing on a concise instrument meant to be appropriate for clinical trials (which became the BNSS) and the other on a more lengthy instrument. Scale items were drafted de novo, based on this process.

Principles for design of the BNSS included: (1) that it be concise and feasible for large, multicenter trials; (2) that the 5 domains cited by the Consensus Development Conference be included, with a separate subscale score for each; (3) items that could be assessed in a variety of cultures; (4) suitability for purposes other than clinical trials, such as epidemiological and psychological studies; (5) maintaining a distinction between anticipatory and consummatory aspects of anhedonia, based on the preliminary evidence that people with schizophrenia may have an impairment in one of these aspects but not the other,[9–11] (6) a distinction between internal experience and behavior, so that these could be considered separately in studies using the scale; and (7) not including items that, according to factor analytic studies, are more related to disorganization than to negative symptoms, such as poverty of content of speech and attention.[12]

Earlier versions of the scale were presented, and audience input was sought at the annual meetings of the National Institute of Mental Health's New Clinical Drug Evaluation Unit and the International Society for CNS Clinical Trials and Methodology. These versions were posted on a Web site prior to and after those meetings so more input could be given. Feedback was also obtained from senior figures in the field of schizophrenia trials (see Acknowledgments).

The BNSS includes a manual, score sheet, and workbook, and has 13 items organized into 6 subscales (table 1; and see online supplementary materials). The manual defines the terms used in the scale, provides anchors for each item, and gives instructions for a semistructured interview, including suggested questions. The workbook extracts the suggested questions and the anchors and is designed for the rater's reference during administration. All the items in the BNSS are rated on a 7-point (0–6) scale, with anchor points generally ranging from the symptom's being absent (0) to severe (6).

Table 1. Items in the Brief Negative Symptom Scale

Subscale	Items
Anhedonia	Intensity of pleasure during activities
	Frequency of pleasure during activities
	Intensity of expected pleasure from future activities
Distress	Distress
Asociality	Asociality: behavior
	Asociality: internal experience
Avolition	Avolition: behavior
	Avolition: internal experience
Blunted affect	Facial expression
	Vocal expression
	Expressive gestures
Alogia	Quantity of speech
	Spontaneous elaboration

A scale total score is calculated by summing the 13 individual items; subscale scores are calculated by summing the individual items within each subscale. The distress subscale has only one item, which quantifies the absence of distress, but this subscale is otherwise treated in the same manner as the other subscales. Thus, the BNSS has possible total scores ranging from 0 to 78.

Administration of the instrument typically takes about 15 min; if administered at the end of an interview that includes other instruments, less time may be required. The scale was designed primarily for use in treatment trials but may have other applications such as clinical evaluation and tracking of change. The scale does not define a negative symptom subtype.

Participants

Twenty subjects with a *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV) diagnosis of schizophrenia participated in the study. They were recruited from outpatient units at the Medical College of Georgia ($N = 10$) and the Maryland Psychiatric Research Center ($N = 10$). The diagnoses were made by treating psychiatrists and confirmed using the psychosis and affective disorder modules of the Structured Clinical Interview for DSM-IV. Patients with an IQ < 70 were excluded. The subjects had an average age (SD) of 48.1 (6.6) years, 11.8 (1.3) years of education, and a Wechsler Abbreviated Scale of Intelligence (WASI) full-scale estimated IQ of 86.1 (12.1). Eighty percent were male, 50% were Caucasian, and 45% African American. Five of the patients met criteria for deficit schizophrenia (Kirkpatrick et al. 1988) and 15 were categorized as nondeficit.

All subjects gave written informed consent with oversight by the respective institutional review boards.

Table 2. Descriptive Statistics for the 6 Subscales of the Brief Negative Symptom Scale

	Total Score	Anhedonia	Distress	Asociality	Avolition	Blunted Affect	Alogia
Mean	26.8	5.4	1.6	3.9	5.0	7.7	3.4
Median	27.0	5.0	1.0	4.0	5.0	8.0	3.0
SD	16.8	4.9	1.8	2.9	3.1	5.1	3.3
Range	0–66	0–18	0–6	0–12	0–11	0–18	0–12
Skewness	0.29	0.60	0.79	0.66	0.03	0.05	0.57
Kurtosis	−0.67	−0.48	−0.24	−0.18	−0.69	−0.69	−0.68

Note: The possible range of scores for each scale: Total = 0–78; Anhedonia = 0–18; Distress = 0–6; Asociality = 0–12; Avolition = 0–12; Blunted Affect = 0–18; Alogia = 0–12.

Procedure

Ten patients each were interviewed by a psychiatrist (B.K.) or a clinical psychologist (G.S.) who administered the BNSS, SANS[4], PANSS[7], and Clinical Global Impression (CGI[13]) item, in that order. These interviews were videotaped for later ratings. The Schedule for the Deficit Syndrome[14] had previously been administered to all the patients, as had the 2 subtest version of the WASI,[15] which was used to estimate full-scale IQ. Ratings were based on information pertaining to a 1-week period and were derived from patient self-report and direct patient observation.

Prior to conducting the interview, the raters participated in a 1-day training workshop on the instruments that focused on interrater reliability. Raters consisted of faculty and research staff members from academic psychiatric centers. All raters had extensive prior experience conducting patient symptom interviews. After the patients had completed the interview sessions, the 20 videotaped interviews were rated independently by 7 raters from 3 different research groups: 3 psychiatrists, 2 psychologists (one with a doctorate, the other with a master's degree), a nurse, and one bachelor-level raters.

Test–retest reliability was determined by examining the consistency of scores in 10 patients who completed 2 interview sessions that were separated by 1 week. The retest (ie, second) interviews were rated by 3 raters (a psychiatrist, the PhD psychologist, and a bachelor-level rater).

Results

Descriptive Statistics and Distribution of Scores

Descriptive statistics for the full sample of patients are presented in table 2. Each of the BNSS subscales was approximately normally distributed.

Interrater Reliability and Internal Consistency

To assess interrater reliability, intraclass correlation coefficients (ICCs) were calculated for the BNSS total score and for each subscale. The ICC for the BNSS total score was 0.96, and ICC values for the subscales were Anhedonia 0.95, Distress 0.89, Asociality 0.92, Avolition 0.91, Blunted Affect 0.92, and Alogia 0.93. ICCs for the SANS total score and the PANSS negative symptom subscale total were 0.92 and 0.81, respectively.

Cronbach's alpha was calculated to examine internal consistency. The alpha value for the 13-item BNSS scale was .93, indicating that the items measure a single latent construct of negative symptoms. Additionally, all the items were significantly correlated with the BNSS total scale score, and values ranged from $r = .53$ ($P < .001$) for the Distress item to $r = 0.85$ ($P < .001$) for Spontaneous Elaboration. The alpha coefficients ranged from .88 to .93 when each item was omitted individually, suggesting no benefit from excluding any individual items.

Test–Retest Reliability

Pearson's correlation coefficients were calculated to estimate the test–retest reliability of BNSS scores measured during 2 interviews separated by 1 week. Results indicated that the BNSS total score has high temporal stability, with $r = 0.81$ ($P < .001$). Test–retest reliability was also good for the BNSS subscales (Anhedonia: $r = .76$; $P < .001$; Distress: 0.80, $P < .001$; Asociality: $r = .85$, $P < .001$; Avolition: $r = .90$, $P < .001$; Blunted Affect: $r = .77$, $P < .001$; Alogia: $r = .83$, $P < .001$) and individual BNSS items (data not shown).

Concurrent Validity

The BNSS total score was highly correlated with both the SANS ($r = .84$, $P < .001$) and PANSS ($r = .80$, $P < .001$) total negative symptom scores, suggesting that the measure assessed an underlying construct of negative symptoms similar to that of other standardized measures of negative symptoms.

Subscale-level concurrent validity was assessed by examining correlations between BNSS subscale total scores and global subscale scores from the SANS: BNSS Anhedonia and SANS Anhedonia/Asociality ($r = .67$, $P < .001$); BNSS Asociality and SANS Anhedonia/Asociality

Table 3. Brief Negative Symptom Scale Item Factor Loading

	Factor Loading	
	1	2
Item 1: Intensity of pleasure during activities	0.27	**0.91**
Item 2: Frequency of pleasure during activities	0.19	**0.93**
Item 3: Intensity of expected pleasure from future activities	0.13	**0.83**
Item 4: Distress	0.49	0.13
Item 5: Asociality behavior	0.56	**0.77**
Item 6: Asociality inner experience	0.54	**0.71**
Item 7: Avolition behavior	0.48	**0.79**
Item 8: Avolition inner experience	0.47	**0.77**
Item 9: Facial expression	**0.71**	0.31
Item 10: Vocal expression	**0.77**	0.17
Item 11: Expressive gestures	**0.78**	0.09
Item 12: Quantity of speech	**0.87**	0.30
Item 13: Spontaneous elaboration	**0.81**	0.39

Note: Items loading on the factor are in bold.

($r = .66$, $P < .001$); BNSS Avolition and SANS Avolition ($r = .67$, $P < .001$); BNSS Blunted Affect and SANS Blunted Affect ($r = .79$, $P < .001$); and BNSS Alogia and SANS Alogia ($r = .67$, $P < .001$).

The BNSS Distress item showed a negative correlation with a sum of the PANSS Depression, Guilt, Anxiety, and Hostility items ($r = -.33$, $P < .01$), indicating that the distress item validly measures the absence of dysphoria.

Construct Validity

Principal components factor analysis with maximum-likelihood rotation was used to examine the factor structure of the BNSS. Results indicated a 2-factor solution, with factor 1 accounting for 57% (eigenvalue = 7.35) of the variance and factor 2 accounting for 14% (eigenvalue = 1.82; table 3). The factors were interpreted to reflect the underlying constructs of anhedonia/avolition/asociality and emotional expressivity, respectively. These can also be viewed as an impairment of subjective experience and an impairment of observable behavior, respectively.

Discriminant Validity

Comparison of the correlations among the BNSS total score, SANS total score, and the PANSS Negative Symptom subscale with Positive, General, and Total symptom subscale scores from the PANSS were used to assess discriminant validity (table 4). Like the SANS and PANSS total scores, the BNSS total score had moderate relationships with general psychopathology. The PANSS and SANS showed weak correlations with PANSS positive symptoms; however, the BNSS total score was not significantly correlated with positive symptoms.

The BNSS total score was not significantly correlated with the PANSS Depression item ($r = .14$, $P = .11$), and the PANSS Depression item was only modestly correlated with BNSS Anhedonia items (BNSS item 1: $r = .44$, $P < .001$; item 2: $r = .42$, $P < .001$; item 3: $r = .42$, $P < .001$). These correlations suggest that negative symptoms measured on the BNSS are not synonymous with depression and that the Anhedonia items capture a form of affective disturbance that has little overlap with depression, as would be expected.

The BNSS total score also showed good discriminant validity with regard to cognitive function, as it did not have a significant relationship to WASI full-scale IQ ($r = -.13$, $P = 0.58$) or to the WASI vocabulary ($r = -.18$, $P = 0.45$), and Matrix Reasoning ($r = -.06$, $P = 0.74$) subtests used to estimate full-scale IQ.

Predictive Validity

To examine predictive validity, we examined the relationship between the CGI item score and the total scores for the BNSS, SANS, and the PANSS negative syndrome scale. All 3 negative symptom scales had moderate univariate associations to global psychopathology as measured by the CGI score, with the BNSS showing the highest correlation among the 3 negative symptom scales: BNSS: $r = .60$, $P < .001$; SANS: $r = .53$, $P < .001$; PANSS: $r = .56$, $P < .001$.

Discussion

In this preliminary study, we found that the BNSS had excellent interrater and test–retest reliability as well as strong internal consistency. Its concurrent validity was also supported by its relationship to 2 other widely used negative symptom scales. With regard to discriminant validity, the BNSS did not have a significant relationship with positive symptoms, while the predictive validity was supported by its relationship to a measure of global psychopathology. We also found 2 factors that we interpreted as reflecting the underlying constructs of anhedonia/avolition/asociality and emotional expressivity. Similar factors have been found in other studies of negative symptom rating scales.[16]

The Distress item did not load onto any of the factors, but this may have been due to restricted variance in that item in the current sample; in a group with greater severity and more variance, the Distress item may load onto one of the other factors. The concept of distress—or as in the BNSS, a lack of normal distress—is not usually considered a negative symptom. However, removing that item did not lead to a meaningful change in the internal consistency of the scale. Measures of distress have also been used in combination with negative rating scale

Table 4. Discriminant Validity

	PANSS Positive Score	PANSS General Score	PANSS Total Score
BNSS total	0.09	0.40***	0.58***
SANS total	0.24**	0.61***	0.78***
PANSS Negative	0.18*	0.54***	0.76***

Note: BNSS, Brief Negative Symptom Scale; SANS, Scale for the Assessment of Negative Symptoms; PANSS, Positive and Negative Symptom Scale.
*$P < .05$; **$P < .01$; ***$P < .001$.

scores to delineate patient groups with and without primary negative symptoms, with good validity (C. Arango, J. Bobes, B. Kirkpatrick, M. Garcia-Garciad, and J. Rejase on behalf of the CLAMORS Study Collaborative Group, unpublished data).[18–32] Further study will be needed to determine whether this item can serve this purpose or be useful in other ways. Whether or not this item has utility with regard to delineating deficit and nondeficit groups, a lack of emotionality has long been noted to be a prominent feature in some people with schizophrenia,[1] and our results suggest that this feature is related to negative symptoms as usually defined.

The current study did not address some important psychometric characteristics of the BNSS. These include its ability to detect change in clinical trials and its relationship to variables previously shown to be related to negative symptoms, such as neurological signs. Its relationship to the deficit/nondeficit construct (ie, primary, enduring negative symptoms[33]) is also unknown, as our small sample did not permit an examination of this issue. The small sample size also raises the question of the stability of the factor structure we found. Another limitation of our study is that all the rating scales were completed by the same rater.

There were also limitations to the generalizability of our findings. Our sample consisted of outpatients whose symptoms were typically mild to moderate. Psychometric properties and the amount of time needed to administer the BNSS may differ in more severely ill groups. However, in light of the relatively restricted variance in our sample, our ability to attain good interrater reliability suggests that reliability in more severely ill groups should also be good. We also did not use information from informants, although in many studies that may be feasible. On the other hand, the good interrater reliability was obtained by raters from 3 different sites and different professional training. We did not find a relationship to our measure of cognitive function; a larger sample or other, more extensive measures might have found such a relationship.

There is increasing sensitivity to the problem of pseudospecificity[8,34] or primary vs secondary negative symptoms in the study of psychotic disorders. The intent of the distress item is to aid in this area. The relationship of BNSS total score to depression was not significant, and there was no significant relationship to positive symptom scores. Although our sample size was a limitation, the effect size was small for both of these relationships, so even in a larger sample, there is not likely to be strong correlation. However, in future studies, interpreting BNSS scores in the context of rating scale scores for depression, extrapyramidal symptoms, and psychotic symptoms may be useful. In clinical trials, an appropriate design can also help minimize the problem of pseudospecificity.[8]

The relative value of the BNSS, compared with the SANS, PANSS negative symptom subscale, the Negative Symptom Assessment, etc., cannot be adequately assessed by any one study. Use of the BNSS in clinical trials in which another negative symptom scale is used would be informative. The potential advantages of the BNSS—which need to be tested—are brevity; a separation of appetitive and consummatory anhedonia, asociality and anhedonia, and behavior and internal experience; a strong theoretical base; the distress item; and its embodying the recommendations of the Consensus Development Conference. Its design enables researchers to consider many aspects of negative symptoms separately and relate them to treatments, imaging, and other variables.

Our multisite study demonstrates that raters from a variety of backgrounds can achieve excellent interrater reliability with relatively brief training. Should the BNSS prove to be sensitive to change, it may also be useful for assessing treatment response and clinical progress in routine clinical care. Other study designs and samples with different clinical features would be helpful in assessing its utility.

Supplementary Material

Supplementary material is available at http://schizophreniabulletin.oxfordjournals.org.

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