

ABSTRACT

Title of dissertation: THE NEGATIVE SYMPTOM RATING SCALE:
INITIAL EVALUATION OF RELIABILITY AND
VALIDITY

Courtney Brynn Forbes, Doctor of Philosophy, 2009

Dissertation directed by: Professor Jack J. Blanchard
Department of Psychology

Negative symptoms in schizophrenia are a major determinant of the social and occupational impairments that characterize the disorder, as well as a significant source of distress for caregivers, and predictors of poor long-term outcome. Despite the compelling evidence for the clinical relevance of negative symptoms, this domain of the illness remains inadequately addressed by current pharmacotherapy and psychotherapy. As identified at the NIMH-MATRICES Consensus Development Conference on Negative Symptoms, a significant barrier to progress in the treatment of this symptom domain is the current lack of an adequate measure for assessment of negative symptoms (Kirkpatrick et al., 2006). It was in response to this need that the NIMH-MATRICES Negative Symptom Workgroup developed a new measure, the Negative Symptom Rating Scale (NSRS). The current study provided the first evaluation of the psychometric properties of the newly developed NSRS, including the inter-rater agreement and internal consistency of the NSRS scales, and assessed convergent and discriminant validity. The results of this initial psychometric evaluation of the NSRS are generally quite encouraging, and provide information that

has helped inform data-driven modifications to the measure for upcoming validation studies. With regards to reliability, the NSRS demonstrated adequate internal consistency for the scale as a whole, and for three of the five subscales. The results indicated that the Asociality and Avolition subscales warrant further revisions or modifications to improve internal consistency. Additionally, three of the five subscales were found to have good to excellent interrater reliability, with the Avolition and Alogia subscales falling in the fair range. Results generally demonstrated adequate convergent validity between the NSRS and other measures of negative symptoms, namely the SANS and the BPRS Anergia subscale. Additionally, results indicated general convergence between clinician-rated anhedonia using the NSRS and self-reported anhedonia as measured by the TEPS. Finally, the NSRS showed discrimination from ratings of psychotic and depressive symptoms. The results of the present study point to areas in which revisions are necessary, and has provided valuable information that is necessary for making revisions and modifications to the measure prior to larger scale evaluation.

THE NEGATIVE SYMPTOM RATING SCALE:
INITIAL EVALUATION OF RELIABILITY AND VALIDITY

by

Courtney Brynn Forbes

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Advisory Committee:

Professor Jack J. Blanchard, Chair
Professor Alan S. Bellack
Assistant Professor Andrea M. Chronis-Tuscano
Associate Professor Ellen S. Fabian
Professor Karen O'Brien

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CHAPTER 1: INTRODUCTION

Schizophrenia is a chronic and debilitating severe mental illness that affects approximately one percent of the general population (Jablensky, 2000). This disorder is characterized by alterations in behavior, thought, perception, language, and emotion. The current diagnostic manual, DSM-IV (APA, 1994), requires that two or more of the five characteristic symptoms, including delusions, hallucinations, disorganized speech, grossly disorganized or catatonic behavior, and negative symptoms (i.e. affective flattening, alogia, or avolition), be present for a significant portion of time over a period of one month to receive a diagnosis of schizophrenia. In addition to two of these symptoms, there must be continuous signs of disturbance for at least six months, and the individual must exhibit social or occupational dysfunction. Given that an individual only needs to meet two of the five symptom criteria, it is possible for individuals to share the same diagnosis of schizophrenia but exhibit vastly different symptom presentations (Earnst & Kring, 1997). For instance, one person might predominantly experience delusions and hallucinations, but never appear disorganized or affectively flat. Conversely, another person with the diagnosis may experience disorganization of speech and negative symptoms, yet never display delusions or hallucinations.

This phenotypic heterogeneity of schizophrenia symptoms has long been acknowledged in the literature, and has often been associated with discussions regarding various methods for subtyping or otherwise categorizing aspects of the illness (Sass, 1989). The creation of dichotomies, such as positive-negative, acute-chronic, and accessory-fundamental, provides both clinician and researchers with

ways in which to simplify the complexities of schizophrenic illness (Sass, 1989). The focus of the present review will be related to the positive-negative dichotomy, in which “positive” refers to overtly psychotic symptoms such as delusions and hallucinations, and “negative” to symptoms characterized by loss of functioning, such as reduced range of emotion and reduced capacity to experience pleasure. In the last twenty-five years, much research has been conducted regarding the positive-negative symptom distinction, resulting in well-replicated findings demonstrating a relationship between negative symptoms and both poor premorbid functioning and various indicators of poor prognosis (Earnst & Kring, 1997).

As negative symptoms have been shown to be related to significant deficits in functioning, and have proven difficult to treat, the National Institute of Mental Health (NIMH) sponsored a consensus conference to identify research priorities for stimulating the development of novel treatments for negative symptoms (Kirkpatrick, Fenton, Carpenter & Marder, 2006). The lack of an adequate measure for assessment was determined to be a significant barrier to progress in the treatment of negative symptoms. As such, a key recommendation resulting from the conference was that a new negative symptom assessment instrument be developed to address the conceptual and psychometric limitations of existing instruments (Kirkpatrick et al., 2006). The NIMH negative symptom workgroup has developed a new instrument, the *Negative Symptom Rating Scale* (NSRS). The research project proposed here will provide an initial evaluation of the reliability and validity of the NSRS, which will directly inform subsequent large scale validation studies.

The following will provide background and historical context for the current issues surrounding the measurement of negative symptoms. A discussion of the history of the positive-negative distinction, the subsequent validation of the negative symptom construct, and a review of currently used negative symptoms measures that will provide the groundwork for discussion of current issues and directions in the field. These issues include the major limitations to current measurement scales outlined as a recent NIMH consensus conference on negative symptoms, and an overview of the development process and content of the newly developed NSRS.

History of the Positive-Negative Distinction

While not utilizing the terms “positive” or “negative” in the discussion of symptoms associated with schizophrenia, the early writings of both Kraepelin (1919) and Bleuler (1950) made distinctions between two classes of symptoms. Kraepelin discussed florid symptoms (i.e. delusions and hallucinations) as well as symptoms characterized by loss or deficits, which he considered to be the most devastating (Kraepelin, 1919). Similarly, Bleuler made a distinction between “core” symptoms which include abnormalities in association, affect, ambivalence, attention, volition and sense of identity, and “accessory” symptoms which include delusions, hallucinations and catatonia (Bleuler, 1950). Again, those symptoms that characterize loss or deficit (i.e. the “core” symptoms) were considered to be the most important and crippling symptoms of schizophrenia (Bleuler, 1950).

The exact origin of the positive-negative distinction within the schizophrenia literature is debated (McGlashan & Fenton, 1992; Sass, 1989). However, the neurologist Hughlings-Jackson (1931) is often cited as the earliest to explicitly

propose this manner of symptom classification (Andreasen, 1982; Andreasen, 1989; Andreasen & Olson, 1982; Ho, Nopoulos, Flaum, Arndt & Andreasen, 1998). Within his formulation, positive symptoms include delusions and hallucinations, and are considered to represent an exaggeration of normal functions. Negative symptoms, conversely, reflect a diffuse loss of function (Hughlings-Jackson, 1931). Strauss and colleagues (1974) conducted one of the first factor analytic studies that provided quantitative support for distinguishing these two symptom profiles in schizophrenia. This led to subsequent research which hypothesized that positive and negative symptoms represent distinct underlying pathophysiological processes (Fenton & McGlashan, 1991; Kay, 1990; McGlashan & Fenton, 1992).

Crow (1980) expanded on the work of Strauss and colleagues (1974), creating a typology that was postulated to facilitate the study of pathophysiology (Andreasen, 1989, Andreasen et al., 1990). Based on previous research on the relationship between symptoms and ventricular size (Johnstone, Crow, Frith, Carney & Price, 1978; Johnstone, Crow, Frith, Husband & Kreel, 1976), the efficacy of dopamine receptor blockade in ameliorating symptoms (Johnstone et al., 1978), and the association between symptoms and the number of dopamine receptors in the post-mortem brain (Owen et al., 1978), Crow proposed a two-syndrome concept purported to represent different underlying dimensions of pathology (Crow, 1980; 1985). One syndrome, termed Type I, was thought to be characterized by positive symptoms (i.e. hallucinations, delusions, thought disorder), to most commonly occur in acute schizophrenia, have no relation with intellectual impairment, and have a hypothesized pathological process involving an increase in dopamine receptors. This form of

schizophrenia was considered to be reversible and potentially responsive to neuroleptic medications. Type II, in contrast, was thought to be characterized by negative symptoms (i.e. affective flattening, poverty of speech, loss of drive), to most commonly occur in chronic schizophrenia, have some relationship with intellectual impairment, and have a hypothesized pathological process involving cell loss and structural changes in the brain. Additionally, Type II was believed to be relatively irreversible, have poor response to neuroleptic medication, and exhibit poor long-term outcome (Crow 1980; 1985; 1989).

Despite the long-standing recognition that negative symptoms may be associated with poor outcomes, described as devastating by Kraepelin (1919), crippling by Bleuler (1950), and irreversible and unresponsive to medication by Crow (1980), these symptoms were relatively ignored within both research and clinical domains. While hypotheses had been presented regarding the role of negative symptoms as important indicators of outcome since the early 1900s, research regarding these symptoms and their correlates was virtually non-existent prior to the 1980s (McGlashan & Fenton, 1992). The fundamental hindrance to the progression of research in this area was the lack of adequate methods to assess and measure negative symptoms (Andreasen, 1982; Andreasen & Olson, 1982). Relatedly, prior to the DSM-IV (APA, 1994), criteria for the diagnosis of schizophrenia created a narrow concept of the disorder through an emphasis on the presence of positive symptoms and de-emphasizing the role negative symptoms (Andreasen & Olsen, 1982). This conceptualization of the disorder was a result of concerns that negative symptoms were imprecise, as they fall on a continuum with normality, and would thus be

difficult to define and diagnose reliably and validly (Andreasen, 1982; Andreasen 1989; McGlashan & Fenton, 1992). Positive symptoms, conversely, with the exception of psychotic-like experiences such as hypnagogic hallucinations or unusual subcultural beliefs, typically do not occur in well people - making decisions about their presence or absence, as well as severity, relatively straight forward (Johnstone, 1989). It was argued that this seemingly excessive prominence of positive symptoms, and de-emphasis of negative symptoms, eroded the construct validity of the schizophrenic diagnosis by ignoring a fundamental component of the illness (Andreasen & Olson, 1982; McGlashan & Fenton, 1992). Research focusing on negative symptoms was facilitated by the development of clinical scales used to quantify them, which subsequently demonstrated their relevance to both research and clinical domains.

Validity of the Negative Symptom Construct

Fundamental to the study of negative symptoms is structural validity. The independence of negative symptoms from other factors associated with the schizophrenic illness such as positive symptoms, depressive symptoms, cognitive impairments, and medication side effects have been of particular interest. Research examining the relationship of negative symptoms with each of these domains will be discussed below. Further, the functional significance of negative symptoms will be reviewed.

Relationships between Negative Symptoms and Other Symptomatology

Three early prominent models of the relationship between positive and negative symptoms were put forth by Andreasen (Andreasen 1982, Andreasen &

Olsen, 1982), Crow (1980), and Gottesman (Gottesman, McGuffin & Farmer, 1987). Within Andreasen's model, positive and negative symptoms were considered to be two subtypes that fall on either end of a bipolar dimension of pathology, with the expectation that the two domains of symptoms would be inversely correlated. Crow, while also proposing two subtypes of schizophrenia based on the predominance of either positive or negative symptoms, postulated that the two symptom domains were independent processes that could simultaneously exist within an individual. Therefore, according to Crow's theory, positive and negative symptoms should be uncorrelated. Finally, Gottesman and colleagues proposed that those patients exhibiting higher levels of negative symptoms were more severely affected by the disorder generally, stating that the positive and negative symptom domains are correlates of a single unipolar dimension of pathology.

These three conceptualizations of the relationship between positive and negative symptoms were tested utilizing confirmatory factor analysis (Lenzenweger, Dworkin & Wethington, 1989). Results indicated that Crow's independent dual process model provided the best fit to the observed data. However, there is evidence to suggest that the two domains may not be completely independent, but rather slightly positively correlated. Among the other two models, Andreasen's model was found to have the worst fit to the data, a finding which has been well substantiated (e.g. Johnstone et al., 1981; Lewine, Fogg & Meltzer, 1983; Lindenmayer, Kay & Friedman, 1986; McKenna, Lund & Mortimer, 1989; Pogue-Geile & Harrow, 1984). These results provided evidence for the independence of negative and positive symptoms. However, while the two dimensional model of Crow may have fared

better than the others, it is possible that this model is an oversimplification and that a model with more factors would better fit the range of schizophrenic symptomatology (Earnst & Kring, 1997).

The symptom structure of schizophrenia has continued to be the subject of extensive study. These investigations, recently reviewed by Blanchard and Cohen (2006), have resulted in a wide variety of potential symptom factor structures ranging anywhere from three to eleven factors, with the three and five factor models exhibiting the most support. The three factor model is comprised of positive, negative and disorganized symptom factors. The disorganization factor often includes bizarre behavior and thought disturbance (Blanchard & Cohen, 2006), but symptoms such as poverty of content of speech or attentional impairment, which are typically thought of as negative symptoms, have also been included within this factor in some studies (i.e. Bilder, Mukherjee, Rieder, & Pandurangi, 1985; Liddle, 1987). The three factor model, typically resulting from studies utilizing positive and negative symptom scales, has garnered a great deal of empirical support in the literature (Arndt, Alliger & Andreasen, 1991; Bilder, Mukherjee, Rieder, & Pandurangi, 1985; Liddle, 1987; Andreasen, Arndt, Alliger, Miller & Flaum, 1995; Arndt, Andreasen, Flaum, Miller & Nopoulos, 1995; Kulhara & Chandiramani; 1990; Malla, Norman, Williamson, Cortese & Diaz, 1993; Thompson & Meltzer, 1993), including a meta-analysis of empirical studies (Grube, Bilder & Goldman, 1998). The utilization of the PANSS (Kay, Fiszbein & Opler, 1987), which represents a broader assessment of general psychopathology as well as positive and negative symptoms, most often results in a five factor solution (Emsley, Rabinowitz & Torreman, 2003, White et al.,

1997). Factors in this model include negative symptoms, positive symptoms, activation, dysphoric mood, and autistic preoccupation

As can be seen in the factor structures resulting from the utilization of various measures (i.e. SANS, PANSS), the items used in the factor analysis affects the number of factors that result, with broader symptom assessments leading to greater numbers of factors (Blanchard & Cohen, 2006). However, regardless of the symptom measures used, the characteristics of the patient population assessed, or the method of factor analysis employed across these various studies, negative symptoms emerge as a factor that is consistently distinct from other dimensions of the illness (e.g. positive symptoms, disorganization, depression and anxiety) (Blanchard & Cohen, 2006). Therefore, negative symptoms may be considered an independent, distinct factor amongst the symptoms that comprise schizophrenia, which may have unique underlying causes and correlates.

Decades of cross-sectional studies utilizing factor analysis to evaluate the structure of schizophrenia symptoms have demonstrated the independence of negative symptoms from other symptom domains (i.e. positive, disorganized). It was noted by Arndt and colleagues (1995) that symptom models would be further bolstered by evidence demonstrating the coherence of symptoms within a symptom domain as assessed over time, with each domain remaining independent of other symptom factors. Such longitudinal analyses have supported the three factor solution (Arndt, Andreasen, Flaum, Miller & Nopoulos, 1995), and indicate that negative symptoms appear to remain stable while positive symptoms exhibit variability with substantially greater improvement over time (Addington, Leriger & Addington, 2003; Arndt et al.,

1995; Johnstone, Owens, Frith & Crow, 1986). This evidence of unique patterns of symptom change over time supports the theory that positive and negative symptoms represent two separate pathological processes, which possibly arise from different neurobiological substrates (Arndt et al., 1995; Johnstone et al., 1986).

Relationship with depressive symptoms

As noted above the factor structure of the PANSS (Kay, Fiszbein & Opler, 1987), often includes a factor of dysphoric mood, or depression (Emsley, Rabinowitz & Torreman, 2003, White et al., 1997). Important to note is the independence of negative symptoms from depressive symptoms in these factor analyses, given that there is both conceptual and operational overlap between these domains (Sommers, 1985) such as psychomotor retardation and loss of interest in activities. Beyond the results of PANSS factor analyses, additional investigations have supported the independence of negative and depressive symptoms (Addington, Addington, Maticka-Tyndale, 1993; Brekke et al., 1994; Craig, Richardson, Pass & Bregman, 1985; Lewine et al., 1983; McKenna et al., 1989; Prosser et al., 1987). Further, it has been noted that associations found between the two domains likely reflect contamination of the negative symptom measure (i.e. SANS) with depression items (i.e. vegetative symptoms) leading to spurious correlations that do not necessarily reflect a relationship between the two constructs (Craig et al., 1985; Fitzgerald et al., 2002; Lindenmayer & Kay, 1989; McKenna, Lund & Mortimer, 1989; Prosser et al., 1987; Rocca et al., 2005). For example, initial analyses conducted by Muller and colleagues (2001) suggested the presence of a 27 to 49 percent overlap between negative and depressive symptoms. However, following analysis of the latent factors

of the symptom domains, it was determined that the overlap was almost exclusively between negative symptoms and the retardation (i.e. vegetative) factor of the depression measure, and that there was minimal (i.e. less than 10%) overlap between core depression symptoms and the negative symptom domain (Muller, Szegedi, Wetzel & Benkert, 2001).

Longitudinal analyses have also been conducted examining the course of negative symptoms in relation to depressive symptoms. Assessing groups of patients with diagnoses of schizophrenia, major depression, and schizoaffective disorder with prominent depression, analyses indicated that schizophrenia patients not only had higher ratings of negative symptoms, but also that these scores did not decline over time as they did for those with other diagnoses (Lewine, 1990). With regards to depression scores, those with schizophrenia exhibited significantly lower levels of depression than the other groups of patients, with significant declines in symptoms observed for all diagnoses. Results of a longitudinal study by Herbener and Harrow (2001) investigating negative and depressive symptoms in those with schizophrenia or schizoaffective disorder, other psychotic disorders, or major depression demonstrated similar results. Those in the schizophrenia/schizoaffective group exhibited significantly higher levels of negative symptoms than the depression group, and there was no evidence of a relationship between negative and depressive symptoms in any diagnostic group. Given the above cross-sectional and longitudinal evidence, depressive symptoms are currently viewed as conceptually independent from negative symptoms.

Relationship with ratings of medication side effects

Neuroleptic, or antipsychotic, medications often taken by individuals diagnosed with schizophrenia have the potential to cause a wide array of side effects such as extrapyramidal symptoms which include involuntary movements (i.e. tardive dyskinesia), tremors and rigidity (i.e. Parkinsonian-like symptoms), muscle contractions (i.e. acute dystonia), and body restlessness (i.e. akathisia) (Janicak, Davis, Preskor, Ayd, Marder & Pavuluri, 2006). Particularly relevant to the discussion of negative symptoms assessment is akinesia, which is defined by diminished facial expression and gestures, and non-spontaneous speech. As such, akinesia measures often include items that are essentially identical to blunted affect items on negative symptom measures, causing these constructs to be related. However, there is compelling evidence that negative symptoms are not just reactions to medication. For instance, negative symptoms were documented as present prior to the advent of antipsychotic medication (Bleuler, 1950; Kraepelin, 1919), have been observed in schizophrenia patients who do not take antipsychotic medication (Kring, Kerr, Smith & Neale, 1993; Kring & Neale, 1996), and have been found to be stable regardless of medication status over time (Lewine, 1990).

Relationship with cognitive impairments

Cognitive impairment is profound in schizophrenia and is evident across a range of cognitive domains including measures of motor, visual and perceptual functioning, verbal and nonverbal memory, spatial ability, executive functioning, and language (e.g. Blanchard & Neale, 1994; Heinrichs & Zakzanis, 1998; Saykin et al., 1994). Thus, a reasonable question is whether negative symptoms are secondary to

these cognitive impairments. The results of investigations evaluating the relationship between negative and cognitive symptoms, examined using both cross-sectional and longitudinal designs, have been largely mixed. As reviewed by Bell and Mishara (2006), a number of cross-sectional studies have found significant relationships between negative symptoms and various cognitive symptoms such as attention (i.e. Bozikas, et al., 2004), working memory (i.e. Cuesta & Peralta, 1995; Gooding & Tallent, 2004), and language (i.e. Harvey et al., 1998). It has been noted that although negative symptoms have been found in some studies to be correlated with cognitive impairment, these correlations are typically in the moderate range reflecting approximately 9% shared variance (Harvey, Koren, Reichenberg & Bowie, 2006; Keefe et al., 2006). In contrast to the above, results indicating no significant relationship between negative and cognitive symptoms (i.e. Bilder et al., 2000) have also been obtained in a substantial number of studies (Bell & Mishara, 2006). This lack of agreement across studies evaluating negative and cognitive symptoms may be a result from the use of varied negative symptom assessment measures which tap different symptom domains, as well as inconsistency in the cognitive variables being assessed (Bell & Mishara, 2006).

The same inconsistency is true across studies evaluating the longitudinal relationship between change in negative and cognitive symptoms over time, with results of some studies indicating that the symptom domains change together and others demonstrating independence between the domains (Bell & Mishara, 2006). Two more recent studies support the notion that these two symptom domains change independently over time. These studies suggest that while these symptoms may

exhibit significant relationships in cross-sectional research, that this relationship does not translate into either symptom domain causing change in the other over time (Bell & Mishara, 2006; Harvey, Green, Bowie & Loebel, 2006). As such, cognitive and negative symptoms could be viewed as aspects of schizophrenic illness that co-occur yet retain their independence.

In line with this view, Gold (2004) reviewed four categories of evidence supporting the independence of symptoms and cognitive impairments, including that the domains demonstrate two distinct developmental courses, respond differentially to antipsychotic medication, exhibit weak cross-sectional correlations, and that cognitive impairments unlike negative symptoms have been implicated as risk factors for the illness. Further, the domains diverge in their predictive ability with regards to functional impairments, with evidence that negative symptoms are more predictive of functional skills than neurocognitive deficits (Smith, Hull, Huppert & Silverstein, 2002; Hoffman & Kupper, 1997; Milev et al., 2005; Norman et al., 1999; Villata-Gil et al., 2006). While still debated in the literature, negative symptoms are often viewed as relatively independent of cognitive deficits.

Functional Significance

As discussed above, there is a large amount of evidence for the independence of negative symptoms from other schizophrenic symptomatology, medication side effects, and cognitive impairments. Also important to the study of negative symptoms as a construct is external validity, or the relationship of negative symptoms to real world outcomes such as social functioning and quality of life. Since the writings of Crow (1980), negative symptoms have been hypothesized to have an

association with poor outcomes. Indeed, research has indicated that a significant relationship exists, both cross-sectionally and longitudinally, between negative symptoms and impairments of social functioning (Pogue-Geile, 1989; Schuldberg, Quinlan & Glazer, 1999). Specifically, elevations in negative symptoms are consistently related to impairment in a number of functional domains including quality of life (Addington & Addington, 2000; Bozikas et al., 2006; Ho, Nopoulous, Flaum, Arndt & Andreasen, 1998; Hofer et al., 2005; Norman et al., 1999; Norman et al., 2000), social problem solving skills (Addington & Addington, 2000; Patterson, Moscana, McKibbin, Davidson & Jeste, 2001), residential independence (Dickerson, Ringel & Parente, 1999; Hofer et al., 2005; Siegel et al., 2006), and occupational functioning (Breier, Schreiber, Dyer & Pickar, 1991; Evans et al., 2004; Fenton & McGlashan, 1991; Hoffmann, Kupper, Zbinden & Hirsbrunner, 2003; Lysacker & Bell, 1995; Schuldberg, Quinlan & Glazer, 1999; McGurk & Meltzer, 2000). Additionally, research has demonstrated that negative symptoms are predictive of a particularly poor course of the disorder, including partial or no remissions during the first years of illness and a progressive course ultimately leading to permanent disability (Fenton & McGlashan, 1991).

The negative symptom domain of schizophrenia has been found to have a unique impact on family relationships. For instance, negative symptoms have been shown to have substantial negative effects on family members with regards to increased level of caregiver burden (e.g. financial, emotional, and practical burden; Magliano, Marasco, & Fiorillo, 2002; Dyck, Short, & Vitaliano, 1999; Perlick et al., 2006; Provencher & Mueser, 1997). Family conflict, which is related to poor

prognostic outcomes for patients, is also shown to be related to the severity of negative symptoms experienced by the patient. For example, Hooley (1987a) proposed that families of individuals with schizophrenia tend to be more accepting of positive symptoms, as they are easily attributable to the illness. However, it was proposed that deficits associated with negative symptoms are more often attributed to the individual's personality, and are thus more upsetting to family. This hypothesis was supported by a later study demonstrating that individuals with schizophrenia exhibiting predominantly negative symptoms had significantly lower levels of marital satisfaction than those with primarily positive symptoms (Hooley, 1987b). Further, Weisman and colleagues (1998) demonstrated that family members are significantly more likely to be critical of negative symptoms than positive symptoms, and attribute negative symptoms to stable personality characteristics that are under the control of the patient rather than as an effect of the illness. This critical family dynamic, which is a part of a concept termed expressed emotion (see Hooley, 1985a), has consistently been related with poor patient outcomes, including relapse and rehospitalization (Bebbington and Kuipers, 1994; Hooley, 1985b; Tarrier, 1996).

There is evidence that the clinical and behavioral correlates for negative and positive symptoms are not the same (Johnstone, Owens, Frith & Crow, 1986). In contrast to negative symptoms, positive symptoms typically fail to demonstrate an association with the various functioning domains (e.g., Revheim, Schechter, Dongsoo, Silipo, Allingham, Butler & Javitt, 2000; Bozikas et al., 2006; Milev, Ho, Arnt & Andreasen, 2005; Patterson, Moscana, McKibbin, Davidson & Jeste, 2001). Additionally, positive symptoms are associated with different course of illness

variables than negative symptoms, such as greater number of future hospitalizations (e.g. Fenton & McGlashan, 1991; Shuldberg, Quinlan & Glazer, 1999). Given the demonstrated relationship between negative symptoms and various domains of psychosocial functioning, it has been noted that the development of specific interventions to target these symptoms is a treatment priority (Pratt, Mueser, Smith & Lu, 2005).

NIMH Negative Symptom Consensus Conference

Recently, the National Institute of Mental Health (NIMH) convened a group of investigators as a part of the Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) project, in collaboration with negative symptoms researchers, to specifically address the challenge of effectively treating this symptom domain (Kirkpatrick, Fenton, Carpenter & Marder, 2006). This NIMH-MATRICS Consensus Development Conference on Negative Symptoms concluded the following: (1) negative symptoms constitute a distinct therapeutic indication area, (2) negative symptoms and cognitive impairments represent separate domains, and (3) negative symptoms are an unmet therapeutic need for a large proportion of those diagnosed with schizophrenia. In addition, it was determined that a significant barrier to progress in the treatment of negative symptoms is the lack of an adequate measure for assessment, noting that the limitations of existing negative symptom measures are serious and substantial. These most frequently used negative symptom measures will be discussed in turn below, followed by a review of the limitations present across these measures.

Measurement of Negative Symptoms

The following is a brief overview of the development and initial validation of three of the most widely used instruments measuring negative symptoms. This discussion is intended to provide context and background on the field of negative symptom measurement, prior to a review of various measurement limitations.

One of the most widely used general psychiatric scales, the Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962), was available prior to the 1980s but had limitations. The BPRS consists of items pertaining to affect, positive symptoms, negative symptoms, resistance and activation. While this measure does provide some method in which to assess negative symptoms, it was initially developed to measure neuroleptic effects in drug trials and not specifically for the measurement of this symptom domain (Kay, 1990). Further, the breadth of negative symptom assessment is greatly limited, given that this scale only includes three negative items (i.e. blunted affect, emotional withdrawal, motor retardation). Other negative symptoms such as alogia (poverty of speech), anhedonia (reduced ability to experience pleasure) and avolition (reduced motivation) are not assessed by the BPRS.

The first measure designed specifically to assess the negative symptom domain is the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1982). This scale rates the severity of five negative symptoms including alogia (poverty of speech), affective flattening (reduced range of emotions), avolition-apathy (reduced motivation), anhedonia-asociality (reduced ability to experience pleasure, reduced social drive), and attentional impairment. Each of the symptoms are broken down into items that assess observable behavioral components, which are rated on a

six point scale ranging from “not at all” to “severe”. The final item for each symptom domain is a global rating of severity. This global item requires the rater to consider the norms for the age and social status of the patient, and weigh the prominence and severity of the previous items that relate to the domain. Therefore, particular items within the domain can be given a great amount of weight, leading to a high rating of severity for the global rating even if the number of symptoms present within the domain is low.

Results of the initial evaluation of the SANS demonstrated high levels of interrater reliability for each item, as well as good internal consistency ($\alpha = .885$) as determined using the composite score (Andreasen, 1982). However, analyses revealed that inappropriate affect exhibited a low correlation with affective flattening, raising questions regarding its appropriateness as a measure of negative symptoms. Initial study of the relationship between the SANS and external validators indicated that patients with predominantly negative symptoms had the least education, poorer premorbid adjustment, and drastically lower rates of employment than those with predominantly positive or mixed symptoms (Andreasen & Olsen, 1982).

In an attempt to improve upon both the BPRS and the SANS, Kay and colleagues (1989) developed the Positive and Negative Syndrome Scale (PANSS; Kay, Fiszbein & Opler, 1987). The PANSS utilizes all 18 items from the BPRS, as well as 12 items from the Psychopathology Rating Scale (Singh & Kay, 1975), to assess positive and negative symptoms as well as general psychopathology. Items included in this scale were chosen based on their consistency with theoretical concepts, classification of the symptoms as primary to the illness rather than caused

by other factors (i.e. medication side effects), and an attempt to sample from diverse domains of functioning (Kay, Opler & Lindenmayer, 1989). The scale includes a detailed interview guide with strict operational criteria regarding the clinical interview, the definition of each symptom, as well as the seven levels of severity ratings for each item. Seven items of the PANSS assess negative symptoms, including blunted affect, emotional withdrawal, poor rapport, passive/apathetic social withdrawal, difficulty in abstract thinking, lack of spontaneity and flow of conversation, and stereotyped thinking (Kay et al., 1989).

Initial evaluation of the PANSS demonstrated high levels of interrater, split-half, and test-retest reliability as well as good internal consistency (Kay et al., 1989). Additionally, the negative symptoms scale of the PANSS was found to be significantly correlated ($r = .77$) with the SANS, providing evidence of construct validity. With regards to the relationship of the negative scale with external validators, negative symptoms exhibited an association with slower motor activity, affective deficits, impoverished thinking, lower levels of education, cognitive dysfunction, and a family history of psychosis (Kay et al., 1989).

Limitations of Current Negative Symptom Measures

Although several negative symptom scales are available, as reviewed above, the NIMH workgroup concluded that each is problematic. There is no consensus regarding which symptoms make up the negative symptom construct, leading to inconsistencies in definitions and item content across the available measures (Earnst & Kring, 1997; McGlashan & Fenton, 1992; Pogue-Geile, 1989). Such inconsistencies in measurement likely account for variability of results in the research

literature, and hinder the interpretation of findings across studies (Earnst & Kring, 1997). The limitations of current negative symptom measures will be reviewed next, which include the presence of items assessing symptoms not thought to be a part of the negative symptom construct, conflation of conceptually distinct domains within ratings of items, the inclusion of items assessing social success, the lack of structure and prompts provided to complete the measure, as well as the lack of revisions to current measures over the past 20 years preventing the inclusion of more recent research on negative symptoms.

With regards to item content, both the SANS and PANSS exhibit various limitations. For example, the SANS items tapping inappropriate affect, blocking, and attentional impairment have been questioned with regard to their fit within the negative symptom construct (Breier, Schreiber, Dyer & Pickar, 1991). These item issues have been noted by various investigators (Kay, 1990; Kay, Opler & Lindenmayer, 1989; Walker, Harvey & Perlman, 1988), including the developer of the SANS (Andreasen, 1982). However, the SANS has not been updated to remedy these concerns. Also, both the SANS and PANSS include cognitive functioning content that is conceptually distinct from current views of negative symptoms. As mentioned above, the SANS includes ratings of attention, and the PANSS additionally rates abstract thinking and stereotyped thinking. Factor analytic studies have suggested that these items do not fit well together with the other negative symptom ratings (Sayers, Curran & Mueser, 1996; White, Harvey, Opler & Lindenmayer, 1997). Therefore, the symptom ratings included in these scales do not reflect the core deficits of the negative symptom domain. Additionally, the inclusion

of cognitive variables may result in inflated estimates of covariation between negative symptoms and neuropsychological impairment (Harvey, Koren, Reichenberg & Bowie, 2006). An additional serious limitation of the PANSS is the low number of items used to assess the construct, with seven single items each assessing an entire subdomain of negative symptoms. This is despite the fact that single item scales typically demonstrate quite poor psychometric properties.

In addition to issues related to which and how many items are utilized in each measure, issues also arise regarding what kind of information is acquired with each item. One concern is that individual items of both the SANS and PANSS actually reflect several conceptually distinct processes or domains that are not necessarily a part of the negative symptom domain (Horan, Blanchard & Kring, 2006). For instance, in rating anhedonia-asociality on the SANS, item ratings can reflect the frequency of social contact and social activity, decreased interest, decreased pleasure, or even hostility. This is problematic when considering that the construct of anhedonia refers to the individual's experience of pleasure, which is conflated with an assessment of one's level of social activity on the SANS (e.g. "Has to be encouraged to participate in pleasurable activities and/or sometimes does not enjoy otherwise pleasurable activities."). As recommended by Horan et al. (2006) interview-based assessments of anhedonia would benefit from a more refined and specific focus on patients' subjective experience of pleasant emotions, as differentiated from social functioning and from other subjective experiences such as decreased interest, energy or will.

Similar problems are observed with the PANSS items of emotional withdrawal, poor report, and passive/apathetic social withdrawal. Each of these items is conceptually defined in terms of internal states including interest, affect, empathy, and closeness. Yet, none of these PANSS items includes probes tapping these subjective states. Instead, the PANSS relies solely on observation of behavior during the interview and reports of social behavior and functioning from care workers or family. Thus, ratings that presumably reflect deficits in the subjective experience of emotion, interest and feelings of empathy and closeness, in fact do not consider patient reports but rather depend upon observer ratings of social success and functioning.

This conflation of desire or interest with level of social success and functioning is particularly problematic when comparing negative symptom and social functioning measures, in that existing negative symptom rating scales and social functioning scales may unintentionally reflect shared item-content, raising serious concerns regarding the interpretation of results showing a relationship between these two constructs (Addington & Addington, 2000; Bozikas et al., 2006; Milev, Ho, Arndt & Andreasen, 2005; Norman et al., 1999; Schulberg, Quinlan & Glazer, 1999). For example, the Social Functioning Scale (SFS; Birchwood et al., 1990) contains items assessing occupational level (e.g. “Are you currently working?”, “How many hours do you work each week?”) in a manner similar to the SANS (e.g. “What is the patient’s current social/vocational level?”). Relatedly, with regard to measurement of negative symptoms for therapeutic trials, the assessment of desire versus social success may be of increased importance, as desire may be more apt to

respond to treatment within a study period. This is due to the fact that social success and functioning often depends upon many more factors than treatment alone, including financial situation, housing status, and level of social or family support, which may result in slower progress in this domain.

In addition to these issues, criticisms were also made regarding the lack of structure or formalization of the negative symptom interviews themselves, particularly the SANS, which has the potential to affect both validity and reliability (Kay, 1990; Kay, Opler & Lindenmayer, 1989). Concerns have also been raised regarding the minimal detail provided in the definitions of the six levels of severity of the SANS, potentially leading to variability in ratings (Kay, 1990; Kay, Opler & Lindenmayer, 1989). For example, anchors for rating the Affective Non-Responsivity item of the SANS include “Not at all”, “Questionable lack of responsivity”, “Slight but definite lack in responsivity”, “Moderate decrease in responsivity”, “Marked decrease in responsivity”, and “Patient essentially unresponsive, even on prompting”. There is no direction regarding how the rater should make distinctions between “slight”, “moderate” or “marked” decreases, leading to subjective decisions by raters.

Given that the most popular of the negative symptom measures (i.e. SANS, PANSS) are over 20 years old, and have received only minimal refinements in that time, they do not reflect advancements in the understanding of negative symptoms. For example, there is recent evidence to suggest that anhedonia may be better conceptualized as being comprised of two components, consummatory and anticipatory (Gard et al., 2006; Horan, Kring & Blanchard, 2006), which has

implications for the appropriate measurement of this domain. Consummatory pleasure refers to pleasure that is experienced in the moment, when directly engaged in an enjoyable activity with pleasurable stimulus present (Gard, Germans-Gard, Kring & John, 2006; Gard, Kring, Germans-Gard, Horan & Green, 2007).

Anticipatory pleasure, by contrast, refers to the prediction of the future experience of pleasure from some anticipated upcoming activity or stimulus (Gard, Germans-Gard, Kring & John, 2006; Gard, Kring, Germans-Gard, Horan & Green, 2007).

Kring (1999) hypothesized that patients with schizophrenia may have a deficit in the experience of anticipatory but not consummatory pleasure. Initial support for this hypothesis was obtained from experience sampling studies (Gard, Kring, Germans-Gard, Horan & Green, 2007), which led to the development of a self-report measure designed to distinguish between the anticipatory and consummatory components of pleasure (Gard, Germans-Gard, Kring & John, 2006). Using the Temporal Experience of Pleasure Scale (TEPS; Gard et al., 2006), Gard and colleagues (2007) replicated the previous experience sampling results demonstrating no difference between individuals with schizophrenia and controls on the TEPS consummatory scale and a significant difference on the TEPS anticipatory scale- with those with schizophrenia reporting lower levels of anticipated pleasure. Currently, no measure of negative symptoms distinguishes these two components of anhedonia. This distinction between anticipatory and consumatory pleasure within the measurement of the domain of anhedonia not only furthers our knowledge of deficit areas, it also, importantly, may lead to more targeted treatments of anhedonia (Gard et al., 2007).

Additionally, prompts for each item on current measures do not allow for any determination of the cause of the negative symptoms. Therefore, negative symptoms that may be considered secondary to other factors are rated in a similar manner to primary negative symptoms. Within the primary-secondary distinction, secondary negative symptoms are caused by other factors (i.e. depression, medication) and will remit when the other factors are no longer present, whereas primary negative symptoms are not related to episodic factors and are considered long-term core features of schizophrenic illness (see Carpenter, Heinrichs & Wagman, 1988). For instance, an individual experiencing positive symptoms of a paranoid or delusional nature may react by refusing to talk or socialize with others, thus resulting in apparent symptoms of alogia or asociality. Similarly, an individual with comorbid depression may exhibit anhedonia that is not stable over time, but rather comes and goes with each depressive episode. These distinctions may be particularly critical when assessing the efficacy of treatments targeting core negative symptoms, versus those of a secondary nature.

The construct of negative symptoms has been further divided into primary enduring negative symptoms and deficit symptoms, as first described by Carpenter and colleagues in 1988. Both of these groups of negative symptoms are considered intrinsic to the disorder of schizophrenia (Buchanan, 2007), in contrast to the secondary negative symptoms described above (i.e. caused by depression, medication side effects). Enduring or persistent negative symptoms have been defined as those symptoms that are primary to the illness, may be of a secondary nature but do not respond to treatment, lead to functional impairment, and persist between psychotic

episodes (Buchanan, 2007). Deficit symptoms are even more narrowly defined, and have been proposed to represent a separate disease process within the diagnosis of schizophrenia (Buchanan, 2007; Carpenter, Buchanan, Kirkpatrick, Tamminga & Wood, 1993). As such, the criteria for the deficit syndrome include a current diagnosis of schizophrenia, along with at least 2 of 6 negative symptoms that are considered clinically severe (i.e. restricted affect, diminished emotional range, poverty of speech, curbing of interest, diminished sense of purpose, diminished social drive) and have been present for the previous year regardless of level of clinical stability (Buchanan, 2007; Carpenter, Heinrichs & Wagman, 1988). Additionally, two or more of these enduring negative symptoms need to be deemed primary, rather than secondary to other factors (i.e. anxiety, medication side effects, psychotic symptoms, depression). One measure, the Schedule for the Deficit Syndrome (SDS; Kirkpatrick, Buchanan, McKenney, Alphas & Carpenter, 1989) was developed to specifically assess for deficit negative symptoms. However, other current and widely used measures of negative symptoms (i.e. SANS, PANSS, BPRS) make no distinction between deficit, primary, and secondary negative symptoms. It is noted that this lack of distinction between types of negative symptoms in assessment, resulting in measurement of negative symptoms that may be secondary to other factors (i.e. depression), increases observed correlations with other symptoms and hinders development of treatments for core negative symptoms.

In summary, there are clearly a number of significant limitations associated with the current instruments used to assess negative symptoms. These include inconsistency in definitions of the negative symptom domain across instruments,

issues with included items (e.g. inappropriate content, content that overlaps with functioning measures), conflation of actions or behavior with interest or desire, the lack of detail provided in anchors for ratings schemes, the lack of refinements to reflect updated research on negative symptoms, and absence of opportunity to take into account the source of the negative symptoms within the rating systems (i.e. primary versus secondary).

The Negative Symptom Rating Scale

In response to the need for improved measurement that addresses concerns with previous scales, a NIMH-MATRICES workgroup developed the *Negative Symptoms Rating Scale* (NSRS; see Appendix A). This workgroup grew out of a Consensus Development Conference on Negative Symptoms, which convened in January 2005, discussed earlier. Following the consensus conference, this workgroup consisting of psychologists, psychiatrists, industry scientists, and neuroscientists took part in bi-weekly conference calls to begin the development of a next generation negative symptom measure. Development of items for each of the five negative symptom domains (i.e. anhedonia, asociality, avolition, affective flattening, alogia) were split between two groups within the workgroup, with each group reviewing both clinical and basic science literature to inform item development. Following the development of initial items, the two groups reconvened to further refine the measure and develop interview probes, and then met to further discuss conceptual and measurement issues in November 2005. After the revisions made at this meeting, the measure was presented at the February 2006 satellite meeting of the International Society for CNS Clinical Trials and Methodology (ISCTM), and subsequently posted

on the NIMH-MATRICES website to allow for comments and recommendations from researchers outside of the workgroup. The version used in the present study was completed during the Fall of 2006, following the integration of outside input. As the measure was still considered to be under development at the time, the authors of the NSRS opted to be over inclusive with item content, allowing for empirically driven revisions of items or scales based on results of future studies.

The NSRS was designed to assess domains of negative symptoms identified and agreed upon by the consensus group, namely blunted affect (decreases in outward expression of emotion), alogia (decrease in amount of speech), asociality (decreased interest and participation in social relationships), anhedonia (decrease in experiencing pleasure), and avolition (decrease in goal-directed activity) (Kirkpatrick et al., 2006). While the domains covered by the NSRS closely approximate those assessed by the SANS, the item content of the NSRS differs in focus by specifically tapping experiential deficits in addition to performance or achievement deficits. For example, within the anhedonia domain the NSRS items assess deficits in hedonic capacity rather than social performance, as is assessed by other negative symptom measures (e.g., SANS). Additionally, the NSRS assessment of asociality attempts to reduce the conflation of successful social engagement with the experience of interest in social activity that is present in previous measures. With that, the NSRS requires that both diminished interest and social isolation co-occur to obtain high ratings within this domain. The measure, which includes 25 items covering five domains of negative symptoms, is described below.

Table 1.

Subscales of the Negative Symptom Rating Scale

I.	Anhedonia a. Expected or Anticipated Pleasure (social, physical, recreational/vocational) b. Experienced or Consummatory Pleasure (social, physical, recreational/vocational)
II.	Asociality a. Family b. Romantic Relationships c. Friends
III.	Avolition a. Social Interactions b. Work/Vocational/School Activities c. Recreation/Hobbies/Pastimes d. Self-Care
IV.	Blunted Affect a. Facial Expression b. Vocal Expression c. Expressive Gestures d. Eye Contact e. Spontaneous Movements
V.	Alogia a. Quantity of Speech b. Spontaneous Elaboration

The anhedonia subscale measures both expected or anticipated pleasure from future activity (i.e. anticipatory pleasure), as well as pleasure during an activity (i.e. consummatory pleasure), following the recommendation of Gard and colleagues (2007). Ratings of intensity are made for anticipatory pleasure and ratings of intensity and frequency are made for consummatory pleasure. The domains covered in these ratings are broadened beyond those addressed in previous measures, and include social activities, physical sensations, and recreational/ vocational activities. Additionally, the NSRS allows for a differentiation between the experiential and performance deficits associated with anhedonia, as described above.

The asociality subscale assesses internal experiences regarding the degree to which close social bonds are valued and desired, as well as the observable behavior of

actually engaging in social interactions. Again, the number of domains assessed was broadened to include family relationships, romantic relationships and friendships. Reports on both internal and observable aspects of asociality allow the interviewer to determine whether decreased social activity results from true asociality, or from other sources (e.g., decreased social skills, social anxiety, paranoid beliefs). Ratings for the asociality subscale do not reflect pleasure derived from social activities (which is rated under anhedonia) or the extent to which the subject initiates or is motivated to seek out social activity (which is rated under avolition).

The avolition subscale assesses four areas, including social activity, work/vocational/school, recreation, and self-care. Again, both overt behavior and internal experience are considered in making the ratings to determine the presence or absence of other sources leading to the failure to initiate or persist in activity (e.g., decreased opportunity, paranoid beliefs) that are not a result of negative symptoms. The assessment of both behavior and motivation is critical, as a failure to initiate and persist in activity may be due to several sources other than avolition, including decreased opportunity or paranoid beliefs. A patient may have a decrease in goal-directed behavior but still receive a relatively low rating on avolition if the individual has a desire to engage in such behavior. Conversely, patients who report participating in many activities because they are required to (e.g. requirements of a day treatment program) but are not motivated to do so or do not initiate the activities themselves may receive a higher score on this scale than those who are less active but initiate activities on their own.

The blunted affect subscale score is obtained via interview prompts that are designed to elicit emotion (tapping both positive and negative emotional experiences), rather than based exclusively on observations of expressivity within the clinical interview as is the done with prior measures. Such probing is expected to yield more valid and reliable ratings of individual differences in blunted expression. The domains assessed within this subscale of the NSRS include facial expression, vocal expression, expressive gestures, eye contact, and spontaneous movements.

Ratings for the alogia subscale are based on the responses given throughout the interview, with assessments of quantity of speech and amount of spontaneous elaboration. Quantity ratings are restricted to the amount of words produced in responding to the NSRS interview. Other speech abnormalities, such as disorganization, neologisms, or psychotic content are not rated here. Spontaneous elaboration rates the amount of information given beyond what is strictly necessary in order to respond to the interviewer's questions. Whether or not the responses are appropriate is not considered.

Overall, the NSRS attempts to improve upon existing measures of negative symptoms by addressing many of the limitations noted in the literature. This includes removing item content found not to be a good fit within the negative symptom construct (i.e. attentional impairment), attempting to ensure that items tap into distinct processes that reflect core negative symptoms rather than conflate experiential deficits with social success or functioning, as well as to incorporate recent research findings into the overall conceptualization of negative symptoms (i.e. consummatory and anticipatory anhedonia). With regards to the overall organization of the NSRS,

the instrument is formatted as a semistructured interview with numerous prompts and queries provided for each item, addressing concerns regarding the lack of structure in earlier negative symptom measures. Additionally, effort was made to provide clear anchors for making ratings, often including exemplars of answers that would fall under a particular score (e.g. Mild Pleasure - "nice", "fine", "somewhat pleasurable"). Of note, one area of limitation observed in current negative symptoms measures that was not directly addressed in the development of the NSRS was the distinction between deficit, primary, and secondary negative symptoms. There is no measurement of the enduring nature of the negative symptoms or formal assessment of the primary cause of the observed negative symptoms within the NSRS.

Psychometric Evaluation

Another important difference between the NSRS and other scales of negative symptoms (i.e. SANS) is the intent to evaluate and refine the measure based on multiple studies assessing psychometric characteristics. With that, the NSRS has the potential to be the first measure of negative symptoms to be subjected to systematic empirical evaluation prior to dissemination and use in the field. These analyses will include an assessment of various domains of reliability and validity of the measure. As such, the process of measure construction and psychometric evaluation will be discussed briefly.

With regards to measure construction, the development of items to be included in the measure is often based upon a thorough review of relevant research literature (Clark & Watson, 1995), and can additionally be based upon the clinical, educational and research experiences of experts in the particular domain being

assessed (Cicchetti, 1994; Fishman & Galguera, 2003). This manner of selecting items helps to ensure content validity, which refers to how well the items of the measure cover the content area related to the concept being measured (Cicchetti, 1994; Clark & Watson, 1995; Cronbach & Meehl, 1955; Nunally & Bernstein, 1994). It is noted that content validity is often improved when careful planning is put into the development of the measure (Cronbach, 1990). The process of measure development used by the Negative Symptom Workgroup generally followed this model of item development and selection.

An initial assessment of the chosen items should evaluate the item distributions, according to Clark and Watson (1995). Following these analyses, they recommend that those items demonstrating highly skewed unbalanced distributions be eliminated. This recommendation is made because such items provide little information about the respondents, are likely to exhibit weak correlations with other items due to lack of range, and generally lead to instability of correlational results (Clark & Watson, 1995). However, the need to evaluate the items of a measure in diverse population that samples from the full range of the target population prior to the final elimination of items is also recommended, as items may demonstrate different distributions in different populations (Clark & Watson). Following this phase of item evaluation, these authors suggest assessing the internal structure of the measure, which is often evaluated through analysis of internal consistency which is discussed below.

Once a measure such as the NSRS is developed the various aspects of reliability and validity can be examined, which will be described briefly here. One

aspect of reliability typically assessed in the evaluation of a measure is internal consistency, which determines the extent to which the items in a particular scale or subscale hang together and measure the same concept (Cicchetti, 1994; Clark & Watson, 1995; Nunally & Bernstein, 1994). Analyses of internal consistency entail the correlation of items with the scale or subscale to determine the level of relationship, with a low level of internal consistency indicating that either the measure includes too few items or the items have little in common (Nunally & Bernstein, 1994). Such a result would then lead to refinement of the measure to improve this index of reliability. A second aspect of reliability to be assessed in the development of a measure is interrater reliability (Cicchetti, 1994), which measures the level of agreement between two independent raters. As discussed in Cicchetti (1994), the computation of Pearson product-moment correlations in the evaluation of interrater agreement is not sufficient, as this statistic only takes into account the level of agreement in the order of ratings made by the raters. Therefore, it is recommended that statistics such as the intraclass correlation coefficient (ICC) be used in assessment of interrater agreement, as this analysis takes into account the level of actual agreement between raters and additionally corrects for the level of agreement expected by chance (Cicchetti, 1994). The same applies for test-retest reliability, an aspect of reliability that assesses agreement between ratings made at different time periods. The level of reliability demonstrated by a measure can be improved through attention to a number of factors during the measure development and refinement phases. These include ensuring the items are written in a clear manner, providing instructions that are easily understood, creating scoring rules that are as explicit as

possible, and providing adequate training to all raters (Cicchetti, 1994; Nunally & Bernstein, 1994). Each of these suggestions could serve to increase the consistency of ratings across raters and over time.

Further, the assessment of validity is essential to the evaluation of a measure. In addition to content validity discussed above, the concepts of concurrent / convergent and divergent / discriminant validity play an important role in the development of a measure. It is noted that neither of these concepts are to be viewed as all or none (i.e. a measure is valid or invalid), but are rather are a matter of degree (Nunally & Bernstein, 1994) and based upon the combination of multiple pieces of evidence (Cronbach, 1990). First, convergent validity is often assessed through evaluation of the relationship between a new measure and an existing well-known instrument thought to measure the same construct (Cicchetti, 1994; Fishman & Galguera, 2003). There is no optimal standard to reach with regard to magnitude of correlation in the evaluation of convergent validity. However, a very high correlation approximating 1.00 would raise questions about the utility of a new measure, as it does not provide any new information over the existing measure (Cicchetti, 1994; Fishman & Galguera, 2003). Conversely, correlations that are very low would indicate that the new measure is likely assessing a different construct (Cicchetti, 1994). Second, discriminant validity by contrast assesses the independence of the new measure from other constructs thought to be theoretically distinct from the construct of interest (Nunally & Bernstein, 1994). Therefore, analyses of correlations between these different constructs should be low. The study described below evaluating the

NSRS seeks to assess the item distributions, internal consistency, interrater reliability, convergent and discriminant validity of the measure.

CHAPTER 2: RATIONALE

Negative symptoms in schizophrenia are a major determinant of the social and occupational impairments that characterize the disorder, as well as a significant source of distress for caregivers, and predictors of poor long-term outcome. Despite the compelling evidence for the clinical relevance of negative symptoms, this domain of the illness remains inadequately addressed by current pharmacotherapy and psychotherapy. As reviewed above, there is consensus among academic researchers, industry researchers, and the FDA that improved measurement is essential for the field to progress in the development of effective treatments for negative symptoms in schizophrenia (Kirkpatrick et al., 2006), which led to the collaborative effort of creating the NSRS.

The NSRS represents the first substantial step forward in the assessment of this critical symptom domain in more than twenty years, providing researchers and clinicians alike with an instrument that both addresses the concerns associated with previous measures and integrates advances in the empirical literature. The availability of such an updated, sensitive, and reliable measure is crucial for both determining patient treatment needs within a clinical setting, and allowing for the measurement of therapeutic change in pharmacological and psychosocial interventions targeting negative symptoms.

Although the NSRS is the result of an ongoing collaborative NIMH-led effort over the last four years, the measure clearly requires empirical scrutiny before it can be adopted for clinical trials and research. Despite what are seen as important advancements to the assessment of negative symptoms, it is necessary to ensure that

the NSRS avoids limitations of other instruments. This can only be achieved by demonstrating its reliability and validity within a clinical sample. The proposed study will provide a rigorous assessment of the psychometric properties of the NSRS including inter-rater agreement and internal consistency of the NSRS scales, as well as allow for a determination of the NSRS's convergent and discriminant validity.

The research project proposed here will provide an initial evaluation which will directly inform subsequent large scale validation studies.

CHAPTER 3: METHODS

The current study is the first assessment of the newly developed NSRS within a clinical sample of individuals with schizophrenia. As such, initial evaluation of various psychometric properties including the reliability and validity of this measure provide the basis for the proposed hypotheses. The results of this evaluation represent a crucial step in the data-driven refinement process of the NSRS, which will ultimately result in its dissemination to be utilized in both clinical settings and therapeutic trials.

Aims and hypotheses are as follows:

1. To assess reliability, the internal consistency of the five subscales of the NSRS were evaluated using Cronbach's alpha. It was expected that the NSRS would reach the 0.8 benchmark for adequate reliability (Nunally, 1978). Within these analyses, item-total correlations were also computed to examine the fit of each item within the subscales.
2. To assess reliability, inter-rater agreement was assessed using Intraclass Correlation Coefficients (ICC; Shrout and Fleiss, 1979) based on the ratings of two independent raters. The ICCs were evaluated using the standards suggested by Cichetti & Sparrow (1981) which consider ICCs above .75 to be excellent, between .60 and .74 to be good, between .40 and .59 to be fair, and below .40 to be poor. It was expected that the ICCs of the NSRS would reach the good to excellent range.
3. Convergent validity was assessed through comparison of NSRS scores with those of other clinical interview measures tapping negative symptoms,

specifically the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1982) and the Anergia subscale of the Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962). It was hypothesized that the NSRS and these other negative symptoms scales would be significantly positively correlated, as they purport to measure the same construct.

4. Convergent validity was additionally examined using self-report measures. It was hypothesized that the NSRS clinician ratings of reduced pleasure (anhedonia) would significantly correlate with the experience of pleasure as measured by the self-report Temporal Experience of Pleasure Scale (TEPS; Gard et al., 2006).
5. To further assess convergent validity, the relationship of the NSRS to social functioning measures was evaluated, as previous research has demonstrated robust and replicable findings for the relationship between negative symptoms and functioning deficits (Addington & Addington, 2000; Patterson, Moscana, McKibbin, Davidson & Jeste, 2001; Pogue-Geile, 1989; Schuldberg, Quinlan & Glazer, 1999). It was hypothesized that more severe NSRS ratings would be significantly correlated with poorer functioning as measured by both a self-report (i.e. Social Functioning Scale (SFS); Birchwood et al., 1990) and social problem solving (i.e. Maryland Assessment of Social Competence (MASC); Bellack, Sayers, Mueser & Bennett, 1994) measures.
6. As an examination of the discriminant validity of the measure, the independence of subscales of the NSRS from other symptom domains such as psychosis and depression were assessed. It was hypothesized that the NSRS

scores would be unrelated to psychosis and depression, as rated by the BPRS (Overall & Gorham, 1962) and Calgary Depression Scale for Schizophrenia (CDSS; Addington et al., 1992).

Design and Methodology

The present study assessed outpatients with a diagnosis of schizophrenia or schizoaffective disorder to obtain an initial evaluation of the reliability and validity of the newly developed NSRS measure. To accomplish this, the assessment battery included measures tapping negative symptoms, positive symptoms and general symptomatology, depressive symptoms, experiences of pleasure, and social functioning.

Outpatients diagnosed with schizophrenia or schizoaffective disorders were recruited for study participation from the Mental Health Service Lines at the Baltimore Veterans Administration Medical Center (VAMC), the Perry Point VAMC, the Walter P. Carter Center (WPCC), Harbor City Unlimited (HCU), the 701 W. Pratt Street Clinic (701), and the Maryland Psychiatric Research Center (MPRC). Inclusion criteria were: (1) diagnosis of schizophrenia or schizoaffective disorder as determined by medical record review; and confirmed through a diagnostic interview, and (2) age between 18 and 65 years. Exclusion criteria were: (1) documented history of severe neurological disorder or severe head trauma with loss of consciousness, (2) mental retardation as indicated by chart review, and (3) inability to effectively participate due to intoxication or psychiatric symptoms as determined by the Study Interviewer. Consent forms were approved by the University of Maryland at College Park, the University of Maryland at Baltimore, and the Baltimore VAMC.

With regards to recruitment and consent, potential participants were identified by two methods – either via referral from clinicians or via medical record review. To obtain clinician referrals, mental health providers at each location were informed of the study inclusion and exclusion criteria and were asked to identify patients with schizophrenia or schizoaffective disorder who might be interested in participating in an interview about their experiences with mental illness. The clinician then referred the name of the patient to the recruiter or study interviewer who scheduled a time to meet with the client to explain the study and obtain consent. With potential participants identified via medical record review, charts of clients at the BVA, PPVA, HCU, 701, and WPCC were screened by recruiters to identify those with potential to meet inclusion and exclusion criteria for the study. This screening method was approved by the IRB. The mental health clinician of the potentially eligible participant was then contacted to confirm that the patient likely meets study inclusion criteria and was appropriate for participation. For all referrals, regardless of recruitment method, clinician approval to approach a patient about the study was sought before any approach was made. If it proved difficult to contact the potential participant via phone a recruitment letter was sent informing the client of the study, and included a number to call if they were interested in participating.

Following the informed consent procedures the participant was scheduled for an assessment. To ensure that the chart diagnosis of schizophrenia or schizoaffective disorder was current, the participants' diagnosis was confirmed using the Structured Clinical Interview for DSM-IV (SCID-I; First et al., 1995). Those participants who had completed a SCID within the past calendar year as a part of another research

study were not re-assessed using this measure, rather the result of the previous SCID assessment was used for the present study. All SCID assessments were conducted by one of four trained doctoral level psychologists, and diagnoses were achieved utilizing all available information for the patient (patient-report, medical records, treatment providers). Training protocols for each interview measure, including the SCID, are reviewed in detail below.

If it was determined that the client was ineligible for the study due to not meeting inclusion or exclusion criteria following the SCID assessment, the participant was paid \$10 and did not complete the remainder of the assessment. Once diagnostic eligibility was confirmed using the SCID, participants completed the remainder of the assessment battery including demographic information and self-reported symptoms of depression, measures assessing negative symptoms, general psychopathology, and social functioning.

For each participant, assessment measures were split between two interviewers so that independent raters completed the two negative symptom measures (see Table 1). This was done to ensure that ratings made for one measure (i.e. NSRS) were not contaminated with knowledge obtained from the other measure (i.e. SANS). Therefore, Interviewer-1 completed the SCID, BPRS, SANS and SFS with the participant. Interviewer-1 was always one of four doctoral level interviewers who assisted with the project who had achieved adequate reliability on each of the measures included in their portion of the assessment (i.e. SCID, BPRS, SANS, SFS). Interviewer-2, who was one of two masters level interviewers, completed the NSRS, TEPS, CDSS and the MASC. Again, these interviewers achieved adequate reliability

for each of the measures included in their portion of assessment. Additionally, while Interviewer-1 and Interviewer-2 could complete their assessments on different days, the two sets of study assessments were never scheduled or completed more than one week apart.

With regard to the order of the assessment, with few exceptions related to scheduling difficulties, the portion of the interview completed by Interviewer-1 was completed at some point prior to the assessments of Interviewer-2. Further, there was an order of assessments within each interviewers assessment battery. For Interviewer-1, the SCID was always completed first, followed by the BPRS, the SANS, and then the SFS. For Interviewer-2, the MASC was completed first, followed by the NSRS, TEPS, and CDSS. It is important to note that this chosen order of assessment within the battery, as well as the splitting of assessments between interviewers, could have affected ratings. For instance, Interviewer-1 has knowledge of the participants positive symptoms from completing the BPRS prior to making ratings on the SANS – information that Interviewer-2 does not have access to in making ratings on the NSRS. While this separation is in one way important methodologically to assess how the NSRS compares to independent ratings of both positive and negative symptoms, it also leads to interviewers having access to differing information when making ratings.

All assessment interviews were videotaped for the purposes of supervision, and a subset were later evaluated by an independent second rater to determine reliability. This assessment took approximately 4 hours, and participants were paid

\$35 for their participation in the study. Of note, the NSRS measure took approximately 60 to 90 minutes to complete.

Table 2

Study Assessments Conducted by Interviewers

Interviewer 1	Interviewer 2
SCID	NSRS
BPRS	TEPS
SANS	CDSS
SFS	MASC

Note. SCID = Structured Clinical Interview for DSM-IV, BPRS = Brief Psychiatric Rating Scale, SANS = Scale for the Assessment of Negative Symptoms, SFS = Social Functioning Scale, NSRS = Negative Symptom Rating Scale, TEPS = Temporal Experience of Pleasure Scale, CDSS = Calgary Depression Scale for Schizophrenia, MASC = Maryland Assessment of Social Competence

Measures

Symptom Measures

Various symptom assessments were utilized in the current study to determine their relationship with the NSRS. Negative symptoms were evaluated utilizing three different measures, including the NSRS, the SANS, and the Anergia subscale of the BPRS. The BPRS additionally provided information regarding general level of current psychopathology. Depression, which is a construct independent of negative symptoms, was assessed with the Calgary Depression Scale for Schizophrenia (CDSS; Addington et al., 1992). Additionally, the self-report Temporal Experience of Pleasure Scale (TEPS; Gard et al., 2006) was administered as a measure of anticipatory and consummatory experiences of pleasure.

Negative Symptom Rating Scale (NSRS; NIMH-MATRICS Negative Symptom Workgroup, 2007): The NSRS is a 25-item interview measure designed to assess the severity of negative symptoms in schizophrenia and schizoaffective disorder over the

previous week. Each item is rated on a seven point scale, ranging from “absent” to “severe”. These items combine to create five subscales, including Anhedonia, Avolition, Asociality, Blunted Affect and Alogia. No psychometric data is available for this scale. (See Appendix A for measure).

Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1982):

The SANS is a 19-item interview measure, excluding global items, designed to assess the severity of negative symptoms in schizophrenia. Items are rated on a six point scale, ranging from “not at all” to “severe”. The scale items combine to form five rationally derived subscales, including Affective Flattening or Blunting, Alogia, Avolition-Apathy, Anhedonia-Asociality, and Inattention. The SANS is a widely used scale with established reliability and validity (e.g. Mueser, Sayers, Schooler, Mance & Hass, 1994; Peralta, Cuesta & DeLeon, 1995). (See Appendix B for measure)

The SANS was included in this study rather than other measures (i.e. PANSS) as the additional negative symptoms measure for a few reasons. Most notably, the NIMH-MATRICES Consensus Statement on Negative Symptoms indicated that the SANS is preferable to the PANSS as it provides a more comprehensive assessment of negative symptoms (Kirkpatrick, Fenton, Carpenter & Marder, 2006). Additionally, the SANS is considered the oldest scale for the specific measurement of negative symptoms (Moller et al., 1994), as well as one of the most widely used measures of negative symptoms (Sayers, Curran & Mueser, 1996).

Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962): The BPRS is a 20-item interview measure designed to assess current clinical symptomatology as

experienced over the previous week. Items are rated on a seven point scale, ranging from “not reported” to “very severe”. The four subscales of the BPRS were constructed based on the factor structure supported by Mueser and colleagues (1997). These factors include Thought Disturbance (e.g. grandiosity, suspiciousness, hallucinatory behavior, unusual thought content), Anergia (e.g. emotional withdrawal, motor retardation, uncooperativeness, blunted affect), Affect (e.g. somatic concern, anxiety, guilt feelings, depressive mood, hostility), and Disorganization (e.g. conceptual disorganization, tension, mannerisms and posturing). Psychometric properties of the BPRS are well-established (e.g. Anderson, Larsen & Schultz, 1989; Morlan & Tan, 1998; Overall & Gorham, 1962). (See Appendix C for measure)

Calgary Depression Scale for Schizophrenia (CDSS; Addington et al., 1992):

The CDSS is a 9-item semi-structured interview measure specifically designed to assess depressive symptoms in people diagnosed schizophrenia. This measure assesses symptoms experienced over the previous two weeks, including depression, hopelessness, self depreciation, guilty ideas of reference (excluding delusions of guilt), pathological guilt, morning depression, early wakening, suicide, and interviewer observed depression. Items are measured on a four point scale, ranging from “absent” to “severe”. Multiple studies have demonstrated the ability of this measure to assess depressive symptoms separate from positive, negative and extrapyramidal symptoms in people with schizophrenia, setting it apart from other depression measures used in the evaluation of this population (Addington, Addington & Atkinson, 1996; Collins, Remington, Coulter & Birkett, 1996). The CDSS has demonstrated high internal consistency and good interrater reliability (Addington,

Addington & Schissel, 1990; Addington, Addington, Maticka-Tyndale & Joyce, 1992). (see Appendix D for measure)

Temporal Experience of Pleasure Scale (TEPS; Gard et al., 2006): The TEPS is an 18-item measure assessing trait dispositions in anticipatory and consummatory experiences of pleasure. Items are rated on a six point scale, ranging from “very false for me” to “very true for me”. The Anticipatory pleasure (e.g. “I get so excited the night before a major holiday I can hardly sleep.”, “I look forward to a lot of things in my life.”) subscale includes 10 items, and 8 items combine to produce the Consummatory pleasure (e.g. “I enjoy taking a deep breath of fresh air when I walk outside.”, “A hot cup of coffee or tea in the morning is very satisfying to me.”) subscale. This measure has demonstrated good internal consistency, temporal stability, and convergent and discriminant validity (Gard et al., 2006). (See Appendix E for measure)

Functioning Measures

In the measurement of social functioning, a multi-method approach assessing multiple levels of analysis has been advocated (Yager & Ehmann, 2006). More specifically, Penn and colleagues (1995) suggest distinguishing between microsocial and macrosocial domains of social functioning, with measures focusing on social problem solving falling within the microsocial domain and more general community functioning assessments in the macrosocial domain. Within the current study both domains were assessed. Social problem solving was evaluated using the Maryland Assessment of Social Competence (MASC; Bellack, Sayers, Mueser & Bennett, 1994), which is an observational role-play task. Community functioning was

assessed by self-report using the Social Functioning Scale (SFS; Birchwood et al., 1990).

Maryland Assessment of Social Competence (MASC; Bellack, Sayers, Mueser & Bennett, 1994): The MASC was originally developed as a part of the Social Problem Solving Battery (Sayers et al., 1995), and was designed for use with chronic psychiatric populations. The MASC involves role-plays completed by participants with a confederate, and assesses the participant's ability to manage interpersonal problems through conversation. Participants completed 3 role plays, each lasting approximately 3 minutes, covering topics including resolving a conflict with a family member, meeting a new neighbor, and confronting a boss at work. Previous research has determined that the completion of three role-plays results in sufficient reliability (Bellack, Brown & Thomas-Lohrman, 2006). All role plays were videotaped, and later behaviorally coded by an independent rater on a 5-point likert scale in three domains, (1) Conversational Content, (2) Non-verbal Content, and (3) Effectiveness. The MASC has been found to have adequate reliability and validity (Bellack et al., 2007; Bellack, Brown & Thomas, Lohrman, 2006; Mueser et al., 1991; Sayers et al., 1995). (See Appendix F for measure and coding manual)

Social Functioning Scale (SFS; Birchwood et al., 1990): The SFS is an 81-item self-report questionnaire designed to assess social behavior and community functioning in those with schizophrenia. This scale inquires about social functioning in seven areas, including social engagement/withdrawal (e.g. "How often do you start a conversation at home?"), interpersonal behavior (e.g. "How many friends do you have at the present time?"), pro-social behavior (e.g. "How often have you gone to

the movies in the last three months?”), recreation (e.g. “How often have you done an artistic activity in the last three months?”), independence-competence (e.g. “How able are you to use public transportation?”), independence-performance (e.g. “How often have you washed your own clothes in the past three months?”), employment/occupation (e.g. “Are you currently working?”). The SFS has been included in the NIMH-MATRICES consensus battery for the measurement of community functioning, as it has been found to have high internal reliability and ability to discriminate between groups (Birchwood et al., 1990). In this study, the measure will be administered as a verbal interview. (See Appendix G for measure)

Validity of Self Report

Each of the above measures, excluding the MASC, requires some level of self report by the participant regarding emotion, interest, symptoms, or functioning. The question of whether individuals with schizophrenia, who can experience symptoms that involve alteration in reality perception, can validly provide self-reports has been raised (i.e. Atkinson, Zibin & Chaung, 1997). There is evidence from a number of lines of research that suggest individuals with schizophrenia are capable of providing self-reports. For example, Bell and colleagues (2007) concluded that those diagnosed with schizophrenia provided valid self-reports of personality and mood, regardless of their level of insight into their illness (Bell, Fiszdon, Richardson, Lysaker & Bryson, 2007). Additionally, studies measuring quality of life (Khatri, Romney & Pelletier, 2001) and social functioning (Dickerson, Ringel & Parente, 1997) have also found the self-report of individuals with schizophrenia to be valid through comparison with ratings made by caregivers or family members. Similar results were demonstrated in

laboratory studies conducted by Kring and colleagues (Kring, Kerr & Earnst, 1999; Kring & Neale, 1996). The results of these studies indicated that self-reported emotional states were consistent with psychophysiological responses in patients with schizophrenia, and further that the covariation between self-reported emotional states and laboratory emotion induction methods was similar between those with schizophrenia and healthy controls. The above evidence allows for increased confidence in the validity of self reports made by individuals diagnosed with schizophrenia.

Reliability Ratings

Forty percent of all NSRS interviews were rated by a blind rater to determine inter-rater reliability. In addition, reliability ratings were obtained for five randomly selected BPRS, SANS, and MASC assessments – each of which were found to have adequate reliability (ICCs from .82 to .94). The blinding of raters was crucial for protecting against contamination across key measures (i.e. SANS, NSRS, MASC). Therefore, as mentioned above, the study utilized independent interviewers for the SANS and NSRS. To further ensure independence of ratings, reliability raters for both the SANS and NSRS interviews had no interview contact with the participant prior to completing the reliability ratings (i.e. did not complete any part of the assessment with the participant). The SANS reliability ratings were completed by one masters-level trained rater, and the NSRS reliability ratings were split between two masters-level trained raters. In addition, all MASC coding and reliability ratings were completed by blind raters who had no interview contact (i.e. in person or from reliability tapes) with the participant prior to completing the ratings. The MASC

ratings and reliability ratings were completed by two graduate student trained raters. Therefore, for one participant, different individuals rated each of the following: (1) the SANS interview; (2) the NSRS interview; (3) the SANS interview reliability; (4) the NSRS interview reliability; (5) the MASC; and (6) the MASC reliability ratings.

Training

Many of the measures used in this study require training to ensure proper ratings. For this study, the training protocols utilized by researchers at the Mental Illness Research Education and Clinical Center (MIRECC) at the Baltimore VAMC were followed for the SCID, BPRS and SANS. As the NSRS had never previously been used in a research study, there was no standardized training protocol available. However, NSRS interviewers were trained by one of the NSRS developers (J. Blanchard) as described below.

The training protocol for the SCID interviews involved: (1) watching SCID training tapes and reading the manual; (2) watching and rating four training tapes followed by discussion with the supervisor; (3) attending two SCID interviews with a trained interviewer followed by discussion of ratings; (4) completing four SCID interviews with supervision. Additional observed interviews were completed if necessary. In addition to the above, all interviewers attended bi-weekly SCID supervisions.

Training protocols for the BPRS and SANS were as follows: (1) BPRS and SANS forms, background materials and manuals were read; (2) Two BPRS and 2 SANS interviews were observed (in person or on tape), ratings were made along with the interview, and these ratings were then discussed with the interviewer; (3) BPRS

and SANS training tapes were rated, and ratings were compared to consensus ratings and discussed with a supervisor; (4) BPRS and SANS reliability tapes were watched and rated, and ratings were given to the supervisor to compare with consensus ratings. If further work was needed, additional tapes were rated; (5) Two BPRS and SANS interviews were completed while being observed by a trained interviewer. In addition, all interviewers attended bi-weekly BPRS and SANS supervisions.

The training for the NSRS mirrored that of the above mentioned measures, however, due to this being the first evaluation of the measure there were no previously rated tapes to use for training. Therefore, NSRS training consisted of (1) reading the NSRS instrument and background material on negative symptoms; (2) attending a seminar with the developer to discuss measure criteria, watch tapes of other negative symptoms ratings scales to increase understanding of the negative symptom construct, and role-play the interview assessment; (3) completing 2 NSRS interviews with practice patients whose data was not kept for the research study. These interviews were watched, rated, and discussed with the developer and other NSRS assessors. In addition, all interviewers attended weekly NSRS supervisions.

CHAPTER 4: RESULTS

Analyses were conducted to examine the psychometric properties and validity of the NSRS. First, sample characteristics were examined with descriptive statistics of demographic and clinical characteristics. This was followed by conducting descriptive statistics on the subscales of the NSRS. Next, reliability was examined through assessment of both internal consistency and interrater reliability. Convergent validity was then assessed through comparing ratings of the NSRS with other measures of negative symptoms, including the SANS and BPRS Anergia subscale. An additional examination of convergent validity was conducted through correlations between the NSRS and measures of community functioning and social skill, as measured by the SFS and MASC. Finally, discriminant validity was assessed through correlating ratings of the NSRS with the BPRS and CDSS, measuring positive and depressive symptoms.

Sample Characteristics

First, the characteristics of the sample were evaluated. These analyses included an assessment of which sites participants were recruited from, how many consented participants completed the full assessment, the diagnoses and general demographics of participants, as well as indicators of the level of illness and symptom severity present in this sample. The final sample of participants for the current study consisted of 38 individuals recruited from one of six sites located in and around Baltimore, MD. Specifically, 21 were recruited and consented from the Baltimore VA, 7 from the Perry Point VA, 14 from the Walter P. Carter Center Fayette Street Clinic, 14 from Harbor City Unlimited, 1 from the University of Maryland 701 W.

Pratt Street Clinic, and 1 from the Maryland Psychiatric Research Center. A total of 58 people were consented, and 41 completed the assessment protocol. Reasons for exclusion from the final data set included ineligibility due to diagnosis (N = 10), not completing the assessment following consent (N = 4), and that some assessments were not videotaped by error (N = 3).

Of the 38 participants, a total of 27 (71%) had a diagnosis of schizophrenia and 11 (29%) had a diagnosis of schizoaffective disorder based upon a SCID diagnostic assessment completed by a Ph.D. level interviewer. As expected based on recruitment locations, the sample was largely male (82%) and African-American (90%). The mean age of the sample was 47 years old, with an average of 12 years of education. Additionally, approximately one third of the sample (37%) reported being employed, and 84 percent indicated that they receive some form of disability benefit. (See Table 1 and 2)

Table 3

<i>Sample Characteristics</i>		Total (%)
Gender		
Male		31 (82%)
Female		7 (18%)
Race		
Caucasian		3 (8%)
Black		34 (90%)
Asian		1 (2%)
Military History		
Veteran		16 (42%)
Non-Veteran		22 (58%)
Employed		
Yes		12 (32%)
No		26 (68%)
Receives Disability Benefits		
Yes		32 (84%)
No		6 (16%)

Diagnosis	
Schizophrenia	27 (71%)
Schizoaffective Disorder	11 (29%)

With regards to severity of illness, analyses indicate that the mean number of self-reported inpatient psychiatric hospitalizations was 10.49 for this sample. Further, quartile analyses revealed that 50% of the sample had been hospitalized 7 or more times, and approximately 25% of the sample had more than 11 inpatient psychiatric hospitalizations.

Table 4

<i>Sample Characteristics</i>			
	Mean	Median	SD
Age	46.89	48.00	8.74
Years of School Completed	11.87	12.00	1.96
<i>Psychiatric Hospitalizations</i>	10.49	7.00	13.00

To obtain a general idea about the symptom severity in the current sample, ratings of BPRS items were analyzed (see Table 3). Results indicated that 25% of the sample obtained a rating higher than “moderate” on items assessing emotional withdrawal, conceptual disorganization, grandiosity, suspiciousness, and blunted affect. Additionally, 25% of the sample received a rating higher than “moderately severe” on items assessing anxiety, depressive mood, and unusual thought content. These results demonstrate that there is a range of illness and symptom severity in the current sample.

Table 5

BPRS Descriptive Statistics (N = 38)

	Mean	SD	25 th Percentile	50 th Percentile	75 th Percentile
<i>BPRS Items</i>					
Somatic Concern	2.39	1.41	1.00	2.00	4.00
Anxiety	2.89	1.71	1.00	3.00	4.00
Emotional Withdrawal	2.05	1.37	1.00	1.00	3.00
Conceptual Disorg.	2.00	1.29	1.00	1.00	3.00
Guilt Feelings	1.79	1.14	1.00	1.00	2.00
Tension	1.76	1.28	1.00	1.00	2.25
Mannerism and Posturing	1.53	1.01	1.00	1.00	1.25
Grandiosity	2.24	1.68	1.00	1.00	3.25
Depressive Mood	2.32	1.69	1.00	1.00	4.00
Hostility	1.74	1.18	1.00	1.00	2.00
Suspiciousness	2.55	1.84	1.00	2.00	3.25
Hallucinatory Behavior	2.95	2.01	1.00	2.00	5.00
Motor Retardation	1.76	1.15	1.00	1.00	2.00
Uncooperativeness	1.32	0.70	1.00	1.00	1.00
Unusual Thought Content	2.82	1.71	1.00	2.50	4.00
Blunted Affect	2.16	1.37	1.00	2.00	3.00
Excitement	1.47	1.03	1.00	1.00	1.25
Disorientation	1.13	0.41	1.00	1.00	1.00
Poverty of Speech	1.34	0.88	1.00	1.00	1.00
Inappropriate Affect	1.21	0.62	1.00	1.00	1.00

Note. Ratings made on a 7 point scale (0 = not reported, 1 = very mild, 2 = mild, 3 = moderate, 4 = moderately severe, 5 = severe, 6 = very severe).

NSRS Subscale Descriptives

To investigate the central tendency and range of the five subscales of the NSRS (i.e. Anhedonia, Asociality, Avolition, Blunted Affect, Alogia), descriptive statistics were conducted (see Table 4). Variable sample sizes will be observed across the different NSRS subscales for all analyses including the measure, resulting from missing data for items within particular subscales (i.e. item not ratable, item not asked by interviewer). Also of note, all items are rated on a 7 point scale. Results indicated that the Anhedonia subscale, which includes 9 items, had a mean of 6,

scores that ranged from 0 to 30 (out of a possible 63), and an average item rating of .75. Therefore, it appears as though a limited range of ratings were utilized within the Anhedonia subscale, with scores skewed towards zero (i.e. non-pathological). Descriptives of the Asociality subscale, which includes 3 items, had a mean of 7, scores that ranged from 2 to 13 (out of a possible 21), and an average item rating of 2.48. These results suggest that the ratings of items within the Asociality subscale better utilize the available range. The third subscale, avolition, which includes 4 items had very similar descriptive results. The mean of the Avolition subscale was 7, with scores ranging from 0 to 15 (out of a possible 28) and an average item rating of 1.74. Analysis of the Blunted Affect subscale, which includes 5 items, resulted in a mean of 6, a range of scores from 0 to 23 (out of a possible 30), and an average item rating of 1.48. Finally, descriptive results for the Alogia subscale revealed a mean of zero, with a range of scores from 0 to 10 (out of a possible 14) and an average item rating of .98. As with the Anhedonia subscale, the Alogia subscale demonstrated a very limited range that was heavily skewed towards zero. This issue with range could affect correlations with these two subscales, as restricted range leads to attenuated relationships. The observed restricted range noted here for the Anhedonia and Alogia scales in particular should be considered when evaluating any future analyses using these subscales.

Table 6

Descriptive Statistics for NSRS Subscales

	Anh.	Asociality	Avolition	Blunted	
				Affect	Alogia
N	33	33	31	37	37
# of items	9	3	4	5	2
Average Item Rating	0.75	2.48	1.74	1.48	0.98
Subscale Mean	6.76	7.45	6.97	7.43	1.95
Subscale Median	6.00	7.00	7.00	6.00	0.00
Subscale SD	5.66	3.45	3.80	6.62	2.76
Subscale Min.	0	2	0	0	0
Subscale Max.	30	13	15	23	10
25 th percentile	3.00	4.00	4.00	0.50	0.00
50 th percentile	6.00	7.00	7.00	6.00	0.00
75 th percentile	8.50	10.00	10.00	12.50	4.00

Note. Ratings of items made on a 7 point scale (0 = no impairment, 1 = very slight deficit, 2 = mild deficit, 3 = moderate deficit, 4 = moderately severe deficit, 5 = marked deficit, 6 = severe deficit)

Additional analyses were conducted to evaluate the relationship between the five subscales of the NSRS. Examination of the subscale correlations revealed a number of significant relationships (see Table 5). As the different domains of negative symptoms are typically correlated, these intra-scale correlations were expected. Specifically, the Anhedonia subscale is correlated with the Asociality subscale ($r = .39$, $p < .05$) but none of the other subscales. To note, this lack of correlation with other subscales could be due to restricted range within the Anhedonia subscale. The Asociality subscale additionally showed relationships with the Blunted Affect ($r = .44$, $p < .05$) and Alogia ($r = .50$, $p < .01$) scales. The Avolition subscale demonstrated relationships with the Blunted Affect ($r = .72$, $p < .01$) and Alogia ($r = .63$, $p < .01$) subscales. Finally, the Blunted Affect subscale was also correlated with the Alogia subscale ($r = .73$, $p < .05$). These results indicate that, as expected, there

are intercorrelations between subscales of the NSRS. Further, the magnitude of these correlations indicate that while the subscales are related, they are not redundant.

Table 7

NSRS Subscale Correlations

	Anhedonia	Asociality	Avolition	Blunted Affect	Alogia
Anhedonia	--				
Asociality	.39*	--			
Avolition	.06	.29	--		
Blunted Affect	.03	.44*	.72**	--	
Alogia	.18	.50**	.63**	.73*	--

Note. The N's in this table range from N = 27 to N = 37.

* $p < .05$, two tailed, ** $p < .01$, two tailed

Reliability

In the present study, two aspects of reliability were assessed. First, the internal consistency of the NSRS and each subscale of the measure was assessed by Cronbach's alpha analysis. The second aspect of reliability assessed was interrater reliability, to determine the level of agreement between two blinded raters. These analyses were conducted using Intraclass Correlation Coefficients (ICCs), with the two-way random effects model, where both the rater and subject are considered random factors (Shrout & Fleiss, 1979).

Internal Consistency

To assess internal consistency, the NSRS was evaluated using Cronbach's alpha (see Table 6). Results indicated that the total score ($\alpha = .85$), Blunted Affect subscale ($\alpha = .84$), and Alogia subscale ($\alpha = .93$) reached the traditional benchmark of .80 for reliability (Nunally, 1978). The Anhedonia subscale ($\alpha = .75$) fell just outside the acceptable range. When the Anhedonia subscale is broken down into the

Consummatory and Anticipatory components, the alphas for each are $\alpha = .61$ and $\alpha = .60$ respectively.

Both the Asociality ($\alpha = .35$) and Avolition ($\alpha = .47$) subscales had substantially lower internal consistency. Reasons for this may include the low number of items in each of these subscales, or the varying content of the items within these subscales. For the Asociality subscale, the corrected item-total correlations reveal a very low correlation for Item 10 ($r = .04$) which rates family relationships. If this item were removed from the subscale, the resulting alpha would increase from $\alpha = .35$ to $\alpha = .50$. For the Avolition subscale, the corrected-item total correlations indicate a very low correlation for Item 20 ($r = .03$) which rates self-care. The alpha of the Avolition subscale would rise from $\alpha = .47$ to $\alpha = .58$ if this item was removed.

Table 8

Corrected Item-Total Correlations and Cronbach's Alpha of NSRS Items and Subscales

	Corrected Item-Total Correlations	Cronbach's α if Item Deleted	Cronbach's α
Total Score			.85
Anhedonia (Total)			.75
Item 1: Social, intensity	.27	.75	
Item 2: Social, frequency	.17	.76	
Item 3: Ant. social, intensity	.71	.67	
Item 4: Physical, intensity	.61	.69	
Item 5: Physical, frequency	.71	.68	
Item 6: Ant. physical, intensity	.04	.78	
Item 7: Rec/Voc, intensity	.49	.72	
Item 8: Rec/Voc, frequency	.02	.78	
Item 9: Ant. rec/voc, intensity	.75	.66	
Anhedonia (Consummatory)			.61
Item 1: Social, intensity	.26	.59	
Item 2: Social, frequency	.14	.62	
Item 4: Physical, intensity	.49	.48	
Item 5: Physical, frequency	.60	.44	
Item 7: Rec/Voc, intensity	.49	.49	

	Corrected Item-Total Correlations	Cronbach's α if Item Deleted	Cronbach's α
Item 8: Rec/Voc, frequency	.06	.66	
Anhedonia (anticipatory)			.60
Item 3: Social, intensity	.51	.36	
Item 6: Physical, intensity	.20	.75	
Item 9: Rec/Voc, Intensity	.60	.20	
Asociality			.35
Item 10: Family	.04	.50	
Item 11: Romantic	.26	.15	
Item 12: Friendships	.33	.01	
Avolition			.47
Item 13: Social	.39	.28	
Item 14: Voc/School	.25	.43	
Item 15: Recreation	.45	.22	
Item 16: Self-Care	.03	.58	
Blunted Affect			.84
Item 17: Facial Exp	.71	.79	
Item 18: Vocal Exp	.81	.76	
Item 19: Gestures	.72	.79	
Item 20: Eye Contact	.34	.88	
Item 21: Spont. Movement	.67	.81	
Alogia			.93
Item 22: Quantity of Speech	.89		
Item 23: Spont. Elaboration	.89		

In order to better understand the above psychometric results for the NSRS, the psychometric features of the existing negative symptom scale, the SANS, will be reviewed next (see Table 7). With regards to the internal consistency of the SANS, analyses indicated that Cronbach's alphas computed for the total score ($\alpha = .81$) and the Affective Flattening subscale ($\alpha = .85$) reached the traditional .80 benchmark for reliability (Nunally, 1978). The remaining subscales, including Anhedonia-Asociality ($\alpha = .69$), Avolition-Apathy ($\alpha = .53$), and Alogia ($\alpha = .47$) fell outside the acceptable range. Item-total correlations computed for the Anhedonia-Asociality subscale revealed a lower correlation for Item 20 rating decreased interested in sex (r

= .28). The removal of this item from the subscale increases the alpha from $\alpha = .69$ to $\alpha = .78$, which more closely approaches the acceptable range.

Table 9

Corrected Item-Total Correlations and Cronbach's Alpha of SANS Items and Subscales

	Corrected Item-Total Correlations	Cronbach's α if Item Deleted	Cronbach's α
Total Score			.81
Anhedonia-Asociality			.69
Asociality	.67	.52	
Anhedonia	.54	.59	
Decreased interest in sex	.28	.78	
Ability to feel closeness	.50	.61	
Avolition-Apathy			.53
Grooming and hygiene	.25	.53	
Role function level	.56	.41	
Role function quality	.34	.45	
Physical anergia	.32	.46	
Affective Flattening			.85
Unchanging facial exp.	.69	.81	
Decrease spontaneous mov.	.55	.84	
Paucity of expressive gestures	.84	.78	
Poor eye contact	.35	.87	
Affective non-responsivity	.72	.81	
Lack of vocal inflections	.68	.82	
Alogia			.47
Poverty of speech	.17	.50	
Poverty of content of speech	.10	.53	
Blocking	.54	.26	
Increased latency of response	.41	.22	

Inter-rater Reliability

The inter-rater reliability of each of the NSRS subscales was assessed by interclass correlation coefficients (see Table 8). In the current study, 15 of the NSRS assessments were rated by a blind second rater. Following guidelines set by Cichetti and Sparrow (1981), two of the five NSRS subscales exceeded the .75 standard for

excellent reliability. These two subscales include Anhedonia (ICC = .92) and Asociality (ICC = .93). Falling just outside this range was the Blunted Affect subscale with an ICC of .72, which is considered to represent good reliability. Analyses of both the Avolition and Alogia subscales revealed only fair inter-rater reliability, with ICCs of .53 and .48 respectively. Overall, the subscales of the NSRS demonstrated adequate interrater reliability, with results indicating that the Avolition and Alogia subscales require further attention to improve this domain of reliability.

Table 10

Intraclass Correlation Coefficients (ICC) for NSRS Subscales

	ICC
Anhedonia ^a	.92
Asociality ^b	.93
Avolition ^c	.53
Blunted Affect ^d	.72
Alogia ^d	.48

Note. ^an = 12. ^bn = 14. ^cn = 10. ^dn = 15.

Convergent Validity

The convergent validity of the NSRS was assessed by examining this measure's relationship with the SANS, which is considered the current standard in the measurement of negative symptoms. The relationship between the NSRS and the Anergia subscale of the BPRS is also assessed, as this subscale of the widely utilized BPRS is often used to broadly assess negative symptomatology (Kay, 1990).

Additionally, negative symptoms as assessed by the clinician-rated NSRS were compared with the self-rated anhedonia ratings of the TEPS. Finally, the correlation between the NSRS and measures of self-rated social functioning (SFS) and observer rated social skill (MASC) is assessed, as previous research has documented

relationships between these constructs and negative symptoms (i.e. Addington & Addington, 2000; Bozikas et al., 2006).

In addition to the above, analyses were also conducted to assess the relationship between the SANS and each of these measures. As the SANS is the current standard negative symptom measure, these additional analyses allow for an initial assessment of how the NSRS performs either similarly or differently from the measure it seeks to improve upon.

Relationship Between NSRS and SANS

To assess convergent validity of the NSRS with other negative symptom measures, correlations were computed between the NSRS and the SANS. Results revealed several correlations between the measures, as seen in Table 9. Specifically, as expected the NSRS Asociality subscale was related to the SANS Anhedonia-Asociality subscale ($r = .58, p < .01$). The relationship between the NSRS Anhedonia subscale and the SANS Anhedonia-Asociality subscale ($r = .30, p = .095$) failed to reach significance, yet the magnitude of the relationship met the traditional benchmark for a medium effect size (Cohen, 1992). Of note, the very limited range observed in the NSRS Anhedonia subscale, in addition to the low sample size, may have contributed to this non-significant result. The Avolition subscales of each of the measures were correlated ($r = .49, p < .01$), as were the corresponding NSRS Blunted Affect and SANS Affective Flattening subscales ($r = .62, p < .01$). The NSRS Alogia subscale was related to the SANS Anhedonia-Asociality ($r = .45, p < .01$) and Affective Flattening ($r = .56, p < .01$) subscales, but showed no relationship with the SANS Alogia subscale ($r = .18, p = .34$). Overall, results indicate that the NSRS has

adequate convergent validity with the SANS. Additional analyses conducted to further explore the relationships between the subscales measuring anhedonia and alogia will be discussed below.

Table 11

Correlations Between NSRS and SANS

	SANS			
	Anhedonia-Asociality	Avolition – Apathy	Affective Flattening	Alogia
<i>NSRS Subscales</i>				
Anhedonia ^a	.30	.11	-.03	-.05
Asociality ^a	.58**	-.10	.23	.02
Avolition ^b	.49**	.49**	.46**	.09
Blunted Affect ^c	.38*	.24	.62**	.20
Alogia ^c	.45**	.11	.56**	.18

Note. ^an = 33. ^bn = 31. ^cn = 37.

* $p < .05$, two tailed, ** $p < .01$, two tailed

To further assess the relationship between the anhedonia scores on the NSRS and SANS, correlations were computed between the Anhedonia subscales of the NSRS and individual items of the SANS Anhedonia-Asociality subscale. This was done to allow for more direct comparison of anhedonia ratings specifically, as the SANS combines asociality and anhedonia into one subscale. Results again indicated no significant correlations between the NSRS Anhedonia total subscale, Consummatory subscale, or Anticipatory subscale and the items included in the SANS Anhedonia-Asociality subscale (see Table 10). Of most importance in these analyses is the lack of correlation between SANS Item 19 rating levels of anhedonia and the NSRS Anhedonia subscales. These results further suggest a lack of convergence between the two scales in the assessment of anhedonia. However, an alternative hypothesis to the lack of correlation between the Anhedonia subscales of

the NSRS and SANS is that the restricted range observed in the NSRS Anhedonia subscale attenuated the correlations between these measures.

Table 12

Correlations between SANS Anhedonia-Asociality Items and NSRS Anhedonia Subscale

	SANS			
	Item 18: Asociality	Item 19: Anhedonia	Item 20: Decreased interest in sex	Item 21: Feel closeness
<i>NSRS</i>				
Anhedonia ^a	.28	.13	.27	.15
Consummatory ^b	.27	.20	.23	.18
Anticipatory ^b	.21	.03	.31	.14

Note. ^an = 33. ^bn = 35.

Additional analyses were also conducted between the NSRS Alogia subscale and items and the SANS Alogia items (see Table 11). These were completed to further investigate the lack of correlation between the alogia subscales across the two scales. Results demonstrated a relationship between the SANS Item 8 measuring poverty of speech and the NSRS Alogia subscale ($r = .38, p < .05$), NSRS Item 22 measuring quantity of speech ($r = .35, p < .05$), and NSRS Item 23 measuring spontaneous elaboration ($r = .38, p < .05$). None of the remaining SANS Alogia items (i.e. poverty of content, blocking, latency of response) showed a relationship with either the NSRS Alogia subscale or individual items. Therefore, these results suggest that the Alogia scales are not entirely unrelated, but rather the NSRS Alogia subscale is related to only one component of the SANS Alogia subscale focusing on poverty of speech.

Table 13

Correlations Between SANS Alogia Items and NSRS Alogia Subscale and Items (N=37)

	Item 8: Poverty of speech	Item 9: Poverty of content	Item 10: Blocking	Item 11: Latency of response
<i>NSRS</i>				
Alogia	.38*	-.27	.14	.15
Item 22:	.35*	-.26	.20	.17
Item 23:	.38*	-.27	.08	.11

Note. * $p < .05$, two tailed

Relationship between NSRS and BPRS Anergia subscale

The above analyses indicate adequate convergence between the NSRS and the measurement of negative symptoms using the SANS. As an additional assessment of convergent validity the NSRS subscales were also correlated with the Anergia subscale of the BPRS, which broadly assesses negative symptoms (see Table 12). Results revealed relationships between the BPRS Anergia subscale and the Avolition ($r = .58, p < .01$), Blunted Affect ($r = .60, p < .01$), and Alogia ($r = .54, p < .01$) subscales of the NSRS, each of which representing a large effect size (Cohen, 1992). Neither the Anhedonia nor Asociality subscales of the NSRS showed significant correlations with the BPRS Anergia subscale. Overall, these results provide additional preliminary evidence supporting the convergent validity of the NSRS.

Table 14

Correlations Between NSRS Subscales and BPRS Anergia Subscale

	BPRS Anergia
<i>NSRS Subscales</i>	
Anhedonia ^a	-.06
Asociality ^a	.16
Avolition ^b	.58**
Blunted Affect ^c	.60**
Alogia ^c	.54**

Note. ^an = 33. ^bn = 31. ^cn = 37.

** p < .01, two tailed

To allow for some comparison with the performance of the SANS, correlations were also computed between the SANS subscales and the BPRS Anergia subscale to assess for the convergence of negative symptom ratings across these measures (see table 13). Results indicated significant relationships between the BPRS Anergia subscale and all four subscales of the SANS, including Anhedonia-Asociality ($r = .39, p < .05$), Avolition-Apathy ($r = .49, p < .01$), Affective Flattening ($r = .84, p < .01$), and Alogia ($r = .42, p < .01$). Therefore, results indicated that three of the five NSRS subscales demonstrated a significant correlation with the BPRS Anergia subscale, while all four SANS subscales were significantly related to the subscale. This discrepancy may be due to differing item content across the scales, which will be examined further in the discussion section.

Table 15

Correlations Between SANS Subscales and BPRS Anergia Subscale (N = 38)

	BPRS Anergia
SANS	
Anhedonia-Asoc.	.39*
Avolition-Apathy	.49**
Affective Flattening	.84**
Alogia	.42**

Note. * $p < .05$, two tailed, ** $p < .01$, two tailed

Relationship between the NSRS and TEPS

Convergent validity was further assessed through the comparison of clinician rated negative symptoms (NSRS) and self-reported experience of pleasure (TEPS), with an expectation that the Anhedonia subscales of the NSRS would demonstrate a relationship with the TEPS (see Table 14). Results revealed correlations between the NSRS Anhedonia subscale and the TEPS Anticipatory subscale ($r = .43$, $p < .05$), and the TEPS Consummatory subscale ($r = .37$, $p < .05$). To further examine this relationship, the NSRS items examining consummatory and anticipatory anhedonia were separated into two separate components. The Consummatory component of the NSRS Anhedonia subscale was correlated with the TEPS Anticipatory subscale ($r = .43$, $p < .05$), and the TEPS Consummatory subscale ($r = .35$, $p < .05$). The relationships between the Anticipatory component of the NSRS Anhedonia subscale and the TEPS subscale scores failed to reach significance. Of note, the correlations between the NSRS Anticipatory component and the TEPS Anticipatory subscale ($r = .32$, $p = .07$) failed to reach significance, yet the magnitude of the relationship was of a medium effect size (Cohen, 1992). None of the TEPS scales demonstrated a correlation with the Asociality, Avolition, Blunted Affect, or Alogia subscales of the

NSRS. The effect sizes of these relationship were also small, with the exception of the correlation observed between the NSRS Avolition subscale and the TEPS Anticipatory subscale ($r = .30$) which met the standard for a medium effect size (Cohen, 1992). Therefore, the NSRS Anhedonia subscale showed adequate convergence with the TEPS measure which assessed the two components of anhedonia.

Table 16

Correlations Between NSRS Subscales and TEPS Subscales

	TEPS Anticipatory	TEPS Consummatory
<i>NSRS Subscales</i>		
Anhedonia Total ^a	.43*	.37*
Anticipatory ^b	.32	.27
Consummatory ^c	.43*	.35*
Asociality ^a	.30	.13
Avolition ^d	.21	.23
Blunted Affect ^e	.15	.10
Alogia ^e	.27	.01

Note. ^an = 31. ^bn = 32. ^cn = 33. ^dn = 29. ^en = 34.

* $p < .05$, two tailed

Correlations were also computed between the SANS subscales and the TEPS subscales (see Table 15). Results demonstrated relationships between the Anhedonia-Asociality subscale and the TEPS Anticipatory score ($r = .47$, $p < .01$), but not the TEPS Consummatory score ($r = .11$, $p > .05$). No relationships were observed between the Avolition-Apathy or Affective Flattening subscales of the SANS and the TEPS subscales. The correlation between Alogia subscale of the SANS and the TEPS Consummatory scale approached significance ($r = .33$, $p = .052$), and is of a medium effect size (Cohen, 1992). The NSRS and SANS appear to have differing relationships with self-reported anhedonia as measured by the TEPS, with the NSRS

Anhedonia subscale correlating with both components of anhedonia and the SANS correlating with only the Anticipatory component.

Table 17

Correlations Between SANS Subscales and TEPS Subscales (N = 35)

	TEPS Anticipatory	TEPS Consumatory
<i>SANS Subscales</i>		
Anhedonia-Asociality	.47**	.11
Avolition-Apathy	.13	.11
Affective Flattening	.01	.07
Alogia	.20	.33

Note. ** $p < .01$, two tailed

The next set of analyses evaluated the relationship between the NSRS and two different assessments of social functioning. First, correlations between the NSRS and SFS, which is a self-report measure of community functioning, were conducted.

Second, the relationship between the NSRS and MASC was evaluated, to determine the level of convergence with behavioral ratings of social skill. Additionally, exploratory analyses were conducted to evaluate the relationship between the two measures of social functioning, as previous research has suggested that there are multiple components the comprise the social functioning domain that are related but not interchangeable (i.e. Dickerson, Parente & Ringle, 2000)

Relationship between the NSRS and Social Functioning.

To test the hypothesis that the clinician rated negative symptoms would be related to poor self-reported social functioning, correlations were computed between subscales of the NSRS and SFS (see Table 16). Results indicated relationships between the NSRS Anhedonia subscale and the SFS Recreation ($r = -.39$, $p < .05$) and SFS Pro-Social Behavior ($r = -.42$, $p < .05$) subscales. The NSRS Avolition

subscale and SFS Pro-Social Behavior ($r = -.50, p < .01$), and the NSRS Alogia subscale and SFS Independence-Performance subscale ($r = -.39, p < .05$) were also correlated. No other correlations between the subscales of the NSRS and SFS reached significance.

Table 18

Correlations Between NSRS Subscales and SFS Subscales

	<i>NSRS</i>				
	Anhedonia	Asociality	Avolition	Blunted	Alogia
<i>SFS Subscales</i>					
Social Engagement	.17	-.03	-.17	-.05	.11
Interpersonal Beh.	-.08	-.17	-.20	-.26	-.11
Independence Perf.	-.20	.06	-.19	-.07	-.39*
Recreation	-.39*	-.14	-.33	.02	-.20
Prosocial Behavior	-.42*	-.18	-.50**	-.14	-.29
Independence Comp	-.16	.03	.16	.29	.13

Note. The N's in this table range from N = 23 to N = 36.

* $p < .05$, two tailed, ** $p < .01$, two tailed

To allow for comparison with the SANS, analyses were also conducted to assess the relationship between the SANS and SFS (see Table 17). Results indicated correlations between the SANS Avolition-Apathy subscale and the SFS Interpersonal Behavior ($r = -.37, p < .05$), Recreation ($r = -.34, p < .05$), and Pro-Social Behavior ($r = -.46, p < .01$) subscales. Additionally, the relationship between the SANS Anhedonia-Asociality subscale and the SFS Social Engagement ($r = -.32, p = .061$) and Pro-Social Behavior ($r = -.32, p = .058$) subscales approached significance. Results indicated that while the NSRS and SANS exhibited a similar number of statistically significant relationships with the SFS, the pattern of those relationships was not consistent.

Table 19

Correlations Between SANS Subscales and SFS Subscales

	SANS			
	Anh-Asoc	Avol-Apa	Affect Flat	Alogia
<i>SFS Subscales</i>				
Social Engagement	-.32	-.24	-.17	-.07
Interpersonal Beh.	-.29	-.37*	-.21	.13
Independence Perf.	-.14	-.17	.00	-.22
Recreation	-.28	-.34*	-.03	.28
Prosocial Behavior	-.32	-.46**	-.12	.18
Independence Comp	.15	-.18	-.12	.30

Note. ^an = 35. ^bn = 34. ^cn = 30. ^dn = 36. ^en = 37.

* $p < .05$, two tailed, ** $p < .01$, two tailed

Relationship between the NSRS and Social Skills

Correlations were conducted between the NSRS subscales and the MASC subscale to evaluate the relationship between negative symptoms and social skill (see Table 18). Of note, there was a considerable drop in sample size for those analyses conducted with the MASC, which likely resulted in reduced power. A total of 14 participants did not have completed MASC ratings as a result of equipment failures (i.e. lack of video recording) or a failure to follow role play protocol (i.e. lack of audio recorded directions), leaving 24 participants included in the following MASC analyses.

Correlational results indicated only one relationship between the subscales, which occurred between the NSRS Anticipatory Anhedonia subscale and the MASC Conversation Content subscale ($r = -.44$, $p < .05$). Of note, the correlations between NSRS Anticipatory Anhedonia subscale and remaining MASC subscales are of a similar magnitude, each a medium effect size, although they did not reach statistical significance. Additionally, correlations between the NSRS Alogia subscale and the

MASC Conversation Content ($r = -.39, p = .063$), Nonverbal Content ($r = -.39, p = .059$), and Effectiveness ($r = -.40, p = .056$) subscales each approached significance, and were also medium effect sizes (Cohen, 1992). A closer look at the relationship between the items that comprise the NSRS Alogia subscale and the MASC subscales revealed relationships between NSRS Item 23 rating spontaneous elaboration, and the MASC Conversation Content ($r = -.43, p < .05$), Nonverbal Content ($r = -.41, p < .05$), and Effectiveness ($r = -.42, p < .05$).

Table 20

Correlations Between NSRS Subscales and MASC Subscales

	Conversation Content	Nonverbal Content	Effectiveness
<i>NSRS Subscales</i>			
Anhedonia ^a	-.33	-.22	-.28
Anticipatory ^b	-.44*	-.31	-.36
Consummatory ^c	-.04	-.02	-.05
Asociality ^a	-.23	-.12	-.12
Avolition ^a	-.18	-.14	-.23
Blunted Affect ^d	-.18	-.22	-.21
Alogia ^d	-.39	-.39	-.40

Note. ^an = 21. ^bn = 22. ^cn = 23. ^dn = 24.

* $p < .05$, two tailed

Similar analyses were conducted between the SANS subscales and MASC subscales (see Table 19). Results demonstrated correlations between the SANS Affective Flattening subscale and the MASC Nonverbal Content subscale ($r = -.40, p < .05$), as well as between the SANS Alogia subscale and the MASC Conversation Content ($r = -.45, p < .05$), Nonverbal Content ($r = -.48, p < .05$), and Effectiveness ($r = -.44, p < .05$) subscales. These results are similar to those found between the NSRS Alogia subscale and the MASC.

Table 21

Correlations Between SANS Subscales and MASC Subscales (N=25)

	Conversation Content	Nonverbal Content	Effectiveness
<i>SANS Subscales</i>			
Anhedonia-Asociality	-.15	-.14	-.11
Avolition-Apathy	-.19	-.29	-.17
Affective Flattening	-.25	-.40*	-.22
Alogia	-.45*	-.48*	-.44*

Note. * $p < .05$, two tailed

Next, exploratory analyses assessing the relationship between the two social functioning measures used in the present study, the SFS and the MASC, were conducted (see Table 20). Results indicated that the two assessments of social functioning were correlated, with a correlation observed between the SFS Independence-Competence subscale and the MASC Conversation Content ($r = .46$, $p < .05$), Nonverbal Content ($r = .49$, $p < .05$), and Effectiveness ($r = .47$, $p < .05$) subscales. These results are consistent with those of prior studies assessing the relationship between functioning measures (i.e. Cohen, Forbes, Mann & Blanchard, 2006; Dickerson, Parente & Ringel; 2000). Overall, these results indicate that the two measures used here appear to tap into relatively distinct aspects of social functioning.

Table 22

Correlations Between the SFS and MASC Subscales

	MASC Conversation Content	MASC Nonverbal Content	MASC Effectiveness
<i>SFS Subscales</i>			
Social Engagement	.06	-.02	.02
Interpersonal Behavior	.11	.10	.09
Independence Performance	.46*	.49*	.47*
Recreation	-.32	-.22	-.36
Pro-Social Behavior	.00	-.08	-.02
Independence Competence	.08	.01	.04

Note. * $p < .05$, two tailed

Discriminant Validity

As an examination of discriminant validity, the NSRS subscales were correlated with measures assessing positive and depressive symptoms with the expectation that they would show no relationships. As hypothesized, correlational analyses conducted with each of the NSRS subscales and the Thought, Affect, and Disorganization subscales of the BPRS revealed no significant correlations (Table 21). Additionally, none of the NSRS subscales were found to be correlated with depression as measured by the CDSS (Table 22). Therefore, the NSRS demonstrated good discrimination from symptom domains previously determined to be independent from negative symptoms (Blanchard & Cohen, 2006).

Table 23

Correlations Between NSRS Subscales and BPRS Subscales

	Thought	BPRS Affect	Disorganized
<i>NSRS Subscales</i>			
Anhedonia ^a	-.03	.00	-.18
Asociality ^a	.16	-.08	.14
Avolition ^b	.02	.07	.19
Blunted Affect ^c	.09	-.10	.15
Alogia ^c	.14	-.09	.27

Note. ^an = 33. ^bn = 31. ^cn = 37.

Table 24

Correlations Between NSRS and CDSS

	CDSS Total Score
<i>NSRS Subscales</i>	
Anhedonia ^a	.10
Asociality ^a	.05
Avolition ^b	.10
Blunted Affect ^c	-.15
Alogia ^c	-.08

Note. ^an = 31. ^bn = 28. ^cn = 34.

The subscales of the SANS were also correlated with the BPRS and CDSS to assess discrimination from positive and depressive symptoms (see Tables 23 and 24). Correlational analyses between the subscales of the SANS and the Thought, Affect, and Disorganized subscales of the BPRS revealed one relationship. This occurred between the SANS Anhedonia-Asociality subscale and the BPRS Thought subscale ($r = .33, p < .05$). With regards to the relationship between the SANS and depression, the SANS Alogia subscale was correlated with the CDSS ($r = .34, p < .05$). Additionally, the relationship between the SANS Anhedonia-Asociality subscale and the CDSS approached significance ($r = .32, p = .065$) with a magnitude falling in the range of a medium effect size (Cohen, 1992).

Table 25

Correlations Between SANS Subscales and BPRS Subscales (N = 38)

SANS	BPRS Subscales		
	Thought	Affect	Disorganized
Anhedonia-Asociality	.33*	.20	.05
Avolition-Apathy	-.26	.04	.26
Affective Flattening	.03	-.14	.21
Alogia	.05	-.06	.24

Note. * $p < .05$, two tailed

Table 26

Correlations Between SANS and CDSS (N=35)

SANS Subscales	CDSS Total Score
Anhedonia-Asociality	.32
Avolition-Apathy	.21
Affective Flattening	-.09
Alogia	.34*

Note. * $p < .05$, two tailed

CHAPTER 5: DISCUSSION

The study of negative symptoms and their measurement is crucial given the considerable evidence pointing to the significant role these symptoms play in social and occupational impairments, and the general long term outcomes of those experiencing schizophrenia. Despite the clear functional significance of these symptoms there remains no efficacious pharmacological or psychosocial intervention to treat or improve negative symptoms, creating an area of unmet therapeutic need within the treatment of schizophrenia. As identified at the NIMH-MATRICS Consensus Development Conference on Negative Symptoms, a significant barrier to progress in the treatment of this symptom domain is the current lack of an adequate measure for assessment of negative symptoms (Kirkpatrick et al., 2006). It was in response to this need that the NIMH-MATRICS Negative Symptom Workgroup developed a new measure, the Negative Symptom Rating Scale (NSRS). The present study sought to examine the psychometric properties of this newly developed scale within a sample of individuals diagnosed with schizophrenia or schizoaffective disorder. This examination included the assessment of reliability, convergent validity, and discriminant validity for the NSRS.

Item and Subscale Descriptives

Analyses examining the distribution of scores across the subscales of the NSRS revealed some issue with floor effects, as both the Anhedonia and Alogia subscales had average item ratings that were between zero and one. Based upon the results of this study, it appears that the current anchors for the Anhedonia subscale underestimate the frequency and intensity of pleasurable experiences in this

population of individuals with schizophrenia. Additionally, the heavy skew towards non-pathological ratings of zero on items of the Alogia subscale indicate possible issues with the criteria used to evaluate this domain. These results indicate the potential need for item revisions within these subscales, which could involve recalibrating the anchors to allow ratings to better capture the range of experiences or behavior exhibited by participants. While the Anhedonia and Alogia subscales had the most substantial issues with the distribution of scores, the remaining three subscales also demonstrated relatively low average item scores ranging from 1.48 to 2.48. This observed skew towards non-pathological scores could be related to the above mentioned possible issues with the item anchors, but could also be a function of the population of participants in the current study. Given that the sample was comprised of individuals in outpatient treatment settings, it is possible that the full range of negative symptoms was not observed due to selection bias. Following the recommendation of Clark and Watson (1995), the distributions of the NSRS items and subscales should be evaluated in additional populations prior to the elimination of items based upon unbalanced distributions.

Internal Consistency

With regards to the first hypothesis, which proposed that the subscales of the NSRS would demonstrate adequate internal consistency, the results were generally encouraging. The internal consistency of the measure as a whole was strong, and the Blunted affect and Alogia subscales exceeded the .80 benchmark for adequate reliability set by Nunally (1978). The Anhedonia subscale fell just short of this benchmark ($\alpha = .75$), both when examining the Consummatory and Anticipatory

components of the subscale separately and when combined into the overall Anhedonia score. Falling out of the adequate range were the Asociality and Avolition subscales (alphas < .47). These subscales are discussed in more detail below.

A closer look at the relationship between the individual items that comprise the Asociality subscale reveals that the item tapping family relationships (Item 10) shows little relationship with the other two items (i.e. romantic relationships, friendship). This lack of cohesion between items may suggest that when assessing asociality, family relationships are in some way different from both romantic relationships and friendships. There is consistent evidence in the literature examining the social network composition of those with schizophrenia suggesting that this population maintains a larger number of family versus non-family relationships (Horan, Subotnik, Snyder & Nuechterlein, 2006; Erickson et al., 1989; Macdonald, Hayes & Baglioni, 2000), with friendships and intimate relationship occurring more rarely (Randolph, 1998; Rosenfield & Wenzel, 1997). Additionally, research has found that beyond having a generally small social network comprised largely of family members, the relationships of individuals with schizophrenia are also less likely to be reciprocal or mutually reliant in nature (Angell & Test, 2002, Beels, 1981; Green, Hayes, Dickinson, Whittaker & Gilheany, 2002). Instead, relationships tend towards “overbenefitting” meaning the individual with schizophrenia obtains more support from the relationship than they give (Angell & Test, 2002). Based on this, it has been suggested that those with schizophrenia may be likely to passively engage in social relationships (Pernice-Duca, 2008). While the above social network literature does not directly speak to the measurement of asociality per se, it does

provide a foundation for considering the potential differences between family relationships and those of friendships and intimate relationships.

In thinking about the current results regarding the internal consistency of asociality, in which the family item exhibited a particularly low item-scale correlation, a few potential explanations could be proposed. For example, the fact that one does not choose their family, as one would their romantic partners or friends, could impact ratings of this item in a number of ways. At one extreme, in which the patient has a supportive and involved family, it is possible that maintaining positive family relationships may not require the same amount of effort as it may with romantic partners or friends. Therefore, the patient may be a relatively passive recipient, as suggested in previous research (Pernice-Duca, 2008) in family relationships yet still highly value and benefit from them. If this patient is also passive within the domains of romantic relationships and friendships, it is possible that they would not have developed or maintained deep bonds with others. In this scenario, the participant would have relatively non-pathological scores on the family item, yet receive more pathological score on the other two items.

At the other extreme, a patient may have experienced relationship-ending conflict with family in the past or be involved in current ongoing family conflict. As a result of these circumstances, having a positive and close relationship with family members may not be possible regardless of efforts made by the patient. Unlike romantic relationships and friendships where one can leave conflictual relationships and move on to develop other potentially more positive relationships within each domain, people are generally cannot choose new family members. Therefore, in this

scenario, it is possible for a patient to score within a pathological range within the family domain and within normal limits on the items rating romantic relationships and friendships. While largely conjecture, these scenarios provide possible explanations for the lack of internal consistency within the asociality subscale which could be further evaluated in future research. However, the above literature and the current psychometric results, suggest the possible need to assess family relationships separately from other forms of social relationships rather than combining these domains within the same scale as is done in other negative symptoms assessments (i.e. SANS, PANSS).

The other NSRS subscale that demonstrated inadequate internal consistency was Avolition, with an alpha of .47. Examination of the item-total correlations for those items that comprise the Avolition subscale revealed that none of the items demonstrated a strong relationship with the total score. Additionally, the self-care item exhibited a particularly low item-total correlation ($r = .03$). Even so, analyses indicated that the removal of this problematic item, or any other item within the subscale, would not drastically improve the overall subscale alpha. These results suggest that revising or reorganizing the items of this problematic subscale is necessary in future revisions of the measure in order to address these issues. One such revision already established by the measure's authors (J. Blanchard, personal communication, April 18, 2009) has been to establish greater continuity between the prompts asked for each of the domains of avolition (i.e. social, vocational/school, recreation, self-care), which has the potential to result in gathering more consistent

information for ratings across the different domains. This could then lead to a more adequate level of internal consistency for this subscale.

The overall pattern of internal consistency results for the NSRS resembled those of the SANS. The internal consistency for the total score of the SANS reached the .80 benchmark (Nunally, 1978), as did the Affective Flattening subscale. Subscales of the SANS that fell below this benchmark included Anhedonia-Asociality, Avolition-Apathy, and Alogia, with alphas ranging from .47 to .69. Of note, these SANS internal consistency results are in line with those found by Mueser et al. (1994) in a large multi site study which investigated the reliability of the SANS. Results of that study also demonstrated less than adequate internal consistency of the Anhedonia-Asociality, Avolition-Apathy, and Alogia subscales, with alphas ranging from .64 to .77. Additionally, those items that demonstrated the lowest item-total correlations in the current study were also deemed problematic for the same reason within the Mueser et al. (1994) study. These SANS items include decreased interest in sex within the Anhedonia-Asociality subscale, grooming and hygiene within the Avolition-Apathy subscale, poor eye contact within the Affective Flattening subscale, and poverty of content of speech within the Alogia subscale. Interestingly, similar items on the NSRS also demonstrated low item-total correlations, including self-care within the Avolition subscale and eye contact within the Blunted Affect subscale. The combination of these results, across studies and across measures, more broadly suggests the possibility that these particular items may not be a good fit within the subscales they are currently components of, or the negative symptoms construct as a

whole. Future studies utilizing much larger sample sizes should address this issue through the utilization of factor analysis.

Inter-rater Reliability

The inter-rater reliability of each NSRS subscale was assessed by intra-class correlation coefficients (ICC), and interpreted using the guidelines specified by Cichetti and Sparrow (1981). These guidelines state that ICCs below .40 are poor, between .40 and .59 are considered fair, between .60 and .74 is considered good, and those exceeding .75 are deemed excellent. Following these standards, three of the five NSRS subscales are considered to have good to excellent interrater reliability. These include the Anhedonia subscale, the Asociality subscale, and the Blunted Affect subscale (ICCs = .72 to .93). The remaining two subscales, Avolition and Alogia, had ICCs that fell within the fair range (ICCs = .48 to .53). These results suggest that modifications are necessary to improve the interrater reliability of both the NSRS Avolition and Alogia subscales. One way this could be achieved is to examine the anchors used to rate items within these subscales, as lack of specificity within the anchors could lead to disagreement across raters. In addition to this, more intensive training could be implemented for raters regarding these domains, both with regards to understanding the constructs and utilizing the provided anchors in a consistent manner (Nunally & Bernstein, 1994).

Convergent Validity

Convergent validity was assessed through comparison of the NSRS with other measures of negative symptoms, as well as measures of social functioning. First, convergent validity was assessed through comparing ratings of the NSRS with the

current standard interview measure for negative symptoms, the SANS. It was hypothesized that ratings on the NSRS and SANS would exhibit positive correlations, particularly between corresponding subscales. Overall, results partially supported this hypothesis. The NSRS Asociality subscale demonstrated a correlation with the SANS Anhedonia-Asociality subscale ($r = .58$), as expected. Also supporting this hypothesis were the positive relationships demonstrated between the Avolition subscales of both measures ($r = .49$), as well as between the NSRS Blunted Affect and the corresponding SANS Affective Flattening subscales ($r = .62$). However, no statistically significant relationships were observed between the NSRS Anhedonia and SANS Anhedonia-Asociality subscales ($r = .30$), or between the Alogia subscales of the two measures ($r = .18$). It should be noted that descriptive statistics evaluating the Anhedonia and Alogia subscales of the NSRS revealed restricted ranges, which could lead to the attenuation of relationships with other measures.

Further analyses were conducted to better understand the lack of correlation between the NSRS Anhedonia subscale and the SANS Anhedonia-Asociality subscale. Due to the fact that the SANS combines ratings for asociality and anhedonia into one subscale, additional analyses were conducted looking at the relationship between individual items within this SANS subscale and the NSRS Anhedonia subscale. Results indicated that neither the NSRS Anhedonia subscale as a whole, nor the Anticipatory and Consummatory components of the subscale, exhibited any correlations with any of the SANS Anhedonia-Asociality items. Most notable was the lack of correlation between the NSRS Anhedonia subscales and the

SANS Anhedonia item. As addressed below, this lack of relationship could be due to the difference in how each of the measures assess the construct of anhedonia.

The observed lack of relationship between the NSRS and SANS assessment of anhedonia is likely related to the differing manners in which each of the scales assesses the construct. The items that comprise the NSRS Anhedonia subscale seek to assess the capacity to experience pleasures from various activities (i.e. social, physical, recreational/vocational) as well as the frequency of experienced pleasure over the previous week (see Appendix A for specific items). The capacity to experience pleasure is assessed by the NSRS through directly asking each participant to describe how much pleasure they felt during activities over the previous week. In addition, assessment of the frequency of pleasurable events includes all activities deemed pleasurable by the participant regardless of their role in initiating or persisting in the activity. This manner of assessing for anhedonia differs from that of the SANS, which in contrast to the NSRS places an emphasis on the initiation of and participation in pleasurable activities in the assessment of anhedonia. For example, the SANS Anhedonia anchor for a mild deficit states “Does not usually initiate pleasurable activities but often participates in what is offered and enjoys it.” (see Appendix B for additional anchors) The NSRS has a much greater focus than the SANS on the internal experience of pleasure as reported by the patient, in an attempt to not conflate the constructs of pleasure and initiation within the Anhedonia scale as occurs in the SANS. Additionally, the NSRS Anhedonia items explore both ratings of the intensity of recent pleasurable experiences as well as the anticipation of potential future pleasurable experiences, potentially providing a broader view of

hedonic capacity than is tapped by the SANS. These considerable differences in the assessment of anhedonia across the two scales, with the NSRS emphasizing the experience of pleasure and the SANS additionally assessing initiation of activity, likely translate into the observed lack of agreement between the two scales in the ratings of anhedonia. Therefore, when considering these substantial differences in the manner in which anhedonia is assessed, it is relatively unsurprising that these two subscales do not exhibit a relationship.

The lack of correlation between the NSRS Alogia and SANS Alogia subscales was also examined more closely in correlational analyses between the individual items of each subscale. These results revealed relationships between the two NSRS Alogia items, assessing quantity of speech and spontaneous elaboration, and the SANS poverty of speech item ($r = .35$ and $r = .38$, respectively). No relationship was observed between the NSRS Alogia items and the remaining SANS Alogia items (i.e. poverty of content of speech, blocking, latency of response). Given that the items that comprise the NSRS Alogia subscale focus on the quantity of speech, versus the content or quality as is also tapped in the SANS subscale, these results could be expected. Additionally, the fit of SANS Item 9 assessing poverty of content of speech within the construct of alogia has generally been questioned in the literature, given the necessity for production of speech (assessed by Item 8) to evaluate lack of content (Sayers, Curran, & Mueser, 1996). This interdependence between items helps explain the moderate negative relationship observed between the NSRS Alogia items assessing quantity of speech and the SANS Poverty of Content of Speech item ($r = -.26$ to $-.27$), a correlation which likely diminished the overall relationship

between the NSRS and SANS Alogia subscales. In line with analyses completed by Sayers and colleagues (1996), additional analyses were conducted in which the SANS Poverty of Content of Speech item was dropped to assess the resulting correlations between the Alogia subscales. The exclusion of the SANS Item 9 raised the correlation between the NSRS and SANS Alogia subscales from $r = .18$ to $r = .31$, however this relationship did not reach statistical significance ($p = .067$). Overall, while the Alogia subscales of the two measures do not show a relationship, the corresponding items assessing quantity of speech did exhibit adequate convergence.

A second evaluation of the convergent validity of the NSRS was conducted by comparing ratings with the Anergia subscale of the BPRS, which can be used as a broad measure of negative symptoms. It was hypothesized that the NSRS and BPRS Anergia subscale would demonstrate positive correlations. This hypothesis was partially supported, with results revealing correlations between BPRS Anergia subscale and the NSRS Avolition, Blunted Affect, and Alogia subscales (r 's range = .54 to .60). However, relationships were not observed between the BPRS Anergia subscale and the NSRS Anhedonia and Asociality subscales (r 's < .16). Of note, the items of the BPRS Anergia subscale include emotional withdrawal, motor retardation, uncooperativeness, and blunted affect – each of which are based upon in session behavior exhibited by the participant. None of the BPRS Anergia items assess for intensity of pleasure obtained from activities, the frequency of participation in pleasurable activities, or the importance and quality of relationships. Given the item content of this subscale, it is less surprising that the NSRS Anhedonia and Asociality subscales did not demonstrate a relationship with the Anergia subscale. Overall,

these results provide additional support for the convergent validity of the NSRS in that negative-symptom related behaviors rated using the BPRS was correlated with similar content domains within the NSRS.

Analyses were also conducted to examine the relationship between the SANS and the BPRS, with results indicating positive relationships between each of the SANS subscales and the BPRS Anergia subscale. Differing from the above results with the NSRS, the SANS Anhedonia-Asociality subscale was found to be correlated with the BPRS Anergia subscale. It could be hypothesized that these discrepant results across NSRS and SANS measures could be in part due to the item content of the two measures, perhaps more specifically related to the emphasis placed on assessing and rating initiation throughout the SANS Anhedonia-Asociality subscales. Given the relationship observed between both the NSRS and SANS Avolition subscales and the BPRS anergia subscale, as well as the relationship demonstrated between the SANS Anhedonia-Asociality subscale and NSRS Avolition subscale, it is possible that the avolitional component of the SANS Anhedonia-Asociality subscale is driving the correlation with the BPRS Anergia scale.

The fourth hypothesis, also examining convergent validity, posited that there would be positive correlations demonstrated between the clinician-rated NSRS Anhedonia subscale and the TEPS, which is a self-report measure of consummatory and anticipatory pleasure. Results were consistent with this hypothesis, with positive correlations observed between the NSRS Anhedonia subscale and both of the TEPS subscales (i.e. consummatory $r = .37$, anticipatory $r = .43$). Additionally, relationships were also observed when the NSRS Anhedonia subscale was broken

down into its Consummatory and Anticipatory components. The NSRS Consummatory subscale was correlated with the two TEPS scores (i.e. consummatory $r = .35$, anticipatory $r = .43$), while relationships between the NSRS Anticipatory subscale and the TEPS subscales approached but did not reach statistical significance (i.e. consummatory $r = .27$, anticipatory $r = .32$). It is possible that the NSRS Consummatory Anhedonia subscale is in fact more strongly related to the TEPS subscales than the NSRS Anticipatory Anhedonia subscale. However, it is also possible that this difference in the relationship between the two Anhedonia components and the NSRS is an artifact of the limited statistical power due to small sample size which could effect the possibility of reaching significance for smaller magnitude relationships. In addition, the TEPS did not have a relationship with any of the remaining NSRS subscales (i.e. asociality, avolition, blunted affect, alogia). Overall, these results demonstrate good convergence between clinician-rated and self-rated levels of anhedonia as measured by the NSRS and TEPS.

Of note, however, is the lack of direct correspondence between each component of Anhedonia (i.e. anticipatory and consummatory) across the NSRS and TEPS scales. For example, the NSRS Consummatory subscale exhibited very similar correlations with both the TEPS Anticipatory ($r = .43$) and Consummatory ($r = .35$) subscales, where one might hypothesize a stronger relationship to appear between the two Consummatory subscales and a weaker relationship across these two components of anhedonia. One possible explanation for this is the overlap observed between the ratings of anticipatory and consummatory anhedonia, which is present in both ratings using the NSRS ($r = .64$, $p < .01$) and the TEPS ($r = .59$, $p < .01$). These correlations

suggest that ratings of the anticipatory and consummatory components of anhedonia, while not entirely redundant, are robustly related. This relationship could in part explain the lack of specific correspondence between the ratings of each anhedonia component across the NSRS and TEPS.

Similar analyses were carried out assessing the relationship between the SANS and TEPS subscales. Results were somewhat consistent with those seen above, with correlations observed between the SANS Anhedonia-Asociality subscale and the TEPS Anticipatory subscale ($r = .47$). The correlation between the SANS Anhedonia-Asociality subscale and the TEPS Consummatory subscale ($r = .11$) was both non-significant and of a far smaller magnitude than observed between this TEPS subscale and the NSRS Anhedonia subscale. However, these results are consistent with those of a previous study (Gard, Kring, Germans-Gard, Horan & Green, 2007), which also found a correlation of a similar magnitude between the SANS Anhedonia-Asociality and the TEPS Anticipatory subscales ($r = .38$) and a non-significant correlation between SANS Anhedonia and the Consummatory subscale ($r = .17$). Interestingly, the items that comprise the SANS Anhedonia subscale do not directly assess for anticipatory pleasure (Gard, Kring, Germans-Gard, Horan, & Green, 2007), yet it was the only subscale of the TEPS that was related to the SANS Anhedonia-Asociality subscale across both studies. Given that the NSRS, in contrast, demonstrated correlations with both TEPS Anticipatory and Consummatory Anhedonia, these results suggest that the NSRS may tap into an aspect of anhedonia (i.e. consummatory pleasure) that the SANS does not.

The final analyses assessing convergent validity addressed the fifth hypothesis, positing that increased negative symptoms would be related to decreased levels of social functioning. Consistent with previous research stating that measurement of functioning is multifaceted (Bellack et al., 2007; Dickersen, Parente & Ringel, 2000; Penn, Mueser, Spaulding, Hope, & Reed, 1995; Yager & Ehmann, 2006), functioning was measured by both self report of general community functioning and a behavioral assessment of social skill. Previous research has shown a robust relationship between negative symptoms and functioning measures (i.e. Bellack, Morrison, Wixted & Mueser, 1990; Addington & Addington, 2000; Dickersen, Ringel & Parente, 1999; Lysacker & Bell, 1995). However, there has been concern regarding the overlap in item content between the measures assessing the two domains (Addington & Addington, 2000; Bozikas et al., 2006; Milev, Ho, Arndt & Andreasen, 2005; Norman et al., 1999; Shuldberg, Quinlan & Glazer 1999), possibly leading to erroneously high correlations. Of particular concern is the measurement of social success within current negative symptom measures, such as the SANS. In response to this concern, the developers of the NSRS sought to minimize indicators of social success throughout the measure to allow for an emphasis on internal experiences in the measurement negative symptoms. Therefore, it was expected that the relationship observed between the NSRS and social functioning may be attenuated as a result of this attempted reduction in item content overlap. The functioning measures were correlated with both the NSRS and the SANS, to allow for an initial comparison between the performance of the two negative symptoms measures.

First, addressing the relationship between the NSRS and the self-report measure, the Social Functioning Scale (SFS), results generally supported the hypothesis. Correlational analyses revealed that four correlations between the subscales of each measure reached statistical significance. These included the relationship between NSRS Anhedonia and both the SFS Recreation ($r = -.39$) and Pro-Social Behavior ($r = -.42$) subscales. These results indicate that higher ratings of anhedonia were associated with lower levels of Recreation, defined here as how often people participated in various activities (i.e. reading, cooking, hobbies), as well as lower levels of Pro-Social Behavior, assessed by how often participants engaged in activities that could be social in nature (i.e. going to the movies, attending class, going to parties). Additionally, higher ratings of Avolition as assessed by the NSRS were also related to lower levels of Pro-Social Behavior, with a correlation of $-.50$. The final correlation observed was between the NSRS Alogia and SFS Independence Performance subscale ($r = -.39$). These results indicates that high ratings of alogia, characterized by less quantity of speech and spontaneous elaboration, was related to lower levels of performing tasks of daily living (i.e. showering, using public transportation, doing food shopping). These results provide preliminary evidence that although the NSRS sought to remove content that would rate levels of social success, a relationship between negative symptoms and community functioning remains.

Results of correlational analyses between the SANS and the SFS were somewhat similar, with relationships identified between the SANS Avolition-Apathy subscale and the SFS Interpersonal Behavior ($r = -.37$), Recreation ($r = -.34$), and Pro-Social Behavior ($r = -.46$) subscales. These findings indicate that higher levels of

Avolition-Apathy as measured by the SANS was related to lower levels of Interpersonal Behavior, which on the SFS includes items rating as how often participants start conversations, how many friends they have, and how difficult they find it to talk with people. Additionally, higher ratings of Avolition-Apathy were related to lower ratings of Recreation and Pro-Social behavior, which are described in more detail above. In comparing these results to those observed between the NSRS and SFS, there is a similar number of statistically significant correlations between each negative symptom measure and the SFS. However, with the exception of the relationship demonstrated between the Avolition subscales of both measures and the Pro-Social Behavior subscale of the SFS, there was little consistency across the measures as to which subscales demonstrated significant correlations. Of note, the small sample size and resulting modest statistical power may have resulted in fewer significant correlations than may have been observed had there been more subjects included in the analyses. Therefore, these analyses should be considered preliminary and require further study for replication.

The second set of analyses assessed the relationship between the negative symptom measures and the MASC (Bellack, Sayers, Mueser & Bennett, 1994), with the expectation that social skill would demonstrate a negative relationship with negative symptoms. Results of correlational analyses between the NSRS and MASC revealed a relationship between the NSRS Anticipatory Anhedonia and the MASC Conversation Content subscales ($r = -.44$). Additionally, the correlations between Anticipatory Anhedonia and the remaining two MASC subscales (i.e. Nonverbal Content, Effectiveness) were each of a similar magnitude, although they did not reach

statistical significance. These results will be discussed further below. While correlations between the NSRS Alogia subscale as a whole and the MASC subscales did not reach significance, the NSRS Alogia item rating spontaneous elaboration was significantly related to each of the MASC subscales with correlations ranging from -.41 to -.43. Of note, analyses conducted between the TEPS and the MASC did not replicate this relationship between anticipatory anhedonia and social skill. This could suggest that there may be unique aspects of the clinical interview that cannot be simply replaced by a questionnaire. Additionally, the content of the TEPS heavily taps into the construct of physical anhedonia, more so than social anhedonia, which could also account for the lack of correlation with a social functioning measure

The results obtained from analysis of the relationship between the SANS and the MASC were generally similar, with correlations observed between the SANS Alogia subscale and each of the MASC subscales – with correlations ranging from -.44 to -.48, a result which will be further discussed below. In addition, the SANS Affective Flattening subscale was correlated with the MASC Nonverbal Content subscale ($r = -.40$).

A particularly interesting result is the observed relationship between the NSRS Anticipatory Anhedonia subscale and the MASC subscales (r 's = -.31 to -.44), as discussed above, and the comparative lack of relationship between the NSRS Consummatory Anhedonia subscale and the MASC subscales (r 's < -.05). These results suggest that a deficit in anticipating pleasure is related to lower ratings of social skill in the role play task. There are several post hoc interpretations of this result. First, it is possible that these results suggest that an anticipatory pleasure

deficit in some way underlies social skill deficits. This viewpoint is generally consistent with that of Gard and colleagues (2007), who hypothesized that deficits in the anticipatory component of anhedonia would have a selective relationship with functional outcome. The results of their study generally supported this hypothesis, with anticipatory but not consummatory anhedonia exhibiting a significant relationship with family functioning and social networks. These findings led the authors to further conjecture that anticipatory pleasure may play a role in social isolation and limited social engagement (Gard, Kring, Germans-Gard, Horan & Green, 2007). The results of the present study, associating anticipatory anhedonia and a measure of social functioning, could be interpreted as consistent with these hypotheses.

A second potential explanation for this relationship could be the presence of shared cognitive abilities or demands involved in completing both the anticipatory anhedonia interview questions and the role play task, as both tasks require the participant to imagine or think hypothetically. For example, the anticipatory anhedonia questions ask the participant to think forward to the next few weeks and consider what they might enjoy during that time. Based on clinical experience with administering the interview, it was apparent that some participants had difficulty answering these future oriented questions. At times, answers would approximate “I don’t know because that has not happened yet.” As discussed in a 2006 paper by Gard and colleagues, anticipatory pleasure involves the ability to create an image of a future stimulus or event (Berridge & Robinson, 2003) in order to predict what will be pleasurable (Gard, Germans-Gard, Kring & John, 2006). In a somewhat similar

manner, the role play task also requires the participant to imagine a hypothetical situation in order to act out a scene with the study interviewer. Therefore, this interpretation of the results would suggest that the relationship demonstrated between an anticipatory pleasure deficit and social skill as measured by the MASC is not direct, but rather the result of a third variable associated with the cognitive burden of the two tasks. Given the lack of cognitive measures in the current study, this hypothesis could not be examined with this data. However, some research suggests that working memory may be a cognitive variable to examine in future studies, as it has previously been related to the ability to predict or anticipate rewarding stimuli in people with schizophrenia (Burbridge & Barch, 2007; Heerey & Gold, 2007). Additionally, this line of future research is consistent with increased interest throughout the literature on specific cognitive correlates of social functioning (i.e. Cohen, Forbes, Mann & Blanchard, 2006; Green et al., 2000)

Additionally, these results demonstrate a consistent negative relationship between MASC ratings and alogia as assessed by both negative symptoms measures. Therefore, those participants who demonstrated less speech throughout the negative symptom interviews were also independently rated as less skilled during the role play task with regards to Conversation Content, Nonverbal Content, and Overall Effectiveness. This finding relating alogia to social skill as rated by the MASC is understandable when considering that the ratings of all three MASC subscales contain components related to speech. Specifically, the ratings of Conversation Content are generally made based on the ability of the subject to engage in spontaneous conversation, appropriately answer questions, and ask relevant questions. The Non-

Verbal Content subscale involved ratings the participant on paralinguistic features of speech, including tone, volume, pace, and inflection, as well as non-verbal behaviors such as facial expression, gestures, and posture. In addition, ratings of this subscale are based on the ability of the participant to speak clearly, fluently, and maintain a smooth flow in conversation. The final subscale of the MASC, rating Effectiveness, assessed the participant on the ability to stick to the goal of reaching a solution within the role play, as well as the ability to generate solutions and make compromises. Clearly, each of these subscales require appropriate levels of speech production by the participant throughout the role play to obtain ratings of good social skill, leading to convergence with the ratings of alogia (Bellack, Sayers, Mueser & Bennett, 1994).

In summary, the NSRS was shown to relate to both self-reported community functioning as measured by the SFS as well as to behavioral skill as measured by the MASC. These results are consistent with previous research which has also found negative relationships between negative symptoms and social functioning (i.e. Addington & Addington, 2000; Van der Does, Dingemans, Linszen, Nugter & Scholte, 1996) and social skill (i.e. Bellack, Morrison, Mueser & Wade, 1989; Patterson, Moscona, McKibbin, Davidson & Jeste, 2001; Sitzer, Twamley, Patterson & Jeste, 2007). The present findings are important as the NSRS has sought to eliminate content that focuses on social success to allow for a more exclusive focus on experiential deficits. A concern had been that this approach would limit the NSRS's association with social functioning. Importantly, the current results clearly indicate that despite the NSRS's altered focus, this measure of negative symptoms

appears to continue to tap deficits directly associated with impairments in social functioning.

Discriminant Validity

The sixth and final hypothesis of the current study posited that the NSRS would show adequate discriminant validity, by demonstrating no relationship with either positive or depressive symptoms. To assess this hypothesis, correlations were conducted between the NSRS and the BPRS, measuring positive and mood symptoms, and the CDSS, assessing depression. Results fully supported this hypothesis, as there were no relationships observed between the NSRS and the BPRS subscales (i.e. thought, affect, disorganization) or the CDSS. Therefore, the NSRS was found to be independent from these measures of positive and depressive symptoms. These results are consistent with prior findings demonstrating that negative symptoms are largely independent of other symptom domains (Blanchard & Cohen, 2006).

The discriminant validity of the SANS was evaluated as well, also using the BPRS and CDSS as measures of positive and depressive symptoms. These results revealed two statistically significant correlations, the first between the SANS Anhedonia-Asociality subscale and the BPRS Thought Disorder subscale ($r = .33$). The second relationship was observed between the SANS Alogia subscale and ratings of depression by the CDSS ($r = .34$). Given the presence of correlations between the SANS and other non-negative symptom domains, and the lack of correlation demonstrated between those domains and the NSRS, the results provide some

evidence that the NSRS may perform better than the SANS with regards to discrimination from positive and depressive symptoms.

These discriminant validity results are of particular importance when considering the measurement of negative symptoms within a drug or psychosocial treatment trial, when the measurement of negative symptoms in a manner which provides ratings independent from other symptoms domains would be critical. Within this context, such a measure would allow the investigator greater confidence that observed improvement in negative symptoms is in fact just that – rather than improvement in psychosis or depression, which then affects ratings on the negative symptom scale. Based upon the present study, there is some initial evidence that the NSRS may be superior to the SANS in this respect, as the NSRS demonstrated no correlations with positive or depressive symptoms. These results, of course, warrant further investigation and replication in larger scale studies.

Limitations

This study has a number of limitations that are important to note. First, the modest sample size used for analyses greatly reduced statistical power, making it more difficult to detect smaller effect sizes. Post-hoc power analyses indicate that with the current sample size of $N = 38$, the power to detect an effect size of .40 is only 0.74 and the power to detect an effect size of .30 drops to .47. Sample size and resulting power was a particular problem for analyses that included MASC data, as there was a relatively large amount of missing data. The next psychometric study of the NSRS seeks to recruit 300 participants to ensure adequate statistical power, and

allow for additional analyses that could not be completed here (i.e. Item Response Theory, factor analysis).

Second, the sample of participants was largely homogenous with respect to gender and race. Specifically, the sample was almost entirely male and African-American, which is consistent with the demographics at each of the recruitment sites located in and around Baltimore City. This lack of range within the sample demographics may limit the generalizability of these results to females and those not of African-American race. Additionally, the combination of the homogeneity of sample demographics and the low sample size precluded analyses examining gender or racial differences. Previous research has consistently indicated the presence of gender differences demonstrating that females tend to exhibit less severe negative symptoms than males (i.e. Gur, Petty, Turetsky & Gur, 1996; Haas & Sweeney, 1992; Moriarty et al., 2001). Given this finding throughout the literature, it will be important to evaluate gender differences in future evaluations of the NSRS. Recruitment conducted in varied geographical areas and a substantially increased sample size proposed in future studies should allow for such analyses to be conducted.

A third limitation of this present study is the lack of normative data. The NSRS is a measure developed for use with clinical populations, designed to assess for deficits within the domain of negative symptoms. However, the anchors of the current NSRS were developed based on assumptions of what is normal, and thus also of what is considered pathological. These assumptions, however, may not be correct. For example, the measurement of the frequency of pleasurable experiences in the

anhedonia section of NSRS in this study revealed that the vast majority of individuals identified seven or more pleasurable activities in the past week. As a result, most participants received a “0” or non-pathological rating on those items. It is thus possible that the NSRS authors grossly underestimated the occurrence of pleasurable experiences in the lives of those with schizophrenia. Beyond this, there is currently no information regarding what would be considered a typical number of pleasurable experiences in various domains (i.e. social, physical, recreational/vocational) in a normative sample, which then does not allow for a determination of what would be considered a deficit in these areas. Therefore, future research seeking to learn more about the hedonic world of both normative samples and those with schizophrenia would be useful. While the anhedonia section of the measure provides a good illustration of the issues raised by not having normative data, the same concern certainly holds for the remaining subscales as well. In general, the collection of normative data for the NSRS would help empirically determine what is pathological versus non-pathological in the rating of negative symptoms.

Summary of Findings and Future Directions

Despite the above limitations, the results of this initial psychometric evaluation of the NSRS are generally quite encouraging, and provide information that has helped inform data-driven modifications for upcoming validation studies. With regards to reliability, the NSRS demonstrated adequate internal consistency for the scale as a whole, and three of the five subscales. The results indicated that the Asociality and Avolition subscales warrant further revisions or modifications to improve internal consistency. Additionally, three of the five subscales were found to

have good to excellent interrater reliability, with the Avolition and Alogia subscales falling in the fair range. Again, these results suggest that modifications to these subscales would be useful with regards to anchors or interviewer training to improve the reliability of ratings.

Results generally demonstrated adequate convergent validity between the NSRS and other measures of negative symptoms, namely the SANS and the BPRS Anergia subscale. One exception to this finding was the lack of relationship between the ratings of anhedonia across the two measures, which may be explained by differing manners in which the construct of anhedonia is assessed. Additionally, results indicated general convergence between clinician-rated anhedonia using the NSRS and self-reported anhedonia as measured by the TEPS. In examining the relationship between the NSRS and measures of community functioning and social skills, as rated by the SFS and MASC respectively, some convergence was observed. Therefore, the results suggest that although social success content was largely removed from the measurement of negative symptoms by the NSRS, the expected relationship between negative symptoms and functioning remained. Finally, the NSRS showed discrimination from ratings of psychotic and depressive symptoms.

Overall, the results of this study indicate that NSRS appears to be a viable measure for the assessment of negative symptoms, with promising results in the areas of reliability, convergent validity, and discriminant validity. The results of the present study also point to areas in which revisions are necessary, as expected, and have already been used to inform revisions of the measure.

Such revisions to the NSRS have been made across the domains of the measure, in an attempt to improve both reliability and validity. One change that is in the anchors for each item from 0 to 6, to 0 to 4. This change was made due to the general difficulty in identifying meaningful distinctions between all seven anchors in the original rating scale used in the present study, as well as data showing that the range of available ratings was not being used. With regards to the subscales of the measure, the most substantial revisions have been made in the Anhedonia and Asociality sections, which will be briefly reviewed below.

A number of changes have been made within the Anhedonia section of the NSRS as a result of findings from the current study. These changes include using a “Rating of Pleasure” likert scale in the assessment of intensity of pleasure, rather than eliciting adjectives from the participant (i.e. good, ok, fun, great). Throughout the present study, it became clear that the participants ability to provide adjectives to describe the amount of pleasure they experienced in a given situation may be influenced by education, severity of alogia, or other factors. The likert scale will allow for a standardized rating of intensity of pleasure, and will be used in future studies of the NSRS. Also within the Anhedonia section of the measure, significant changes were made to the rating anchors in an attempt to capture a larger range of experiences – as the present study resulted in a very limited range of scores for this subscale. Anchors were changed from obtaining a count of experiences to determine the frequency (i.e. 7 pleasurable social experiences was rate a 0 or non-pathological), to determining the range of experiences within each domain and how often the participant experienced these varying experiences. For instance, a rating of “0” (no

impairment) is now “MANY different types of pleasurable experiences daily or near daily” and a rating of “4” (severe deficit) is now “No more than a COUPLE of isolated experiences of pleasure during the last week”

A number of probe questions have been added to the Avolition subscale of the NSRS, as it became clear that they were not symmetrical across the Avolition domains (i.e. social interactions, work / vocational / school activities, recreation / hobbies / pastimes). These modifications were mentioned above in reference to an attempt to improve internal consistency within this domain. Additionally, the added probes provide a more structured framework for assessing the motivation (versus behavioral) piece of Avolition which was lacking in the original version used in the present study. For instance, within the social domain the probe question “Were there times during the past week when you didn’t feel much interest in talking to other people or preferred to be alone? Why?” was added. Similarly, within the Work/Vocational/School activities domain, probes such as “Were there things you meant to do or were supposed to do but just never got around to doing them? Why?” was added. These additional probes will be tested in the next study of the NSRS.

Looking to the future, the NSRS is set to be further evaluated in a larger scale study through a multisite R01 recently funded by NIMH to be completed over the next three years. The Collaboration to Advance Negative Symptom Assessment in Schizophrenia (CANSAS) project will be conducted at four sites including the University of Maryland (PI: Dr. Jack Blanchard), University of Pennsylvania (PI: Dr. Raquel Gur), UCLA (PI: Dr. Bill Horan), and University of California – Berkeley (PI: Dr. Ann Kring). The first study of this grant will evaluate the psychometrics of the

NSRS in approximately 300 outpatients (75 participants per site) with schizophrenia or schizoaffective disorder, using a beta version of the NSRS which includes revisions based on the results of the current study. Study 1 of the CANSAS grant will focus on assessing interrater reliability, item and scale psychometric properties, and discriminant validity. The large sample size of the this first CANSAS study will allow for more sophisticated data analyses than was feasible in the current study, such as Item Response theory, to assist in further data driven refinements to the measure. Additionally, the larger sample size will also allow for the investigation of the factor structure of the measure, as well as identify any gender differences that may be present. Following the first study, additional modification will be made to the measure, in which items determined to be problematic will either be revised or eliminated.

Conclusion

The development of the NSRS has provided the first step towards improved measurement of negative symptoms through addressing many of the limitations observed in existing negative symptom measures. The present study, as the first empirical assessment of the psychometric properties of the NSRS, has demonstrated encouraging results within the domains of both reliability and validity. In addition, this investigation has provided valuable information that is necessary for making revisions and modifications to the measure prior to larger scale evaluation. While the results presented here require replication, they provide initial evidence for the viability of the NSRS as a next generation negative symptom measure that is worthy of further research.

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