ABSTRACT

Title of Document:	AN INITIAL ASESSMENT OF THE CONVERGENT VALIDITY OF THE NEGATIVE SYMPTOM RATING SCALE: THE RELATIONSHIP BETWEEN BEHAVIORAL CODINGS OF EXPRESSED FACIAL AFFECT AND CLINICAL RATINGS OF BLUNTED AFFECT
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Schizophrenia is a severe mental illness that represents a significant public health burden. No treatments are FDA approved for negative symptoms of schizophrenia, primarily because there is no valid, reliable measure for negative symptoms. A new negative symptom measure, the Negative Symptom Rating Scale (NSRS), is in the initial phases of validation. The current study assesses the convergent validity of the scale by examining the relationship between the NSRS and expressed facial affect. The study also sought to clarify the relationship between expressed facial affect and functioning. The results revealed a significant relationship between expressed facial affect and the NSRS subscale of blunted affect, as predicted. However, there was not a significant relationship between expressed facial affect and functioning. These results provide initial evidence for the convergent validity of the

scale. Currently, there is an ongoing research study to further assess the reliability

and validity of the NSRS.

AN INITIAL ASESSMENT OF THE CONVERGENT VALIDITY OF THE
NEGATIVE SYMPTOM RATING SCALE: THE RELATIONSHIP BETWEEN
BEHAVIORAL CODINGS OF EXPRESSED FACIAL AFFECT AND CLINICAL
RATINGS OF BLUNTED AFFECT

By

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Chapter 1: Introduction

Background

Schizophrenia is a severe mental illness that affects approximately one percent of the general population (Jablensky, 2000). According to the DSM-IV (American Psychiatric Association, 2000), two or more of the five hallmark symptoms, including delusions, hallucinations, disorganized speech, grossly disorganized or catatonic behavior, and negative symptoms (i.e., affective flattening, alogia, or avolition), must be present for a significant portion of time over a period of one month to receive a diagnosis of schizophrenia. Additionally, 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). 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). One such categorization is the positive-negative dichotomy (Andreasen, 1982). "Positive" refers to overtly psychotic symptoms, such as delusions and hallucinations, and "negative," refers to symptoms characterized by loss of functioning, such as reduced emotional expression (blunted affect) and diminished ability to experience pleasure (anhedonia).

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). In the last twenty-five years, much research has been conducted regarding the positive-negative symptom distinction resulting in well-replicated findings that demonstrate a relationship between negative symptoms and both poor premorbid functioning and various indicators of poor prognosis (Earnst & Kring, 1997) including impaired social functioning (Schuldberg, Quinlan, & Glazer, 1999), quality of life (Addington & Addington, 2000; Ho, Nopoulos, Flaum, Arndt, & Andreasen, 1998; Hofer, Baumgartner, Edlinger, Humer, Kemmler, Rettenbacher, et al., 2005; Norman, Malla, Cortese, Cheng, Diaz, McIntosh et al., 1999; Norman, Malla, McLean, Panth, Voruganti, Cortese et al., 2000), social problem solving skills (Addington & Addington, 2000; Patterson, Moscana, McKibbin, Davidson, & Jeste, 2001), residential independence (Dickerson, Ringel, & Parente, 1999; Hofer, Baumgartner, Edinger, Humer, Kemmler, Rettenbacher, et al. 2005; Siegal, Irani, & Brensinger, 2006), and occupational functioning (Breier, Schreiber, Dyer, & Pickar, 1991; Evans, Meyers, Kim, Lysaker, Gibson, et al., 2004; Fenton & McGlashan, 1991; Hoffman, Kupper, Zbinden, & Hirsbrunner, 2003; Lysacker & Bell, 1995; McGurk & Meltzer, 2000; Schuldberg et al., 1999). 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). While negative symptoms are incredibly disabling, no medication has demonstrated clinically

significant improvement in negative symptoms (Buckley & Stahl, 2007), and no drug

has received Food and Drug Administration (FDA) approval for the treatment of

negative symptoms (Kirkpatrick, Fenton, Carpenter, & Marder, 2006).

NIMH Negative Symptom Consensus Conference

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

et al., 2006). The Measurement and Treatment Research to Improve Cognition in

Schizophrenia (MATRICS) project was organized, in collaboration with negative

symptoms researchers, to specifically address the challenge of effectively treating the

negative symptoms domain (Kirkpatrick et al., 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 because the limitations of existing negative symptom measures are

serious and substantial.   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). Measurement issues in commonly used negative symptom

assessment instruments will be reviewed below.

Measurement of Negative Symptoms

The following is a brief overview of the development, initial validation and

limitations of three of the most widely used instruments measuring negative

symptoms. Although several negative symptom scales are available, 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). Such inconsistencies in measurement likely account for

the variability of results in the research literature and hinder the interpretation of

findings across studies (Earnst & Kring, 1997).

Brief Psychiatric Rating Scale

One of the most widely used general psychiatric scales is the Brief Psychiatric

Rating Scale (BPRS; Overall & Gorham, 1962), which 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 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.

Scale for the Assessment of Negative Symptoms

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. The final item for each symptom domain is a global rating of severity. Results of the initial evaluation of the SANS demonstrated high levels of inter-rater reliability for each item as well as good internal consistency (alpha = .885) as determined using the composite score (Andreasen, 1982). Negative symptom domains on the SANS have been shown to be highly correlated with each other (Peralta, Cuesta & de Leon, 1995). However, analyses revealed that inappropriate affect exhibited a low correlation with affective flattening raising questions regarding its appropriateness as a measure of negative symptoms.

Positive and Negative Symptom Scale

In an attempt to improve upon both the BPRS and the SANS, Kay, Fizbein, & Opler and (1987) developed the Positive and Negative Syndrome Scale (PANSS; Kay et al., 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 symptoms, negative symptoms and 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). Initial evaluation of the PANSS demonstrated high levels of inter-rater, 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. Negative symptom domains on the PANSS have been found to be highly correlated with each other (Peralta et al., 1995). 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 Measures

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 et al., 1991). These item issues have been noted by various investigators (Kay, 1990; Kay et al., 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, 1994; 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). Furthermore, a 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. Moreover, neither the SANS nor the PANSS delineate behavior from affective states, desire, or environmental factors that could limit behavior. For example, a person with schizophrenia may not engage with others socially, because they cannot afford transportation. Thus, the SANS and the PANSS do not take into account other factors that could influence behavior and be mistaken for negative symptoms. Additionally, this problem may be the cause of the high correlation between these measures and functional outcome measures, because they are so behaviorally based. Thus, these measures may reflect functional outcomes rather than actual negative symptomatology. There are clearly a number of significant limitations associated with the current instruments used to assess negative symptoms.

The Negative Symptom Rating Scale

In response to the need for an improved measure that addresses concerns with previous scales, a NIMH-MATRICS workgroup developed the *Negative Symptoms*

Rating Scale (NSRS). 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. This differentiation is important, because often those with schizophrenia may live in impoverished environments, which, in turn, influences their behavior. Thus, those with schizophrenia may have interest in being social or being employed, but environmental factors, such as lack of transportation or disability status, may result in a lack of social behavior or a lack of employment. Therefore, it is important to distinguish between interest and actual behavior in order to properly assess for negative symptoms. 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.

Figure 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

Subscales of the Negative Symptom Rating Scale

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 was 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 speech produced in responding to the NSRS interview. Other speech abnormalities, such as disorganization, neologisms or psychotic content are not rated here. For the spontaneous elaboration item, interviewers rate the amount of information given beyond what is strictly necessary in order to respond to the NSRS questions. Whether or not the responses are appropriate is not considered.

With regards to the overall organization of the NSRS, the instrument is formatted as a semi-structured interview with numerous prompts and queries provided for each item. 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").

Validation of the Negative Symptom Rating Scale

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Blunted Affect

Blunted affect is a key component of the negative symptom construct. In terms of measurement of negative symptoms, blunted affect has been a fundamental element of every negative symptom instrument (i.e., BPRS; Overall & Gorham, 1962; SANS; Andreasen, 1982; PANSS; Kay et al., 1987). Additionally, blunted affect was included in the MATRICS consensus statement as a primary domain within the negative symptom concept (Kirkpatrick et al., 2006).   Thus, blunted affect has historically been a key component in both the construct and measurement of negative symptoms (Kirkpatrick et al., 2006).

Blunted affect is also reliably associated with other negative symptoms, as well as emerging as an independent factor in studies examining the structure of negative symptoms. Specifically, analyses of the SANS and the PANSS have revealed that blunted affect is correlated with asociality (Kelley, van Kammen, & Allen, 1999; Peralta & Cuesta, 1999), anhedonia (Kelley et al., 1999; Peralta & Cuesta, 1999) and alogia (Peralta & Cuesta, 1995). Additionally, within factor

analyses of the negative symptom construct, diminished expression and blunted affect consistently emerge as a unique factor (Blanchard & Cohen, 2006; Keefe, Harvey, Lenzenweger, Davidson, Apter, Schmeidler, et al., 1992; Kelley et al., 1999; Peralta & Cuesta, 1999).

The construct of blunted affect, as defined by the NSRS, comprises deficits several different behaviors including facial affect, vocal expression, expressive gestures, eye contact, and spontaneous movements. Thus, diminished emotional expression through facial affect and vocal expression are two components of this construct. Diminished emotional expression has been reliably measured in many laboratory studies. Literature on laboratory studies of diminished emotional expression is reviewed below.

Negative Symptoms and Emotion

Laboratory studies have provided evidence for reduced emotional expressivity in response to evocative stimuli in those with schizophrenia (Berenbaum & Oltmanns, 1992; Dworkin et al., 1996; Kring, Kerr et al., 1993; Kring & Neale, 1996; Wolf et al., 2006). In these studies, researchers measure emotional experience and expressivity via expressed facial affect, self-report, clinican-rated interviews and electrodermal activity. In comparison to nonclinical control groups, those with schizophrenia express less facial emotion in response to a wide range of situations employing various types of stimuli intended to produce emotion (Berenbaum, & Oltmanns, 1992; Dworkin, Clark, Amador, & Gorman, 1996; Kring et al., 1993; Kring & Neale, 1996; Wolf, Mass, Kiefer, Wiedemann, & Naber, 2006) and during a task that requires retelling emotional memories (Brozgold, Borod, Martin, Pick,

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Alpert, & Welkowitz, 1998). Of note, this reduced emotional expressivity is also apparent while those with schizophrenia are participating in social interactions (Aghevli, Blanchard, & Horan, 2003).

Additional studies have examined whether individuals with schizophrenia can intentionally change facial displays of emotion. One study examined the relationship between emotional expression, experienced emotion and negative symptoms in schizophrenia (Henry, Rendell, Green, McDonald, & O'Donnell, 2008). Participants with schizophrenia and a nonclinical comparison group viewed comedic film clips while employing emotion regulation strategies. Specifically, participants were asked to "amplify" their facial expressions of emotion (by displaying more facial affect) or to "suppress," or reduce, their emotional expressivity. Compared to controls, those with schizophrenia were found to have deficits in amplifying their emotions, but not in suppressing emotionally expressive behavior (Henry et al., 2008). Interestingly, these deficits in the ability to amplify emotional expressions were significantly correlated with total negative symptomatology. More specifically, a deficit in the ability to amplify expressed emotions was correlated with emotional blunting (Henry et al., 2008).

In summary, blunted affect is a key component of the negative symptom construct and can be reliably measured via facial displays of affect. Correlating behavioral coding of expressed facial affect with the NSRS will move beyond standard clinical ratings of blunted affect in order to determine whether the NSRS correlates with independent behavioral ratings of facial affect providing convergent validity for the scale. Through examining independent behavioral ratings, the

relationship between expressivity and negative symptoms can be explored. Since

negative symptoms are highly correlated with each other, behavioral ratings of facial

affect should also correlate with other negative symptoms (i.e., anhedonia, avolition,

alogia and asociality). In a pilot study employing the NSRS, negative symptoms

were independent of psychotic and depressive symptoms (Forbes et al., manuscript in

preparation). Since FACES ratings are expected to be correlated with negative

symptoms, it is also expected that they will be independent of psychotic and

depressive symptoms. Additionally, the relationship between expressed facial affect

and functioning will be examined.

Expressed Facial Affect and Social Functioning

A secondary aim of the current study is to examine the relationship among

expressed facial affect and functioning. Poor functioning, which includes social

functioning, work functioning and independent living skills, among other domains, is

a hallmark of schizophrenia. Deficits in social functioning are apparent in both the

premorbid phases of schizophrenia and throughout the course of the illness

(Addington, Penn, Woods, Addington & Perkins, 2008; Cannon, Jones, Gilvarry,

Rifkin, McKenzie, Foerster, & Murray, 1997). Individuals with schizophrenia often

identify problems in functioning as being as distressing as symptom domains such as

hallucinations and delusions (Bengtsson-Tops & Hansson, 1999). Clearly, enhancing

our understanding of functioning deficits in schizophrenia would have significant

benefit. However, specific contributions to these deficits are unclear. In the following

section, the relevant literature concerning a contributing factor, emotional expression,

is reviewed.

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One factor, which may contribute to functioning in individuals diagnosed with schizophrenia, is a deficit in emotional expression. An essential element of effective social interactions is the expression of emotion, and the inability to express emotion effectively can cause the deterioration of the relationship (Keltner & Kring, 1998). Blunted affect, in particular, is associated with deficits in the expression of emotion and may contribute to poor social functioning in schizophrenia. Within schizophrenic patient populations, deficits in facial emotional expression are noticeable during social interactions (Aghevli et al., 2003). Additionally, as discussed previously, this population is unable to amplify emotional facial expressions (Henry et al., 2008). Arguably, the ability to intensify one's display of facial affect can be important in the communication of social interest to others. Additionally, other social skills, such as interest in one's communication partner, are considered to be essential in social communication (Kopelowicz, Liberman & Zarate, 2006). Those with schizophrenia have noticeable deficits in these basic social skills (Kopelowicz et al., 2006). Thus, while participating in social interactions, those deeply affected by the negative symptoms of schizophrenia are likely not giving appropriate social cues, such as smiling, and making proper eye contact, which, in turn, causes them to be less socially effective (Blanchard & Panzarella, 1998). However, the precise relationship between expressed facial affect and functioning remains unclear.

In summary, schizophrenia is associated with deficits in several domains of functioning. Expressed facial affect plays a major role in social relationships. However, the exact relationship between deficits in facial affect and level of

functioning remains unknown. One way to examine this relationship is to relate

behavioral codings of expressed facial affect to functioning in schizophrenia.

Chapter 2: Rationale

Negative symptoms in schizophrenia are a major determinant of the social and occupational impairments that characterize the disorder, a significant source of distress for caregivers, and predictor of poor long-term outcome. Despite 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.

Although the NSRS is the result of an ongoing collaborative NIMH-led effort over the last two 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 current study will provide a rigorous assessment of the convergent validity of the NSRS by examining its relationship to behavioral coding of expressed facial affect. Specifically, the relationship between expressed facial affect and clinical ratings of blunted affect and other negative symptoms are explored. Consistent with findings that the NSRS was not related to depression or psychotic symptoms, it was also predicted that behavioral ratings of facial affect would not be related to depression or psychotic symptoms. A second aim of the study is to assess

the relationship between expressed facial affect and functioning. Thus, the current

study will provide new information about the validity of an important negative

symptom instrument as well as contribute to current understanding of functional

deficits within schizophrenia.

Hypotheses

Aims and hypotheses are as follows:

1. Aim 1 was to assess the convergent validity of the NSRS. This aim was

   addressed in two ways. First, behavioral displays of facial affect during an

   interview were coded and subsequently related to the NSRS. It was

   hypothesized that behavioral codings of expressed facial affect would be

   negatively associated with clinically-rated blunted affect on the NSRS such

   that lower expressed facial affect will be associated with higher clinical

   ratings of blunted affect on the NSRS. In addition, due to the high correlation

   among negative symptoms, it was predicted that behavioral coding of facial

   affect would also correlate negatively with all subscales of the NSRS.

2. The second aim examined whether specific facets of the behavioral coding of

   facial affect (i.e., duration, intensity, and frequency of facial affect) were more

   strongly related to clinical ratings of blunted affect. This exploratory aim

   provides important insights as to what type of information clinical raters are

   most reliant on determining blunted affect scores, which may aid in further

   revising the NSRS.

3. In a pilot study of the NSRS, it was determined that the measure was independent of psychotic and depressed symptoms. Similarly, it was hypothesized that psychotic symptoms and depression would not be related to behavioral ratings of expressed facial affect.

4. Finally, the relationship between behavioral coding of facial affect and functional outcome was explored. It was predicted that greater intensity, duration and frequency of facial affect would be positively associated with functional outcome.

Chapter 3: Method

Design and Methodology

Participant Recruitment and Inclusion/Exclusion Criteria

Data from the current study were derived from a larger study aiming to assess reliability and validity of the NSRS. Participants were recruited from the Mental Health Service Lines at the Baltimore Veterans Administration Medical Center (VAMC), the Perry Point VAMC, the Walter P. Carter Center, and the Maryland Psychiatric Research Center (MPRC). Participants included 38 outpatients diagnosed with schizophrenia or schizoaffective disorder. Inclusion criteria are as follows: (1) diagnosis of schizophrenia or schizoaffective disorder as determined by medical record review, and (2) age between 18 and 65 years. Exclusion criteria are as follows: (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.

Procedure

Mental health clinicians employed at the Baltimore and Perry Point VAMCs, Walter P. Carter Center, and the MPRC were familiarized with the study aims and inclusion/exclusion criteria. Then, we asked mental health clinicians to identify patients diagnosed with schizophrenia or schizoaffective disorder who were potentially interested in participating in the current study. If the participant met study inclusion and exclusion criteria, as determined by the mental health clinician, he/she were referred to the study interviewer who provided the participant with a description of the study procedures and obtained informed consent. After providing consent, participants underwent a full assessment battery including demographic information, measures assessing negative symptoms, social functioning, general psychopathology and self-reported depressive symptomatology. Assessments were conducted by masters-level interviewers who achieved adequate reliability for each of the measures in the assessment battery. In order to ensure ratings made for one measure (i.e., NSRS) were not biased with information provided in another measure (i.e., SANS), independent interviewers administered the two negative symptom measures. All interviews were videotaped for later evaluation by an independent second rater in order to check rater agreement. The entire assessment lasted approximately 2 hours, and participants were compensated $25 for their time.

Of the 38 videotaped interviews, 6 videotapes were compromised (i.e., the videotape did not record, or the interview got cut-off before the NSRS section).

Thus, no data could be collected on these 6 participants. This left a final sample of 32 participants. Participants' videotapes were reviewed and coded using the Facial Expression Coding System (FACES). Originally, the FACES analyses were planned on two separate sections of the NSRS (the anhedonia and blunted affect subscales). These sections were chosen because they include questions that elicit emotional responses (i.e., "Tell me how you would feel if you spent time with your friends this week") and, thus, were the most likely portions of the interview to include displays of facial affect. Prior research studies have found adequate results with approximately 4-6 minutes of sampling (Kring & Neale, 1996; Kring et al., 1993); 2 portions of the interview that are each 5 minutes in length are an appropriate amount of time for coding. However, once analyses were underway, it was determined that many participants did not have 5 full minutes of interview for the blunted affect section. Length of interview ranged from 0 seconds to 5 minutes with an average of 1 minute and 11 seconds. Because the amount of interview available for coding was so varied, and rating would be impossible to perform on a subgroup of participants (i.e., those with less than 1 minute), it was determined that the FACES ratings for the blunted affect section should be excluded from the current study. Subsequent analyses were conducted on the anhedonia section of the NSRS interview, which consisted of the first 5 minutes of the Anhedonia section of the interview. The anhedonia subsection elicits a discussion of pleasurable activities and allowed the participant a chance to express emotion.

For FACES ratings, agreement between the two coders was established during a training period using videos of participants who were not included in the study.

During the training period, coders were supervised by Dr. Blanchard and discussed

the procedures for the facial expression ratings. Once all coders had an understanding

of how to accurately rate these dimensions, they began rating tapes individually, and

agreement was calculated statistically across the entire set of ratings (as described

below). All videotapes were rated independently by two separate coders. Raters

were blind to the participants' ratings on the NSRS and other study measures. All

FACES ratings were made on the NSRS videotapes without audio.

<u>*Measures*</u>

Symptom Measures

Various symptom assessments were utilized in the current study to determine

their relationship with the NSRS and expressed facial affect. Negative symptoms

were evaluated utilizing the NSRS. The BPRS provided information regarding

general level of current psychopathology and psychotic symptoms. Depression was

assessed with the Calgary Depression Scale for Schizophrenia (CDSS: Addington,

Addington, & Maticka-Tyndale, 1992).

Negative Symptom Rating Scale (NSRS; Kirkpatrick et al., 2006; Mueser,

Sayers, Schooler, Mance, & Haas, 1994): 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." A more detailed listing of these items was

provided earlier in this document. These items combine to create five subscales

including anhedonia, avolition, asociality, blunted affect and alogia. Initial results

from the first pilot study of the NSRS indicate that the measure demonstrates good

reliability, discriminant validity and convergent validity with other negative symptom

measures (See Appendix A for the full instrument).

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." A recent meta-analysis evaluating the factor

structure of the BPRS recommended use of five subscales (Shafer, 2005). These

include Affect (e.g., anxiety, guilt feelings, depressive mood, and somatic concern),

Positive Symptoms (e.g., unusual thought content, conceptual disorganization,

hallucinations, and grandiosity), Negative Symptoms (e.g., blunted affect, emotional

withdrawal, and motor retardation), Resistance (e.g., hostility, uncooperativeness,

suspiciousness) and Activation (e.g., excitement, tension, and mannerisms-posturing).

Psychometric properties of the BPRS are well-established (see Appendix B for full

measure; Anderson, Larsen & Schultz, 1989; Morlan & Tan, 1998; Overall &

Gorham, 1962).

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, Maticka-Tyndale, 1992; Addington, Addington & Atkinson, 1996; Collins, Remington, Coulter & Birkett, 1996). The CDSS has demonstrated high internal consistency and good inter-rater reliability (see Appendix C for full measure; Addington, Addington & Schissel, 1990; Addington, et al., 1992).

Functioning Measure

Social Functioning Scale (SFS; Birchwood, Smith, Cochran, Wetton, & Copestake, 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 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 use public transportation?"), independence-performance (e.g., " How often have you washed your own clothes in the past three months?"), and employment/occupation (e.g., "Are you currently working?"). The SFS has demonstrated good reliability and validity in samples of individuals diagnosed with schizophrenia and healthy controls (Birchwood et al.,

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1990). In this study, the measure was administered as a verbal interview to ensure

proper understanding of test items (see Appendix D for full measure).

Behavioral Ratings of Expressed Facial Affect

Facial Affect Coding System (FACES; Kring & Sloan, 1991; Kring & Sloan,

2007*).* The FACES system allows coding for duration, frequency, valence, intensity

and predominant expression of facial displays during the period of coding. The

FACES system defines an expression in two different ways. First, an expression is

defined by either a change from a neutral display to a non-neutral display and then

back to a neutral display. Another definition is a change from a neutral display into a

non-neutral display and then into another different affective display, which is coded

as two different expressions. The expression is first coded as either positive or

negative (i.e., valence). Then, coders rate the intensity of the expression on a 4-point

Likert scale (from 1 = "low" to 4 = "very high"). Finally, coders note the duration of

the expression. At the end of the coding period, coders summarize the information

for both the positive and negative expressions. In order to calculate the frequency

variable for positive expressions, the number of positive expressions is added

together. In order to attain the intensity variable for positive expressions, all intensity

levels for positive expressions are added and then averaged over the positive

expression frequency variable. To compute the duration variable for positive

expressions, the duration of each positive expression is added together and averaged

over the positive expression frequency variable. The same procedure is done for the

negative facial expressions. The FACES system has demonstrated good inter-rater

reliability (Kring & Sloan, 2007). Additionally, FACES displayed adequate validity

in relation to other coding systems, self-report measures and clinician rated measures

(see Appendix E for FACES manual and Appendix F for FACES summary sheet;

Kring & Sloan, 2007).

Chapter 4: Results

Sample Characteristics

The final sample of participants (N = 32) had a mean age of 46.41±9.45. Demographics from the sample revealed that 87.5% were African-American, 9.4% were Caucasian, and 3.1% were Asian. Further, 21.9% were female and 78.1% were male (see Table 1). In terms of education attainment, 40.6% of the sample had attended some high school, 37.5% had graduated high school, 18.8% had attended some college, and 3.1% had completed graduate school. In relation to employment, 31.3% of the sample was employed, and 68.8% of the sample was unemployed. Further, 34.4% identified as military veterans. In terms of medication status, 28.1% were prescribed a first-generation antipsychotic, 34.4% were prescribed a second generation antipsychotic, 6.3% were taking both a first and second generation antipsychotic, 6.3% were not taking medication, 3.1% were taking psychotropic medication other than antipsychotics, and 21.9% were missing data on their medication regimen primarily because they could not recall their medication when prompted by the interviewer.

Analyses

Procedures to Address Missing Data

As mentioned previously, this study intended to examine frequency, intensity and duration ratings for both positive and negative facial affective displays. After ratings were completed, only 5 participants had negative facial expressions. Clearly,

this creates too small of a sample to conduct substantive analyses; therefore, negative

facial expressions are eliminated from subsequent analyses. All following analyses

will be conducted on positive facial affective displays only.

Data was missing from the several of the scales. In terms of the NSRS

subscales, the Anhedonia subscale had data for 27 participants, the Asociality

subscale had data for 29 participants, and the Avolition subscale had data for 26

participants. However, both the Blunted Affect subscale and the Alogia subscale had

data for all 32 participants. For the Calgary Depression Scale, data was available for

30 participants. For the SFS, available data also varied depending on the subscale.

For the Engagement/Withdrawal subscale there was data for 30 participants, the

Interpersonal Behavior subscale had data for 28 participants, the Prosocial Behavior

subscale had data for 31 participants, the Recreation subscale had data for 31

participants, the Independence/Competence subscale had data for 29 participants, and

the Independence/Performance subscale had data for 24 participants.

FACES Variables

As in previous studies that have utilized the FACES measure, inter-rater

agreement for FACES ratings was calculated using an intra-class correlation (ICC;

Shrout and Fleiss, 1979). Using this random-effects model, raters are treated as if

selected from a random sample of raters, and each target is rated by a different set of

k judges. Three raters coded videotapes. After training, two raters coded half of the

videotapes (non-overlapping), with a third rater coding all videotapes. Thus, there

were two rater pairs with each rater coding half of the tapes paired with the rater who

coded all tapes. ICCs between rater pairs were calculated across participants for each

of the three separate variables (frequency, duration, and intensity). ICCs for Pair 1 ranged from .93 to .98 and from .89 to .99 for Pair 2, indicating excellent agreement (see Table 2).

The FACES coding results in three variables: frequency, intensity and duration of facial expressions. As in previous studies employing the FACES measure, the intensity and duration variables were averaged over the frequency variable in order to control for the effects of different numbers of facial expressions between participants. The frequency variable is not averaged. This method is consistent with previous data analyses on FACES data (Kring & Sloan, 1991; Kring & Sloan, 2007). For the FACES variables, the mean frequency of expressions was 1.52±2.00, the mean duration in seconds was 2.88±3.74, and the mean intensity of expressions was .95±.96. Subsequently, the frequency, intensity and duration variables were transformed into z-scores to ease interpretation given the different metric of each scale. This method is consistent with previous research on FACES (Kring & Sloan, 1991; Kring & Sloan, 2007).

Correlations Among FACES Variables

Correlations among the individual FACES variables of frequency, duration, and intensity were computed (see Table 3). Correlations ranged from .59 to .78, and all of the individual FACES variables for positive expressions were significantly interrelated ($p < .01$). While these intercorrelations are consistent with previous research studies employing FACES (e.g., Kring et al., 1993), they are not as high as those seen in previous research (e.g., when participants watch a neutral film, intercorrelations between the variables ranged from .84 to .97).

Correlations Between FACES Variables and Negative Symptom Ratings

In order to address the first hypothesis, expressed facial affect was correlated with symptom ratings of blunted affect on the NSRS. As can been seen in Table 4, bivariate correlations revealed that the 3 FACES variables, frequency, intensity and duration, were negatively correlated with the NSRS blunted affect subscale at $p < .01$. Correlations ranged from -.42 to -.52 (see Table 4). Therefore, the higher the clinical rating of blunted affect, the less displayed facial affect. Thus, an independent, behavioral measure of expressed facial affect correlated negatively with the NSRS blunted affect subscale.

In order to address the second portion of this hypothesis, that expressed facial affect would correlate with the other subscales of the NSRS, bivariate correlations were performed to examine the relationship between the frequency, intensity and duration of expressed facial affect and the other 4 subscales of the NSRS, anhedonia, asociality, avolition and alogia. Analyses revealed that no other subscales of the NSRS were significantly correlated with FACES ratings (see Table 4). However, there were a few correlations that were of moderate effect size. Specifically, there was a negative correlation between the Avolition subscale of the NSRS and the frequency of facial expression on FACES, $r = -.30$, $p = .10$. Additionally, the Avolition subscale of the NSRS negatively correlated with the Intensity of facial expressions on FACES, $r = -.34$, $p = .08$. Issues surrounding power will be outlined further in the discussion section.

In order to further examine the relationship between negative symptoms and FACES variables, magnitudes of correlations were compared. Specifically, the

magnitudes of correlations were compared between the following: the Blunted Affect

and Asociality subscales for frequency, and the Blunted Affect and Avolition

subscales for both the Intensity and Duration variables. In terms of the Blunted

Affect and Asociality subscales and the frequency variable, there was not a

significant difference between the magnitudes of the correlations, $z = .88$, $p = .37$.

Next, the magnitudes of the correlations for the Blunted Affect and Avolition

subscales and the Intensity variable were examined and were not significant, $z = .79$,

$p = .42$. Finally, the difference between the correlation magnitudes for the Blunted

Affect and Avolition subscales for Duration and it was not significant, $z = .57$, $p =$

.56. Thus, none of the correlation magnitude comparisons reached significance.

The current study was part of a larger study examining the reliability and

validity of the NSRS; thus, data for the SANS was available. Exploratory analyses

were conducted on the data to determine specific associations between SANS ratings

and behavioral codings of expressed facial affect in this sample. The SANS affective

flattening subscale negatively correlated with both frequency ($r = -.37$, $p < .05$) and

intensity ($r = -.41$, $p < .05$) of facial expressions. Additionally, the SANS alogia

subscale significantly correlated with the intensity of facial expressions ($r = -.35$, $p <$

.05). All other correlations did not reach significance. Of interest, the affective

flattening subscale, which is similar to the blunted affect subscale on the NSRS, only

correlated with two of the three expressed facial affect domains, frequency and

intensity, while the NSRS blunted affect subscale correlated with all three domains of

frequency, intensity and duration. Additionally, while the SANS Alogia subscale

significantly correlated with the intensity of facial expressions, the NSRS Alogia subscale did not. These issues will be further discussed in the limitations section.

Multiple Regression

In terms of the second hypothesis, (i.e., to determine what aspect of facial expression drives clinical ratings of blunted affect), multiple regression was planned. However, given the high degree of multicollinearity among the predictor variables, the regression could not be performed. Examination of the zero-order correlations revealed all three dimensions of behavioral coding were significantly associated with clinical ratings of blunted affect.

Correlations between FACES ratings and Psychotic and Depressive Symptoms

It was hypothesized that negative symptoms and FACES ratings would be independent of psychotic and depressive symptomatology. To address this aim, bivariate correlations were conducted to determine the relationship between FACES ratings and psychotic and depressive symptomatology. None of the FACES ratings correlated with the BPRS Thought Subscale or the Calgary Depression subscale (See Table 5). Thus, as predicted, FACES ratings were not related to both psychotic and depressive symptoms.

Correlations Between FACES Ratings and Functioning

Finally, the relationship between FACES ratings with functional outcome was assessed. Bivariate correlations revealed no significant associations in the predicted direction (see Table 6). However, there was a significant correlation in the opposite of the predicted direction between intensity of facial expressions and the

Independence/Competence subscale of the Social Functioning Scale. Thus, the more

facial intensity a participant displayed, the less likely they were to be competent in

areas such as using public transportation and handling money. It is possible that the

lack of significant in these findings is due to the lack of power as mentioned above.

Chapter 5: Discussion

This study sought to examine the convergent validity of the NSRS by

exploring the relationship between clinician rated negative symptoms on the NSRS

and behavioral coding of expressed facial affect. As hypothesized, clinical ratings of

blunted affect correlated negatively with behavioral coding of expressed facial affect.

Thus, this finding provides convergent validity for the newly developed NSRS. This

research provides a substantial step forward in the validation of the NSRS as the gold-

standard rating scale for negative symptoms in schizophrenia. A secondary aim of

this study was to examine the relationship between behavioral coding of expressed

facial affect and functional outcomes. There was not a significant relationship

between any of these variables. The findings from the current study and their

applicability to the extant literature are reviewed below.

As hypothesized, a significant negative correlation was observed between

clinician ratings of blunted affect on the NSRS and all variables of behavioral coding

of facial affect. Specifically, the higher a clinician rated a participant's blunted affect

(i.e., higher symptomatology), the less facial affect they displayed in the domains of

frequency, intensity and duration. Diminished facial expression (i.e., affective

flattening) is a hallmark of the negative symptoms of schizophrenia and is noted as

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one of the DSM-IV diagnostic criteria for schizophrenia (American Psychiatric

Association, 2000). Recent studies of facial expression in schizophrenia have

consistently noted reduced facial expression in this population (Berenbaum &

Oltmanns, 1992, Kring et al., 1993, Kring & Neale, 1996, Tremeau, Malaspina,

Duval, Correa, Hager-Bubny, Coin-Bariou, Macher, Gorman, 2005; Wolf et al.,

2006). Thus, diminished facial expression, an objective rating, was negatively

correlated with clinician ratings on the NSRS scale, which confirms the convergent

validity of the scale.

Because this is an initial pilot study of the NSRS, to date there is no literature

regarding expressed facial affect and the NSRS. However, there is a small literature

regarding negative symptoms and expressed facial affect. Additionally, the current

study was able to utilize SANS ratings, which yielded results demonstrating that the

SANS Affective Flattening subscale, which is similar to the Blunted Affect subscale

of the NSRS, was associated with diminished frequency and intensity of facial

expressions. Both the NSRS and SANS findings in the current study are consistent

with a previous research study that found a significant correlation between

diminished facial expressiveness in schizophrenia and blunted affect as measured by

the SANS affective flattening ratings (Troisi, Pompili, Binello, & Sterpone, 2007).

Further, diminished facial affect in patients with schizophrenia correlated negatively

with the BPRS anergia subscale, which is another measure of negative symptoms

(Tremeau et al., 2005). This finding is consistent with the findings in the present

study. However, in one study, the SANS affective flattening subscale score and the

"unchanging facial expression" item on the SANS were not related to behavioral

codings of expressed facial affect (Kring, 1993). Thus, significant associations found in the current study between expressed facial affect and clinician ratings of blunted affect on negative symptom scales are largely consistent with previous research. Although one study found conflicting results, it is somewhat difficult to explain given the varied methods employed across studies including different facial affect coding systems, the type of behavior that was coded (i.e., interview, social interaction, or eliciting emotion via a film clip, etc.) and the use of the SANS or the BPRS to measure negative symptoms. However, it is clear that the relationship between reduced facial expressivity and the blunted affect scale of the NSRS provides convergent validity for the newly developed NSRS scale. These results further the work to establish the NSRS as a valid scale for the measurement of negative symptoms in schizophrenia.

Due to the high correlation between blunted affect and other negative symptoms, it was hypothesized that behavioral coding of expressed facial affect would also correlate with negative symptoms. None of the correlations between the remainder of the NSRS subscales and behavioral coding of expressed facial affect were significant. In exploratory analyses between the SANS and FACES ratings, a significant negative correlation was observed between the SANS subscale of Alogia and Intensity of facial expressions. The literature regarding the relationship between negative symptoms and behavioral codings of expressed facial affect is mixed. In a study employing the FACES measure to code the reactions to positive and negative emotional film clips in a population of those with schizophrenia, SANS total score was not related to behavioral codings of expressed facial affect (Kring et al., 1994).

The study did not provide further breakdowns regarding subscales of the SANS. Another study analyzed social role plays using the FACES measure and observed only a weak association between SANS total score and behavioral coding of expressed facial affect (Aghevli et al, 2003). While this research finding is consistent with the results of the current study, there are significant methodological differences in the previous research such as the methodology of eliciting emotional reactions to film clips and analyzing social role plays. Interestingly, a previous study found a significant association between expressed facial affect, the SANS alogia subscale and the SANS total score (Troisi et al., 2007). This research is consistent with the exploratory finding in the current study in which the SANS alogia subscale was associated with diminished intensity of facial expressions. However, in the current study both the NSRS alogia subscale and SANS total score were not significantly correlated with behavioral codings of expressed facial affect. Of note, there were significant methodological differences between this previous research and the current study. The previous research prompted participants to imitate others' facial expressions, to create a facial expression that captured an emotional word and to describe a recent event based off of an emotional word (Troisi et al., 2007). Further, this research used a different facial affect coding system, the Facial Action Coding System, which is similar to FACES except that it employs further breakdowns of types of emotions and uses sums of scores instead of averages. Thus, while findings in the literature are mixed, the results of the current study are largely consistent with several studies in this domain.

In the current study, the lack of significant correlations between the NSRS subscales, other than the Blunted Affect subscale, and behavioral codings of expressed facial affect likely occurred because there was not enough power in the sample. Using a medium effect size of $d = .3$, power was calculated on the sample. The total sample size ranged from 26 to 32 yielding power that ranged from .60 to .68. Thus, the power of the study was not sufficient to detect even medium effect sizes. Issues surrounding power will be examined further in the limitations section.

Results were consistent with the prediction that behavioral codings of expressed facial affect would not be related to psychotic or depressive symptoms. Consistent with the current study, two previous studies investigating the relationship between expressed facial affect and symptoms of schizophrenia did not find any association between psychotic symptoms and expressed facial affect (Tremeau et al., 2005; Troisi et al., 2007). Additionally, depression was not related to expressed facial affect in a previous study (Troisi et al., 2007), which is consistent with the results of the current study.

A secondary aim of this study was to assess the relationship between behavioral coding of facial affect and functional outcomes. It was predicted that there would be a positive correlation between all domains of expressed facial affect and functional outcomes. Unexpectedly, no correlations reached significance in the predicted direction, which could be explained by several factors. First, certain correlations likely did not reach significance because the sample did not have enough power. In these analyses, the sample size ranged from 24 to 31. Power analyses based on these sample sizes revealed power ranging from .57 to .67. Additionally,

the lack of findings could also be due to the type of behavior that was analyzed. In this study, coding was completed on an interview not a social interaction. A social interaction may have mimicked a real world situation, which, in turn, could have highlighted this relationship. The lack of findings for this aim could also be due to the measurement used to assess functioning. Measurements relied solely on patient self-report, which often does not correlate with observer ratings of functioning (Bowie, Twamley, Anderson, Halpern, Patterson, & Harvey, 2007). These issues are outlined further in the limitations section. Further, the finding, in the opposite of the predicted direction that greater facial intensity was associated with reduced capacity to function in areas such as handling money and using public transportation was unexpected. Again, this finding could be influenced by inaccurate self reporting of current functioning (Bowie, et al., 2007). In summation, the lack of significant findings in the predicted direction were unexpected and could be due to the methodology used to elicit emotional responding or inaccuracies in self-reports of current functioning.

Recently, another group investigated the relationship between expressed facial affect and functional outcomes in a sample of patients with schizophrenia (Troisi et al., 2007). Diminished facial expression explained more variance in social and vocational outcomes than negative symptoms (Troisi, et al., 2007). Thus, while the current study did not yield significant results in these domains, other research suggests that expressed facial affect significantly impacts functional outcome. The results of the current study should be replicated in a large sample that would provide an adequate level of power. This and other limitations are outlined below.

While this study has major strengths such as an ethnically diverse patient sample and the utilization of a new measure for negative symptoms, it also has notable limitations. Limitations in this study include: the evolution of the NSRS across data collection, the unexpected lack of data points for negative facial expressions, the small sample size, the inability to examine gender differences due to the small sample size, the influence of medication on facial expression and self-report measures of functioning. First, while the use of a newly developed measure is a strength of the study due to the limitations of widely used negative symptom measures, the administration of the measure evolved over the course of the study. Most notably, when the first interviews of the NSRS were administered, all questions from the blunted affect section were administered. Subsequently, it was determined that if the clinician had obtained that information elsewhere during the interview, they did not need to ask all questions outlined in the blunted affect section. This change in administration impacted the current study because there was not enough data for coding in the blunted affect section. Thus, the blunted affect section was dropped from the study, and all analyses were conducted on the anhedonia portion of the interview. Overall, the measure was being refined during the course of the current study and may have affected the results. Due to this issue, there was not adequate power for the statistical analyses. As mentioned previously, inadequate power likely affected significance values for the correlations between some of the other negative symptom domains and behavioral coding of affect as well as some of the relationships between functional outcome and behavioral coding of affect.

Second, there were very few data points for negative expressions. This is likely because the anhedonia section was used for coding. This section of the interview asks participants to recount recent pleasurable experiences. Thus, this evoked positive emotion and few negative facial expressions were observed. The findings of the current study diverge from the literature on this topic. Schizophrenic populations tend to display more negative affect than controls (Berenbaum & Oltmanns, 1992; Martin, Borod, Alpert, Brozgold, & Welkowitz, 1990). However, one study noted an increase in positive facial expressions amongst patients with schizophrenia even in reaction to negative stimuli (i.e., a sad face; Falkenberg, Bartels & Wild, 2007). The authors interpreted this finding in light of other research stating that those with schizophrenia experience difficulties processing emotional stimuli, which may cause them to interpret the sad face as a neutral face. In the current study there were few data points for negative expressions, which likely resulted from methodological differences between elicitation of affect in the current study versus previous research. As a result of the limited negative expressions, analyses were only conducted on positive facial expressions, which may have affected the current findings. Therefore, the results should be interpreted in light of this distinction.

In addition to losing data points due to dropping the blunted affect subsection and lack of negative facial expressions, the small sample size was a further limitation. While the original aim was to collect data points on 38 participants, videotape issues dropped that number to 32 participants that had adequate videotape for coding. The small sample size likely influenced the results of the study because there was not enough power from the sample size. Power was a notable issue for analyses on

FACES variables and NSRS subscales as well as FACES variables and current functioning. Thus, small sample size was a limitation in the current study.

A further limitation of the current study was the inability to conduct gender analyses. The majority of the sample was male (i.e., 78.1%), which did not allow for gender analyses to be conducted. Research conducted on emotional expression in healthy samples have repeatedly noted gender differences (Brody & Hall, 2000; Fischer, 1993). Additionally, gender differences in course, functioning, and symptomatology of schizophrenia are outlined in the literature (Thorup, Petersen, Jeppesen, Ohlenschlaeger, Christensen et al., 2007). Thus, it is likely that gender differences could have influenced the results of this study. Because gender is an important aspect of both emotion and schizophrenia, the current study should be replicated in either a larger sample that allows for gender analyses or on a sample of women.

Another limitation of the current study was the possible effect of medication on expressed facial affect. The majority of the sample was taking some type of neuroleptic medication. Neuroleptic, or antipsychotic, medications have the potential to cause a wide variety of side effects such as extrapyramidal symptoms, which include muscle contractions (i.e., acute dystonia), involuntary movements (i.e., tardive dyskinesia), tremors and rigidity (i.e., Parkinsonian-like symptoms) and body restlessness (i.e., akathisia) (Janicak, Davis, Preskor, Ayd, Marder & Pavuluri, 2006). These side effects could influence expressed facial affect in the current study. Thus, it is possible that neuroleptic medication influenced expressed facial affect, which may have influenced the results of the present study.

Another limitation of the current study is the method employed to measure current functioning. The SFS is a self-report scale that relies on the patient's report of their current functioning. Recent research suggests that those with schizophrenia may overestimate or underestimate their level of functioning when compared to their case manager's assessment of their functioning (Bowie, Twamley, Anderson, Halpern, Patterson, & Harvey, 2007; Taylor & Langdon, 2007). Therefore, it is unclear whether ratings of functioning in the current study reflect true, real-world functioning. Thus, current functioning may best be assessed using multiple measures that tap several different sources of information.

Future Directions and Conclusions

The current research study provides evidence for the convergent validity of the NSRS as a gold-standard measure for the treatment of negative symptoms. As mentioned previously, one limitation of this study is the limited sample size. Future research should seek to replicate these findings in a larger sample. A larger sample size could provide adequate power for analyses that were of trend significance and further gender analyses. Additionally, future replications should seek to code interviews that specifically probe for negative emotional experiences. This methodology would allow for expressions of negative affect that would yield sufficient data points for analyses. Further, multiple modalities should be employed to assess current functioning in order to attain accurate measurement of this construct. Thus, addressing limitations of the current research in future replications will strengthen future studies investigating these constructs.

In summation, the current study aimed to assess the convergent validity of the NSRS by examining the relationship between behavioral codings of facial affect and clinician ratings of blunted affect on the NSRS. The results of the current study suggest that the NSRS evidences good convergent validity. Currently, a large scale study is underway to assess the validity and reliability of the NSRS. First, the initial version of the NSRS will be administered to 100 participants with schizophrenia and schizoaffective disorder. The results of this study will be used to make data driven refinements to the measure. After the NSRS is revamped accordingly, it will be administered to 300 patients with schizophrenia and schizoaffective disorder. The validity and psychometric properties of the measure will be assessed in this sample. This study will also examine the relationship between negative symptoms and functional outcomes in schizophrenia. This research represents a substantial step forward in the creation of a new, psychometrically sound instrument for the measurement of negative symptoms.

Appendices

Appendix A: Negative Symptom Rating Scale

Appendix B: Brief Psychiatric Rating Scale

Appendix C: Calgary Depression Scale for Schizophrenia

Appendix D: Social Functioning Scale

Appendix E: Facial Affect Coding System Manual

Appendix F: Facial Affect Coding System Summary Sheet

Appendix A: Negative Symptom Rating Scale

I. ANHEDONIA SUBSCALE

A. Pleasure during social activities

1. Highest intensity of pleasure during any social activity
        0 – Strong or very intense pleasure
        1 – Fairly strong pleasure
        2 – Moderate pleasure
        3 – Mild pleasure
        4 – Slight pleasure
        5 – Very slight pleasure
        6 – No pleasure in any social context and complete emotional indifference to people

2. Frequency of pleasurable social activities
        0 – Very often: Many pleasurable experiences
        1 – Frequently: several pleasurable experiences
        2 – Often: Some pleasurable activieis
        3 – Sometimes: A few pleasurable experiences
        4 – Occasionally: One or two pleasurable experiences
        5 - Rarely: Hardly any pleasurable experiences
        6 – Never: No pleasurable experiences

B. Pleasure expected (anticipated) from future social activities

3. Highest intensity of expected pleasure from future social activities
        0 – Strong or very intense pleasure
        1 – Fairly strong pleasure
        2 – Moderate pleasure
        3 – Mild pleasure
        4 – Slight pleasure
        5 – Very slight pleasure
        6 – No pleasure expected in future social context activities; completely indifferent about future social activities.

4. Highest intensity of pleasure during any physical sensation
        0 – Strong or very intense pleasure
        1 – Fairly strong pleasure
        2 – Moderate pleasure
        3 – Mild pleasure
        4 – Slight pleasure
        5 – Very slight pleasure
        6 – No pleasure from any physical sensations, and complete emotional indifferent to them

5. Frequency of pleasurable physical sensations
       0 – Very often: Many pleasurable experiences
       1 – Frequently: several pleasurable experiences
       2 – Often: Some pleasurable activieis
       3 – Sometimes: A few pleasurable experiences
       4 – Occasionally: One or two pleasurable experiences
       5 - Rarely: Hardly any pleasurable experiences
       6 – Never: No pleasurable experiences

D. Pleasure expected (anticipated) from future physical sensations.

6. Highest intensity of expected pleasure from future physical sensations
       0 – Strong or very intense pleasure
       1 – Fairly strong pleasure
       2 – Moderate pleasure
       3 – Mild pleasure
       4 – Slight pleasure
       5 – Very slight pleasure
       6 – No pleasure expected from future physical sensations or activities; completely indifferent about future physical activities or sensations

E. Pleasure from recreational/vocational activities

7. Highest intensity of pleasure during any recreational/vocational activities
       0 – Strong or very intense pleasure
       1 – Fairly strong pleasure
       2 – Moderate pleasure
       3 – Mild pleasure
       4 – Slight pleasure
       5 – Very slight pleasure
       6 – No pleasure expected from recreational/ vocational activities; completely indifferent to recreational/vocational activities

8. Frequency of pleasurable recreational/vocational activities
       0 – Very often: Many pleasurable experiences
       1 – Frequently: several pleasurable experiences
       2 – Often: Some pleasurable activieis
       3 – Sometimes: A few pleasurable experiences
       4 – Occasionally: One or two pleasurable experiences
       5 - Rarely: Hardly any pleasurable experiences
       6 – Never: No pleasurable experiences

F. Experience of expected (anticipated) pleasure from recreational/vocational activities

9. Highest intensity of expected pleasure from future recreational/vocational activities
        0 – Strong or very intense pleasure
        1 – Fairly strong pleasure
        2 – Moderate pleasure
        3 – Mild pleasure
        4 – Slight pleasure
        5 – Very slight pleasure
        6 – No pleasure expected from future recreational/ vocational activities; completely indifferent to recreational/vocational activities

II. ASOCIALITY SUBSCALE

A. Family

10. Family Relationships
        0 – no impairment
        1 – very slight deficit
        2 – mild deficit
        3 – moderate deficit
        4 – moderately severe deficit
        5 – marked deficit
        6 – severe deficit
        7 – not rated: no living family

B. Romantic Relationships

11. Romantic Relationships
        0 – no impairment
        1 – very slight deficit
        2 – mild deficit
        3 – moderate deficit
        4 – moderately severe deficit
        5 – marked deficit
        6 – severe deficit

C. Friends

12. Friendships
        0 – no impairment
        1 – very slight deficit
        2 – mild deficit
        3 – moderate deficit
        4 – moderately severe deficit
        5 – marked deficit
        6 – severe deficit

III. AVOLITION SUBSCALE

A. Social Interactions

13. Social Interactions
  0 – no impairment
  1 – very slight deficit
  2 – mild deficit
  3 – moderate deficit
  4 – moderately severe deficit
  5 – marked deficit
  6 – severe deficit

B. Work/Vocational/School Activities

14. Work/Vocational/School Activities
  0 – no impairment
  1 – very slight deficit
  2 – mild deficit
  3 – moderate deficit
  4 – moderately severe deficit
  5 – marked deficit
  6 – severe deficit
  7 – not rated: subject is in the hospital for the duration of the rating period

C. Recreation/Hobbies/Pastimes

15. Recreation/Hobbies/Pastimes
  0 – no impairment
  1 – very slight deficit
  2 – mild deficit
  3 – moderate deficit
  4 – moderately severe deficit
  5 – marked deficit
  6 – severe deficit

D. Self-Care

16. Self-Care
  0 – no impairment
  1 – very slight deficit
  2 – mild deficit
  3 – moderate deficit
  4 – moderately severe deficit
  5 – marked deficit
  6 – severe deficit

IV. BLUNTED AFFECT SUBSCALE

A. Facial Expression

17. Facial Expression
        0 – no impairment
        1 – very slight deficit
        2 – mild deficit
        3 – moderate deficit
        4 – moderately severe deficit
        5 – marked deficit
        6 – severe deficit

B. Vocal Expression

18. Vocal Expression
        0 – no impairment
        1 – very slight deficit
        2 – mild deficit
        3 – moderate deficit
        4 – moderately severe deficit
        5 – marked deficit
        6 – severe deficit

C. Expressive Gestures

19. Expressive Gestures
        0 – no impairment
        1 – very slight deficit
        2 – mild deficit
        3 – moderate deficit
        4 – moderately severe deficit
        5 – marked deficit
        6 – severe deficit

D. Eye Contact

20. Eye Contact
        0 – no impairment
        1 – very slight deficit
        2 – mild deficit
        3 – moderate deficit
        4 – moderately severe deficit
        5 – marked deficit
        6 – severe deficit

E. Spontaneous Movements

21. Spontaneous Movements
       0 – no impairment
       1 – very slight deficit
       2 – mild deficit
       3 – moderate deficit
       4 – moderately severe deficit
       5 – marked deficit
       6 – severe deficit

F. Blunted Affect Subscale: Basis of Rating
       Emotional prompts
       Other interview questions
       Both

V. ALOGIA SUBSCALE

A. Quality of speech

22. Quality of speech
       0 – no impairment
       1 – very slight deficit
       2 – mild deficit
       3 – moderate deficit
       4 – moderately severe deficit
       5 – marked deficit
       6 – severe deficit

B. Spontaneous Elaboration

23. Spontaneous elaboration
       0 – no impairment
       1 – very slight deficit
       2 – mild deficit
       3 – moderate deficit
       4 – moderately severe deficit
       5 – marked deficit
       6 – severe deficit

OPTIONAL ITEMS:

EXPERIENCE OF NEGATIVE EMOTION ITEM

24. Experience of negative emotion
       0 – Very often
       1 – Frequently
       2 – Often
       3 – Sometimes
       4 – Occasionally
       5 – Rarely
       6 – Never

JUDGMENT OF CAUSE ITEM

25. Judgment of cause
Based on all available information, what is your judgment as to the principal cause of the negative symptoms? Choose either 1, 2, or 3

    1 – The negative symptoms are mostly primary rather than secondary to the factors in B, below
    2 – The negative symptoms are mostly secondary to the factors below. If choosing 2, choose only one from a through e. If you think more than one makes a significant contribution, pick the most important factor.
        a. Depression and/or anxiety
        b. Suspiciousness
        c. Other hallucinations and/or delusions
        d. Disorganization
        e. Medication side effect or a general medical condition
        f. Missing
    3 – Does not apply, as all fo the ratings are less than 2

Appendix B: Brief Psychiatric Rating Scale

Directions: There are 20 items to be rated. The starred items (Items 3, 4, 6, 7, 13, 14, 16, 17, 18 and 19) should be rated on the basis of observations made during the interview. For these items. 1 = Not observed. The remaining items should be rated on the basis of reported (i.e., subjective) information pertaining to the past week. For these items, 1 = Not reported.

1. **Somatic Concern**: During the past week how has your physical health been? Do you feel you are physically ill in any way?(What do you think is wrong?) (How serious is it?) Have you worried about your health recently? Degree of concern over present bodily health. Rate the degree to which physical health is perceived as a problem by the patient whether complaints have a realistic basis or not. Do not rate mere reporting of somatic symptoms. Rate only concern for (or worrying about) physical problems (real or imagined). Rate on the basis of reported (i.e. subjective) information pertaining to the past week.

Not Reported

Very Mild: occasionally is somewhat concerned about body, symptoms or physical illness

Mild: occasionally is moderately concerned, or often is somewhat concerned

Moderate: occasionally is very concerned, or often is moderately concerned

Moderately Severe: often is very concerned

Severe: is very concerned most of the time

Very Severe: is very concerned nearly all of the time

Cannot be assessed adequately because of severe formal thought disorder, uncooperativeness, or marked evasiveness/guardedness or; Not assessed

2. **Anxiety**: During the past week have you felt very frightened or anxious? Have you worried a lot? (What do you worry about?) Have you had the feeling that something terrible might happen? Worry, fear, or overconcern for present or future. Rate solely on the basis of verbal report of patient's own subjective experiences. Do not infer anxiety from physical signs or from neurotic defense mechanisms. Do not rate if restricted to somaticconcern. (fill in "Not rated")

Not reported

Very Mild: occasionally feels somewhat anxious

Mild: occasionally feels moderately anxious, or often feels somewhat anxious

Moderate: occasionally feels very anxious, or often feels moderately anxious

Moderately Severe: often feels very anxious

Severe: feels very anxious most of the time

Very Severe: feels very anxious nearly all of the time

Cannot be assessed adequately because of severe formal thought disorder, uncooperativeness, or marked evasiveness/guardedness or; Not assessed

Not rated

3. **Emotional Withdrawal**: Deficiency in relating to the interviewer and to the interview situation. Overt manifestations of this deficiency include poor/Abe of eye contact, failure to orient oneself physically toward the interviewer, and a general lack of involvement or engagement in the interview. Distinguish from BLUNTED AFFECT, in which deficits in facial expression, body gesture, and voice pattern are scored.

Not observed

Very Mild: e.g., occasionally exhibits poor eye contact

Mild: e.g., as above, but more frequent

Moderate: e.g., exhibits little eye contact, but still seems engaged in the interview and is appropriately responsive to all questions

Moderately Severe: e.g., stares at floor or orients self away from interviewer, but still seems moderately engaged

Severe: e.g., as above, but more persistent or pervasive

Very Severe: e.g., appears "spacey" or "out of it" (total absence of emotional relatedness), and is disproportionately uninvolved or unengaged in the interview

Cannot be assessed: (e.g., scored from audiotape)

4. **Conceptual Disorganization**: Degree of speech incomprehensibility. Include any type of formal thought disorder (e.g., loose associations, incoherence, flight of ideas, neologisms). DO NOT include mere circumstantiality or pressured speech, even if marked. DO NOT rate on the basis of the patient's subjective impressions (e.g., "my

thoughts are racing, I can't hold a thought," "my thinking gets all mixed up"). Rate ONLY on the basis of observations made during the interview.

Not observed

Very Mild: e.g., somewhat vague, but of doubtful clinical significance

Mild: e.g., frequently vague, but the interview is able to progress smoothly

Moderate: e.g., occasional irrelevant statements, infrequent use of neologisms, or moderate loosening of associations

Moderately Severe: as above, but more frequent

Severe: formal thought disorder is present for most of the interview, and the interview is severely strained

Very Severe: very little coherent information can be obtained

Not assessed

5. **Guilt Feelings**: During the past week have you been blaming yourself for anything? Have you been feeling guilty? (Do you feel that you deserve punishment?) (Have you been thinking about this a lot?) Overconcern or remorse for past behavior. Rate on the basis of the patient's subjective experiences of guilt as evidenced by verbal report. Do not infer guilt feelings from depression, anxiety, or neurotic defenses.

Not observed

Very Mild-occasionally feels somewhat guilty

Mild: occasionally feels moderately guilty, or often feels somewhat guilty

Moderate: occasionally feels very guilty, or often feels moderately guilty

Moderately Severe: often feels very guilty

Severe: feels very guilty most of the time, or encapsulated delusion of guilt

Very Severe: agonizing constant feelings of guilt, or pervasive delusions(s) of guilt

Cannot be assessed: adequately because of severe formal thought disorder, uncooperativeness, or marked evasiveness/guardedness, or Not assessed

6. **Tension**: Rate motor restlessness (agitation) observed during the interview. DO NOT rate on the basis of subjective experiences reported by the patient. Disregard suspected athogenesis (e.g., tardive dyskinesia).

Not observed

Very Mild: e.g., occasionally fidgets

Mild: e.g., frequently fidgets

Moderate: e.g., constantly fidgets, or frequently fidgets, wrings hands and pulls clothing

Moderately Severe: e.g., constantly fidgets, wrings hands and pulls clothing

Severe: e.g., cannot remain seated (i.e., must pace)

Very Severe: e.g., paces in a grantic manner

Cannot be assessed: (e.g., scored from audiotape)

7. **Mannerism and Posturing**: Unusual and unnatural motor behavior. Rate only abnormality of movements; do not rate simple heightened motor activity here. Consider frequency, duration, and degree of buzzard. Disregard suspected pathogenesis.

Not observed

Very Mild: odd behavior but of doubtful clinical significance, e.g. occasional unprompted smiling, infrequent lip movements

Mild: strange behavior but not obviously bizarre, e.g., infrequent head-tilting (side to side) in rhythmic fashion, intermittent abnormal finger movements

Moderate e.g. assumes yoga position for a brief period of time, infrequent lounge protrusions, rocking

Moderately Severe: e.g., assumes and maintains yoga position throughout interview, unusual movements in several body areas

Severe: as above, but more frequent, intense, or pervasive

Very Severe: e.g., bizarre posturing throughout most of the interview, continuous abnormal movements in several body areas

Cannot be assessed: (e.g., scored from audiotape)

8. **Grandiosity**: During the past week have you felt more self-confident than usual? Do you have any special abilities or talents? Do you feel there is a special purpose or mission to your life? (Have you thought you might be somebody rich or famous?) Inflated self-esteem (self-confidence), or inflated appraisal of one's talents, powers, abilities, accomplishments, knowledge, importance, or identity. Do not score mere grandiose quality of claims (e.g., "I'm the worst sinner in the world," "The entire country is trying to kill me") unless the guilt/persecution is related to some special, exaggerated attributes of the individual. Also, the patient must claim exaggerated attributes; e.g., if patient denies talents, powers, etc., even if he or she states that others indicate that he/she has these attributes, this item should not be scored, fill in Not scored.

Not reported

Very Mild: e.g., is more confident than most people, but of only possible clinical significance

Mild: e.g., definitely inflated self-esteem or exaggerates talents somewhat out of proportion to the circumstances

Moderate: e.g., inflated self-esteem or exaggerates talents somewhat out of proportion to the circumstances, or suspected grandiose delusions(s)

Moderately Severe: e.g., a single (definite) encapsulated grandiose delusion, or multiple (definite) fragmentary grandiose delusions

Severe: e.g., a single (definite) grandiose delusion/delusional system, or multiple (definite) grandiose delusions that the patient seems preoccupied with

Very Severe: e.g., as above, but nearly all conversation is directed toward the patient's grandiose delusion(s)

Cannot be assessed adequately because of severe formal thought disorder, uncooperativeness, or marked evasiveness/guardedness or; Not assessed

Not scored

9. **Depressive Mood**: In the past week have you had less interest in your usual activities? Have you felt sad or depressed? (Have you cried at all?) (How bad is the feeling?) (How long does it last?) Subjective report of feeling depressed, blue, "down in the dumps." etc. Rate only degree of reported depression. Do not rate on the basis of inferences concerning depression based upon general retardation and somatic complaints.

Not reported

Very Mild: occasionally feels somewhat depressed

Mild: occasionally feels moderately depressed, or often feels somewhat depressed

Moderate: occasionally feels very depressed, or often feels moderately depressed

Moderately Severe: often feels very depressed

Severe: feels very depressed most of the time

Very Severe: feels very depressed nearly all of the time

Cannot be assessed: adequately because of severe formal thought disorder, uncooperativeness, or marked evasiveness/guardedness, or Not assessed

10. **Hostility**: During the past week have you been feeling irritable? How have you been getting along with other people? (Have you gotten in any arguments or fights?) Have you been easily annoyed or angered? (How strongly have you felt this way?) (How much of the time?) Animosity, contempt, belligerence, disdain for other people outside the interview situation. Rate solely on the basis of verbal report of feelings and actions of the patient toward others during the week. Do not infer hostility from neurotic defenses, anxiety or somatic complaints.

Not reported

Very Mild: occasionally feels somewhat angry

Mild: often feels somewhat angry, or occasionally feels moderately angry

Moderate: occasionally feels very angry, or often feels moderately angry or occasionally yells at others

Moderately Severe: often feels very angry, often yells at others or occasionally threatens to harm others

Severe: has acted on his anger by becoming physically abusive on one or two occasions or makes frequent threats to harm others

Very Severe: has been physically aggressive and/or required intervention to prevent assaultiveness on several occasions; or any serious assaultive act

Cannot be assessed: adequately because of severe formal thought disorder, uncooperativeness, or marked evasiveness/guardedness, or Not assessed

11. **Suspiciousness**: How did you get along with people in general during the past week? Do you feel that you have to be on guard with people? Has anyone been giving you a hard time, or accusing you of things? Has anyone deliberately tried to annoy you? Tried to harm you?
Belief (delusional or otherwise) that others have now, or have had in the past, malicious or discriminatory intent toward the patient. On the basis of verbal report, rate only those suspicions which are currently held whether they concern past or present circumstances.
Not reported

Very Mild: rare instances of distrustfulness which may or may not be warranted by the situation

Mild: occasional instances of suspiciousness that are definitely not warranted by the situation

Moderate: more frequent suspiciousness, or transient ideas of reference

Moderately Severe: pervasive suspiciousness, or frequent ideas of reference

Severe: definite delusion(s) of reference or persecution that is (are) not wholly pervasive (e.g. an encapsulated delusion)

Very Severe: as above, but more widespread, frequent, or intense

Cannot be assessed: adequately because of severe formal thought disorder, uncooperativeness, or marked evasiveness/guardedness, or Not assessed

12. **Hallucinatory Behavior**: Have you had any unusual experiences during the past week? Do you seem to hear noises or voices when there's no one around and nothing else to explain it? Have you had visions, or seen things that others couldn't see? Is there anything unusual about the way things feel, or taste, or smell? (How often do you hear voices?) (Do your voices make it hard to concentrate?) (Do they tell you to do things?) Perceptions (in any sensory modality) in the absence of an identifiable external stimulus. Rate only those experiences that have
occurred during the last week. DO NOT rate "voices in my head," or "visions in my mind" unless the patient can differentiate between these experiences and his or her thoughts.

Not reported

Very Mild: suspected hallucinations only

Mild: definite hallucinations, but insignificant, infrequent or transient (e.g., occasional formless visual hallucinations, a voice calling the patient's name

Moderate: as above, but more frequent or extensive (e.g., frequently sees the devil's face, two voices carry on lengthy conversations)

Moderately Severe: hallucinations are experienced nearly every day, or are a source of extreme distress

Severe: as above, and has had a moderate impact on the patient's behavior (e.g., concentration difficulties leading to impaired work functioning)

Very Severe: as above, and had had a severe impact (e.g. attempts suicide in response to command hallucinations) Cannot be assessed: adequately because of severe formal thought disorder, uncooperativeness, or marked evasiveness/guardedness, or Not assessed

13. **Motor Retardation**: Reduction in energy level evidenced in slowed movements. Rate on the basis of observed behavior of the patient only; do not rate on the basis of the patient's subjective impression of his or her own energy level.

Not observed

Very Mild: and of doubtful clinical significance

Mild: e.g. conversation is somewhat retarded, movements somewhat slowed

Moderate: e.g. conversation is noticeably retarded but not strained

Moderately Severe: e.g. conversation is strained, moves very slowly

Severe: e.g., conversation is difficult to maintain, hardly moves at all

Very Severe: e.g. conversation is almost impossible, does not move at all throughout the interview

Cannot be assessed: (e.g., scored from audiotape)

14. **Uncooperativeness**: Evidence of resistance, unfriendliness, resentment, and lack of readiness to cooperate with the interviewer. Rate only on the basis of the patient's attitude and responses to the interviewer and the interview situation; do not rate on the basis of reported resentment or uncooperativeness outside the interview situation.

Not observed

Very Mild: e.g. does not seem motivated

Mild: e.g. seems evasive in certain areas

Moderate: e.g. monosyllabic, fails to elaborate spontaneously

Moderately Severe: e.g. expresses resentment and is unfriendly throughout the interview

Severe: e.g. refuses to answer a number most questions

Very Severe: e.g. refuses to answer most questions

Cannot be assessed

15. **Unusual Thought Content**: Have you had any difficulty with your thinking in the past week? Do certain things have special meaning for you? (Give me an example) Is there any interference with your thoughts? Is there anything controlling your thoughts
or movements? Do you see references to yourself in surprising places like on TV? Severity of delusions of any type - consider conviction and effect on actions. Assume full conviction if patient has acted on his or her beliefs. Rate on the basis of reported (i.e. subjective) information pertaining to the past week.

Not reported

Very Mild: delusion(s) suspected or likely

Mild: at times, patient questions his or her belief(s) (partial delusion)

Moderate: full delusional conviction, but delusion(s) has little or no influence on behavior

Moderately Severe: full delusional conviction, but delusion(s) has only occasional impact on behavior

Severe: delusion(s) has significant effect e.g. neglects responsibilities because of preoccupations with belief that he/she is God

Very Severe: delusion(s) has major impact e.g., stops eating because believes food is poisoned

Cannot be assessed: adequately because of severe formal thought disorder, uncooperativeness, or marked evasiveness/guardedness, or Not assessed

16. **Blunted Affect**: Diminished affective responsivity as characterized by deficits in facial expression, body gesture, and voice pattern. Distinguish from EMOTIONAL WITHDRAWAL in which the focus is on interpersonal impairment rather than affect. Consider degree and consistency of impairment.

Not observed

Very Mild: e.g. occasionally seems indifferent to material that is usually accompanied by some show of emotion

Mild: e.g., somewhat diminished facial expression or somewhat monotonous voice or somewhat restricted gestures

Moderate: e.g. as above but more intense, prolonged, or frequent

Moderately Severe: e.g., flattening of affect including at least two of the three features ; severe lack of facial expression, monotonous voice, or restricted body gestures

Severe: e.g., profound flattening of affect

Very Severe: e.g., totally monotonous voice, and total lack of expressive gestures throughout the evaluation

Cannot be assessed: (e.g., scored from audiotape)

17. **Excitement**: Heightened emotional tone, including irritability and expansiveness (hypomanic affect). Do not infer affect from statement of grandiose delusions.

Not observed

Very Mild: and of doubtful clinical significance

Mild: e.g., irritable or expansive at times

Moderate: e.g., frequently irritable or expansive

Moderately Severe: e.g., constantly irritable or expansive; or at times enraged or euphoric

Severe: e.g. enraged of euphoric throughout most of the interview

Very Severe: e.g., as above but to such a degree that the interview must be terminated prematurely

Cannot be assessed

18. **Disorientation**: Now I want to ask you some standard questions that we usually ask at this point; What is today's date? (What day of the week is it? What month? What day of the month? What year?) Where are we now? Confusion or lack of proper association for person, place, or time.

Not reported

Very Mild: e.g. seems somewhat confused

Mild: e.g. indicates 1982 when, in fact it is 1983

Moderate: e.g. indicates 1978

Moderately Severe: e.g. is unsure where he/she is

Severe: e.g. has no idea where he/she is

Very Severe: e.g. does not know who he/she is

Cannot be assessed: Adequately because of severe formal thought disorder, uncooperativeness, or marked evasiveness/guardedness, or Not assessed

19. **Poverty of Speech**: A restriction in the amount of spontaneous speech, i.e., conversation and answers to questions are either brief or un elaborated. Meaningful information is rarely provided.

Not observed

Very Mild: questionable

Mild: occasional replies do not include elaborated information even when this is appropriate.

Moderate: as above, but more frequently replies do not include elaborated information or occasional replies are monosyllabic or brief.

Moderately Severe: at least half of the patients' replies are monosyllabic or brief.

Severe: most answers are rarely more than a few words in length, and occasionally questions may be left unanswered.

Very Severe: patients' answers are either monosyllabic or she/he fails to answer questions.

Cannot be assessed: adequately because of severe fromal thought disorder, uncooperativeness, or marked evasiveness/guardedness; or not assessed.

20. **Inappropriate Affect**: Affect expressed is inappropriate or incongruous with the context of the situation. Most typically, this manifestation of affective disturbance

takes the form of smiling or assuming a silly facial expression while talking about a serious or sad subject.

Not reported

Very Mild: questionable

Mild: at least one clear instance of inappropriate smiling or other inappropriate affect

Moderate: at least two clear instances of inappropriate affect

Moderately Severe: occasional to frequent instances of inappropriate affect

Severe: frequent instances of inappropriate affect

Very Severe: affect is inappropriate most of the time

Cannot be assessed: adequately because of severe formal thought disorder, uncooperativeness, or marked evasiveness/guardedness, or Not assessed

Appendix C: Calgary Depression Scale for Schizophrenia

Directions: Ask the first question as written. Use follow up probes or qualifiers at your discretion. Time frame refers to last two weeks unless stipulated. The last item, #9 is based on observations of the entire interview.

1. DEPRESSION: How would you describe your mood over the last two weeks? Do you keep reasonably cheerful or have you been very depressed or low spirited recently? In the last two weeks how often have you (own words) every day? All day?

    0 – Absent
    1 – Mild – Expresses some sadness or discouragement on questioning
    2 – Moderate – Distinct depressed mood persisting up to half the time over last 2 weeks: present daily
    3 – Severe – Markedly depressed mood persisting daily over half the time interfering with normal motor and social functioning

2. HOPELESSNESS: How do you see the future for yourself? Can you see any future? - or has life seemed quite hopeless? Have you given up or does there still seem some reason for trying?

    0 – Absent
    1 – Mild – Has at times felt hopeless over the past two weeks but still has some degree of hope for the future
    2 – Moderate – Persistent, moderate sense of hopelessness over last week. Can be persuaded to acknowledge the possibility of things being better.
    3 – Severe – Persisting and distressing sense of hopelessness

3. SELF DEPRECIATION: What is your opinion of your self compared to other people? Do you feel
better, not as good, or about the same as others? Do you feel inferior or even worthless?

    0 – Absent
    1 – Mild – Some inferiority, not amounting to feeling of worthlessness
    2 – Moderate – Subject feels worthless, but less than 50% of the time.
    3 – Severe – Subject feels worthless more than 50% of the time. May be challenged to acknowledge otherwise.

4. GUILTY IDEAS OF REFERENCE: Do you have the feeling that you are being blamed for something or even wrongly accused? What about? (Do not include justifiable blame or accusation. Exclude delusions of guilt.)

    0 – Absent
    1 – Mild – Subject feels blamed but not accused less than 50% of the time.

2 - Moderate - Persisting sense of being blamed, and/or occasional sense of being accused.
3 - Severe - Persistent sense of being accused. When challenged, acknowledges that it is not so.

5. PATHOLOGICAL GUILT: Do you tend to blame yourself for little things you may have done in the past? Do you think that you deserve to be so concerned about this?

0 – Absent
1 – Mild – Subject sometimes feels over guilty about some minor peccadillo, but less than 50% of the time.
2 - Moderate - Subject usually (over 50% of the time) feels guilty about past actions the significance of which s/he exaggerates.
3 - Severe - Subject usually feels s/he is to blame for everything that has gone wrong, even when not his/her fault.

6. MORNING DEPRESSION: When you have felt depressed over the last 2 weeks have you noticed the depression being worse at any particular time of day?

0 - Absent - No depression.
1 - Mild - Depression present but no diurnal variation.
2 - Moderate - Depression spontaneously mentioned to be worse in a.m.
3 - Severe - Depression markedly worse in a.m., with impaired functioning which improves in p.m.

7. EARLY WAKENING: Do you wake earlier in the morning than is normal for you? How many times a week does this happen?

0 - Absent - No early wakening.
1 - Mild - Occasionally wakes (up to twice weekly) 1 hour or more before normal time to wake or alarm time.
2 - Moderate - Often wakes early (up to five times weekly) 1 hour or more before normal time to wake or alarm.
3 - Severe - Daily wakes 1 hour or more before normal time.

8. SUICIDE: Have you felt that life wasn't worth living? Did you ever feel like ending it all? What did you think you might do? Did you actually try?

0 - Absent.
1 - Mild - Frequent thoughts of being better off dead, or occasional thoughts of suicide.
2 - Moderate - Deliberately considered suicide with a plan, but made no attempt.
3 - Severe - Suicidal attempt apparently designed to end in death (i.e. accidental discovery or inefficient means).

9. OBSERVED DEPRESSION: Based on interviewer's observations during the entire interview. The question "do you feel like crying?" used at appropriate points in the interview, may elicit information useful to this observation.

    0 - Absent.
    1 - Mild - Subject appears sad and mournful even during parts of the interview, involving affectively neutral discussion.
    2 - Moderate - Subject appears sad and mournful throughout the interview, with gloomy monotonous voice and is tearful or close to tears at times.
    3 - Severe - Subject chokes on distressing topics, frequently sighs deeply or cries openly, or is persistently in a state of frozen misery if the examiner is sure that this is

Appendix D: Social Functioning Scale

Directions: This questionnaire helps us to learn how you have been recently. It takes about 20 minutes to complete. Before starting, please answer the following:

1. Where do you live?

2. Who do you live with?

Social Engagement/Withdrawal Subscale:

1. What time do you get up?

2. How many hours of the day do you spend alone (e.g., alone in a room, walking out alone, listening to radio or watching TV alone)?

3. How often do you start a conversation at home?

4. How often do you leave the house (for any reason)?

5. How do you react to the presence of strangers?

Interpersonal Communication Subscale:

1. How many friends do you have at the present time (people you see regularly, do activities with, etc.?)

2. Do you have a boyfriend/girlfriend (if not married)?

3. How often are you able to carry out a sensible or logical conversation?

4. How easy or difficult do you find it talking to people at the present time?

Independence – Performance Subscale:

Directions: Indicate how often each of the following was done during the past 3 months.

1. Buying items from stores without help

2. Washing dishes, cleaning up, etc.

3. Regular showering/bathing etc.

4. Washing own clothes

5. Looking for a job (if unemployed)

6. Doing the food shopping

7. Preparing and cooking a meal

8. Leaving the house alone

9. Using buses, trains, etc.

10. Using money

11. Budgeting

12. Choosing and buying clothes for self

13. Taking care of personal appearance

Recreation Subscale:

Directions: How often has the respondent done each of the following in the last 3 months:

1. Playing musical instruments

2. Sewing, knitting

3. Gardening

4. Reading

5. Watching television

6. Listening to CDs/tapes/radio

7. Cooking

8. Do It Yourself activities (e.g., plumbing, carpentry)

9. Fixing things (car, bike, household item)

10. Walking

11. Driving/biking (as recreation)

12. Swimming

13. Hobbies (e.g., collecting things)

14. Shopping

15. Artistic activity (painting, crafts)

Prosocial Subscale:

Directions: How often has the respondent done each of the following in the last 3 months:

1. Movies

2. Theater/concert

3. Watching an indoor sport (wrestling, basketball)

4. Watching an outdoor sport (football, baseball)

5. Art gallery/museum

6. Exhibition/festival/fair

7. Visiting places of interest

8. Meetings/talks etc. (count AA/NA meetings)

9. Attending class

10. Visiting relatives in their homes

11. Being visited by relatives

12. Visiting friends (including girlfriend/boyfriend)

13. Parties

14. Formal occasions

15. Dance club

16. Nightclub/social club

17. Playing an indoor sport

18. Playing an outdoor sport

19. Club/society

20. Bar

21. Eating out

22. Church activity

Independence – Competence:

Directions: How able are you to do each of the following activities?

1. Use public transportation

2. Handle money

3. Budget money

4. Cook for self

5. Do weekly shopping

6. Look for a job

7. Wash own clothes

8. Take care of personal hygiene

9. Wash, clean, etc.

10. Buy things from stores

11. Leave the house alone

12. Choose and buy clothes

13. Care for personal appearance

Occupational/Employment Subscale:

1. Are you currently working? (this includes job training courses/rehabilitation)

2. If Yes:
       2a. What kind of work are you doing?

2b. How many hours do you work each week?

2c. How long have you had this job? (months)

3. If No:

3a. When did you last work (in months)?

3b. What kind of job was it?

3c. How many hours did you work each week?

4. Do you collect payments for a physical or mental disability?

5. Are you currently in outpatient treatment (i.e., attend a hospital/treatment center as a day patient)?

6. Do you think that you are capable of some kind of employment/work?

7. How often do you make attempts to find a job (e.g., look in the newspaper, go to employment center)?

Appendix E: Facial Affect Coding System Manual

The Facial Expression Coding System (FACES):

A Users Guide

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The Facial Expression Coding System (FACES): A User's Guide

Facial expression of emotion is of great interest to many researchers. It has been studied in connection with subjective emotional experience, physiological arousal, and communication to name but a few areas. Interest in facial expression has a rich history dating back to the mid 19th century (Piderit, 1858, 1888; Gratiolet, 1865). Perhaps the most influential of these early theorists was Charles Darwin. In his book, *The Expression of the Emotions in Man and Animals*, Darwin (1896) argued that facial expressions were universal and innate characteristics. In the infancy of the science of psychology, William James hypothesized that facial expression played a causative role in the experience of emotion. In fact, according to James, changes in the facial musculature comprised a large portion of emotional state. James' ideas about emotion set forth a tradition of scholarly debate about the role of facial expression in emotion that continues today. In the early 1960's, Tomkins (1962, 1963) proposed what has become known as the facial feedback hypothesis. Stated succinctly, facial feedback theory holds that facial expression provides feedback which in turn produces the emotion. A tradition of research investigating the facial feedback hypothesis (see Adelmann & Zajonc, 1989 for a review) has ensued, but several unanswered questions remain regarding the mechanisms and functions of facial expressions of emotion.

Systems for Coding Facial Expression

Ekman and Friesen (1976, 1978) were pioneers in the development of measurement systems for facial expression. Their system, known as the Facial Action Coding System or FACS, was developed based on a discrete emotions theoretical perspective and is designed to measure specific facial muscle movements. A second system, EMFACS, is an abbreviated version of FACS that assesses only those muscle movements believed to be associated with emotional expressions. In developing these systems, Ekman importantly distinguishes between two different types of judgments: those made about behavior (measuring sign vehicles) and those that make inferences about behavior (message judgments). Ekman has argued that measuring specific facial muscle movements (referred to as action units in FACS) is a descriptive analysis of behavior, whereas measuring facial expressions such as anger or happiness is an inferential process whereby assumptions about underlying psychological states are made. It is important to point out, as Ekman does, that any observational system requires inferences about that which is being measured. Other available systems have been designed to measure either specific aspects of facial behavior (e.g., Ermiane & Gergerian, 1978; Izard, 1979; see Ekman (1982) for a selective review) or more generally defined facial expressions (e.g., Notarious & Levenson, 1979).

Why a New System?

The primary reason for developing a new system was based on the perceived need for a facial coding that is theoretically aligned with a dimensional model of emotion. Several researchers have argued that affective expression consists of two broad dimensions: valence and arousal (e.g., Russell, 1980; Schlosberg, 1952). Similarly, researchers have

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argued that emotional experience variance is also best captured by two dimensions (e.g., Larsen & Diener, 1992; Watson, Clark, & Tellegen, 1988). Most currently available coding systems of facial behavior are based on discrete emotion theory and are designed to measure a number of specific or basic emotions. Although some might argue that these systems can be considered "dimensional" to the extent that discrete categories can be combined to form dimensions, this approach is inconsistent with the empirical literature upon which dimensional models of emotion have developed. The Facial Expression Coding System (FACES) was designed as a dimensional measure of facial behavior.

Second, while the Ekman and Friesen systems have been the pacesetters for studying facial expression of emotion, they are not without cost. It takes a great deal of time to train coders to use the system accurately and reliably (Ekman (1982) estimated approximately 100 hours were needed for training). Additionally, coding time can be quite extensive and as a result, often only small segments of subjects' facial behavior are coded with FACS. EMFACS is somewhat more economical in that coders are not required to detect each muscle change but rather decide if a group of changes presumed to be associated with particular emotions have occurred. Being restricted to examine small portions of a subjects data, although useful if researchers are interested in identifying specific responses to specific stimuli, can also be problematic. First, examining small segments may obscure an examination of the natural unfolding of expressive behavior over time. Second, selection of these segments most often requires *a priori* decisions about which segment is likely to produce the most expressive behavior. Selecting segments which maximize the likelihood of expressive behavior for all subjects can be quite difficult.

An Overview of FACES

The Facial Expression Coding System (FACES) was developed as a less time consuming alternative to measuring facial expression that is aligned with dimensional models of emotion. The system provides information about the frequency, intensity, valence, and duration of facial expressions. The selection of the variables included in the system was based on theory and previous empirical studies. Adopting the descriptive style of Ekman and similar to the work of Notarious and Levenson (1979), an expression is defined as any change in the face from a neutral display (i.e., no expression) to a non-neutral display and back to a neutral display. When this activity occurs, a frequency count of expressions is initiated. Next, coders rate the valence (positive or negative) and the intensity of each expression detected. Notice that this is quite different from assigning an emotion term to each expression. While FACES requires coders to decide whether an expression is positive or negative, it does not require the application of specific labels. There is support in the literature for this approach, often referred to as the cultural informants approach (Gottman & Levenson, 1985). That is, judgments about emotion, in this case whether an expression is positive or negative, are made by persons who are considered to be familiar with emotion in a particular culture. In addition to valence and intensity, coders also record the duration of the expression. Finally, a global expressiveness rating for each segment is made, and judgements about specific emotions expressed throughout the segment can also be obtained.

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How to Use FACES

FACES was initially developed to measure facial expressions in response to five minute film clips. The system can be adapted to other applications, however, and attempts to represent the broad applicability of the system are made throughout the manual. Generally speaking, the system allows for the examination of a subject's entire record of expressive behavior. When we videotaped subjects viewing emotional films, the soundtrack from the movie was not included on their videotapes. Thus, coders only viewed subjects facial reactions to the films. We have typically had two raters coding each subject. As will be discussed below, reliability for FACES has routinely been very high.

Detecting an Expression

While viewing a subject's record, an expression is detected if the face changes from a neutral display to a non-neutral display and then back to a neutral display. It is important to note, however, that a facial display may not always return to the original neutral display but may instead return to a display that, although neutral, does not exactly resemble the prior neutral expression. Additionally, if after a subject displays a shift from a neutral to non-neutral display and, instead of returning to a neutral display, shows a clear change in affective expression, this change is counted as an additional expression. For example, if while smiling, a subject then raises his or her eyebrows and stops smiling, indicating more of a surprised look, two expressions will be coded.

Duration

Once an expression has been detected, the duration is measured. For convenience, a time-mark in seconds should be included on subjects' videotape. The duration measurement should start as soon as the subject changes from a neutral to non-neutral display. This time should be recorded on a coding form (sample coding forms are presented in the Appendix). The duration measurement should stop as soon as the subject changes back from a non-neutral to neutral display, and the time should be recorded on the coding form. The duration in seconds can then be calculated by subtracting the beginning time from the end time and then recorded on the coding form.

Valence

Next, the coder must decide whether the expression was positive or negative and make the appropriate notation on the coding form. If there is doubt as to whether the expression is positive or negative, a comprehensive list of affect descriptors is presented in the Appendix. Extensive research (Russell, 1980; Watson & Tellegen, 1985) has established these descriptors as either positive or negative. They are provided simply as a guide for coders in determining the valence of an expression. Coders are not asked to supply a descriptor for each expression detected.

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<u>Intensity</u>

Intensity ratings for an individual expression range from one to four (1=low, 2=medium, 3=high, 4=very high). The low rating is given for those expressions that are mild, such as a smile where a subject slightly raises the corners of his/her mouth but does not show the teeth, and very little movement around the eyes occurs. The medium rating is given for those expressions where a subject's expression is more moderate than mild in intensity, such as a smile bordering on a laugh, with the eyebrows slightly raised and the lips apart, exposing the teeth. The high rating is given for an expression that involves most, if not all, of the face, such as laughing with an open mouth and raising the eyebrows and cheeks. The very high rating is reserved for those expressions that are very intense. An example of such an expression is one where a subject is undeniably laughing, with the mouth completely open with the eyebrows and cheeks substantially raised.

<u>Summarizing the data</u>

When film clips are the stimuli, we have found it useful to provide summary information at the end of each film clip. Specifically, two, subjective global ratings are taken: judgments about the specific emotion(s) being expressed and a judgment about the overall level of expressiveness. Additionally, summary information is calculated for the frequency, intensity, and duration measures for both positive and negative expressions. two sample summary sheets are found in the Appendix.

Predominant Emotion Expressed

Although not a primary focus of the system, we have used two different rating schemes to assess more specific judgements of individual emotions: a forced choice rating and Likert format ratings. Using the forced choice method to determine the predominant emotion expressed, the coder should look over the coded expressions for the entire segment to obtain an assessment of whether the subject was expressing predominantly positive or negative emotions. Then, the coder is required to choose one of seven emotions on the summary form (happiness, sadness, disgust/fear, interest, neutral/indifferent, surprise, or anger). These were chosen as manipulation checks for the emotional film clips and can certainly be modified for different applications. This can be a difficult item to code. For example, a subject who was expressive during the segment can still obtain a global rating of neutral/indifferent if the expressions were all low in intensity and short in duration.

Using Likert scales, coders are required to rate, using a six point scale (1 = not at all to 6 = very much), the degree to which each specific emotion (e.g., happiness, sadness, amusement, fear, disgust, anger, interest) was expressed during the segment.

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Level of Expressiveness

This rating is the coder's global assessment of expressiveness during a segment. Before making this assessment, the coder should look at all the individual expression ratings during the segment. That is, this rating requires consideration of individual ratings of valence, duration, and intensity. The global rating of expressiveness ranges from one to five (1=low, 2=fairly low, 3=moderate, 4=fairly high, 5=high). A low rating would be given to a subject who had none or few expressions all of which were short and low in intensity. In contrast, a high rating would be assigned to a subject who had many highly intense and longer expressions.

Summary Measures

The total number of expressions is computed by simply counting the frequency of positive and negative expressions and recording these on the summary form. Similarly, the duration for expressions is computed by adding together the seconds for the positive and negative expressions (computed separately) and recording them on the summary form. Calculating mean duration is accomplished by dividing the total duration of positive expressions by the number of positive expressions. Mean negative duration is calculated by dividing the total negative duration by the number of negative expressions. Calculating the mean positive intensity requires that the positive intensity ratings be added together and divided by the number of positive expressions. In the same fashion, the mean negative intensity is calculated by dividing the sum of the negative intensity ratings by the number of negative expressions. The means for duration and intensity can be included on the summary sheet, or can be easily calculated using whatever statistical package you use (e.g., SPSS, BMDP, SAS, SYSTAT).

Things to Watch out for:

Experience with the coding system tells us that there are a number of things that can be problematic for coders if they are not discussed ahead of time. Below, we provide a list of the most common problems. This list is necessarily tied to our application and thus may not be applicable in other studies or settings. These suggestions are offered as guides, not absolute solutions, for coders.

Shifting Body Positions

A coder may sometimes mistake a change of body position for a change from a neutral to non-neutral facial display. Coders must take special care to ensure that the face changes in addition to the body posture shift in order to record that an expression has occurred.

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Not paying attention

The coder should not code any expressions if the subject does not appear to be paying attention to the stimuli. Although this can be difficult to determine, if the subject is looking down or away from the stimulus that is being presented, it is likely that he or she is not attending. We have also employed separate ratings of attention in order to assess this more systematically. Depending on the application and subject population, this may be advisable.

Hand covering part of face

If a subject's hand is covering part of the face, the coder may unfortunately need to rely on the other parts of the face to detect the occurrence of facial expressions. For example, if the subject is covering the mouth area, the coder will need to pay special attention to the eye, nose, forehead, and cheek areas to code expressions.

Eye glasses

If the subject is wearing eye glasses, the coder may find it difficult to examine the subject's eyes during facial expressions. In this situation, the coder is encouraged to examine as best as possible eye movements (e.g., eyebrows raised above the eyeglass frame) as well as other areas of the face when determining whether or not an expression has occurred.

Contact lenses

If the subject is a contact lens wearer, chances are good that he or she may have eye movements related to the lenses and not to facial expressions per se. If possible, determine ahead of time if the subject wears and/or experiences any problems with contact lenses. If repetitive movements (e.g., blinking) occur that do not appear to be tied to the stimulus presentation, these should not be coded as facial expressions. Determination of this can be difficult and is best established by observing several occurrences of such movements across stimulus presentations.

Gum chewing

Subjects chewing gum can present a sticky problem for coders. Gum chewing may actually inhibit natural expressive displays. The best solution here is to make sure a subject removes gum prior to the beginning of stimulus presentation.

Talking

Talking during a study can be problematic if more than one subject is being run through a study or if an experimenter is in the room. The best advice is to strongly encourage subjects to refrain from talking during the experiment. In the event that coders

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are faced with rating a segment in which a subject is talking, attempts should be made to identify an expression independent of the talking. For example, if a subject smiles and then begins talking, the smile should be recorded as an expression. If on the other hand, the subject begins talking and has clearly diverted attention from the stimulus presentation, and smiles, it should not be recorded as an expression.

Facial tics

Occasionally, a subject may repeatedly display facial movements that do not appear to be expressions of emotion and are instead facial tics. As cited above, contact lens wearers may have eye movements that are related only to the lenses. Other people may have other repetitive facial movements. These may not be obvious initially, but after viewing several minutes of a subject's record, they may become more prominent. A special case involves psychiatric patients with tardive dyskinesia. Patients who have taken neuroleptic medication for long periods of time may develop this very unfortunate side effect. Tardive dyskinesia involves uncontrollable repetitive movements that may involve facial muscles, most often those around the mouth. Any work done with psychiatric patients should involve careful assessment of these symptoms.

Assessing Rater Agreement

Since its inception, reliability for coders using FACES has been calculated using the intraclass correlation coefficient. The intraclass correlation coefficient is the correlation between one measurement (e.g., ratings of facial expressions) on a target and another measurement made on that same target (Shrout & Fleiss, 1979). More specifically, following the Case 2 study described by Shrout & Fleiss (1979), the coders (judges) are considered to be selected from a random sample of judges, and each judge rates each subject or target. That is, it is assumed that FACES can be used effectively by any set of coders. The formula used to calculate the ICC is derived from the components of a two-way ANOVA (Subjects x Coders) which partitions the within-target sum of squares into a between-coders sum of squares and a residual sum of squares. Because the variance to due coders is not ignored, the coefficient can be interpreted as an index of agreement rather than consistency (Shrout & Fleiss, 1979). As such, the formula is:

$$ICC = \frac{BMS - EMS}{BMS + (k-1)EMS + k(CMS - EMS)/n}$$

where:

BMS = between subjects mean square
EMS = residual mean square
CMS = between coders mean square
k = number of coders
n = number of subjects

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In our applications, using trained undergraduate and graduate students as coders and with varied subject populations (e.g.,undergraduates, adult community residents, psychiatric patients), the agreement has been very high, ranging from .70 to .99.

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Appendix F:

Facial Affect Coding System Summary Sheet

Subject ID: _____   Rater: _____   Film Type:_____

Time start: _____   Time end: _____   Duration: _____

Valence: Positive: _____   Negative: ____

Intensity: low   medium   high   very high
               1   2   3   4

Time start: _____   Time end: _____   Duration: _____

Valence: Positive: _____   Negative: ____

Intensity: low   medium   high   very high
               1   2   3   4

_____

Time start: _____   Time end: _____   Duration: _____

Valence: Positive: _____   Negative: ____

Intensity: low   medium   high   very high
               1   2   3   4

Time start: _____   Time end: _____   Duration: _____

Valence: Positive: _____   Negative: ____

Intensity: low   medium   high   very high
               1   2   3   4

What is the overall level of expressiveness for this person for this film clip?

Low	fairly low	medium	fairly high	high
1	2	3	4	5

Number of positive expressions: _____

Number of negative expressions: _____

Mean intensity-positive: _____

Mean intensity-negative: _____

Duration of positive expressions: _____ (in seconds)

Duration of negative expressions: _____ (in seconds)

Table 1

Demographic Characteristics for the Patient Sample (N = 32)

	Patient Sample N (%)
Gender	
Male (%)	25 (78.1%)
Female (%)	7 (21.9%)
Ethnicity	
Caucasian (%)	3 (9.4%)
African American (%)	28 (87.5%)
Asian (%)	1 (3.1%)
Hispanic (%)	0 (0.0%)
Other (%)	0 (0.0%)
Education	
Attended some high school (%)	13 (40.6%)
High School Graduate (%)	12 (37.5%)
Part-college (%)	6 (18.8%)
Employment Status	
Employed (%)	10 (31.3%)
Unemployed (%)	22 (68.8%)
Military Service	11 (34.4%)

Table 2

Intra-class Correlations (ICC) for FACES Variables (N = 32)

	ICC Pair 1	ICC Pair 2
Frequency of positive expressions	.98	.99
Duration of positive expressions	.99	.89
Intensity of positive expressions	.93	.99

Note. FACES: Facial Expression Coding System

Table 3

Correlations Between Individual FACES Variables (N = 32)

	r
Frequency x Duration	.59*
Frequency x Intensity	.71*
Duration x Intensity	.78*

Note. * $p < 0.01$; FACES: Facial Expression Coding System.

Table 4

Correlations Between NSRS Subscales and FACES Variables(r)

	Frequency	Intensity	Duration
NSRS Subscales			
Anhedonia (N = 27)	-.16	.00	-.08
Asociality (N = 29)	-.30	-.21	.00
Avolition (N = 26)	-.23	-.34	-.28
Blunted Affect (N = 32)	-.50**	-.52**	-.42*
Alogia (N = 32)	-.22	-.28	-.04

Note. *p < .05; **p < .01.

Table 5

Correlations between FACES Subscales and Psychotic and Depressive Symptomatology

	BPRS Thought Subscale (N = 32)	Calgary Depression Scale (N = 30)
FACES Subscales		
Frequency	-.09	-.16
Intensity	.12	-.21
Duration	.14	-.23

Note. NSRS: Negative Symptom Rating Scale; BPRS: Brief Psychiatric Rating Scale.

Table 6

Correlations Between Social Functioning Scale Variables and FACES Variables(r)

	Frequency	Intensity	Duration
Engagement/Withdrawal (N = 30)	.01	.08	.02
Interpersonal Behavior (N = 28)	.31	.33	.24
Pro-Social Behavior (N = 31)	.12	.03	.08
Recreation (N = 31)	-.07	-.15	-.15
Independence/Competence (N = 29)	-.28	-.39	-.36
Independence/Performance (N = 24)	.03	-.04	.04

Note. FACES: Facial Expression Coding System

Bibliography

Addington, D., Addington, J., & Atkinson, M. (1996). A psychometric comparison of the Calgary Depression Scale for Schizophrenia and the Hamilton Depression Rating Scale. *Schizophrenia Research, 19*, 205-212.

Addington, D., Addington, J., Maticka-Tyndale, E., & Joyce, J. (1992). Reliability and validity of a depression rating scale for schizophrenics. *Schizophrenia Research, 6*, 201-208.

Addington, D., Addington, J., & Schissel, B. (1990). A depression rating scale for schizophrenics. *Schizophrenia Research, 3*, 247-251.

Addington, J., & Addington, D. (2000). Neurocognitive and social functioning in schizophrenia: A 2.5 year follow-up study. *Schizophrenia Research*, *44,* 47-56.

Addington, J., Penn, D., Woods, S. W., Addington, D., & Perkins, D. O. (2008). Social functioning in individuals at clinical high risk for psychosis. *Schizophrenia Research, 99,* 119-124.

Aghevli, M. A., Blanchard, J. J., & Horan, W. P. (2003). The expression and experience of emotion in schizophrenia: A study of social interactions. *Psychiatry Research, 119*, 261-70.

American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders (Text Revision).* Washington, D.C.: American Psychiatric Association.

Anderson, J., Larsen, J.K. & Schultz, V. (1989). The brief psychiatric rating scale: Dimension of schizophrenia: Reliability and construct validity, *Psychopathology, 22,* 168-176.

Andreasen, N. C. (1982). Negative symptoms in schizophrenia: Definition and reliability. *Archives of General Psychiatry, 39*, 784-788.

Bengtsson-Tops, A., & Hansson, L. (1999). Clinical and social needs of schizophrenic outpatients living in the community: The relationship between needs and subjective quality of life. *Social Psychiatry and Psychiatric Epidemiology, 34,* 513-518.

Berenbaum, H., & Oltmanns, T. F. (1992). Emotional experience and expression in schizophrenia and depression. *Journal of Abnormal Psychology, 10*, 37-44.

Birchwood, M., Smith, J., Cochran, R., Wetton, S., & Copestake, S. (1990). The social functioning scale: The development and validation of a new scale of social adjustment for use in family intervention programs with schizophrenic patients. *British Journal of Psychiatry, 157*, 853-859.

Blanchard, J. J., & Cohen, A. S. (2006). The structure of negative symptoms within schizophrenia: Implications for Assessment. *Schizophrenia Bulletin, 32,* 238-245.

Blanchard, J. J., & Panzarella, C. (1998). Affect and social functioning in schizophrenia. In K. T. Mueser, & N. Tarrier (Eds.), *Handbook of Social Functioning* (pp. 181-196). Needham Heights, MA: Allyn & Bacon.

Bowie, C. R., Anderson, H., Halpern, B., Patterson, T. L., Harvey, P. D. (2007). Self-assessment of functional status in schizophrenia. *Journal of Psychiatric Research, 41,* 1012-1018.

Breier, A., Schreiber, J. L., Dyer, J., & Pickar, D. (1991). National institute of mental health longitudinal study of chronic schizophrenia. *Archives of General Psychiatry, 48*, 239-246.

Brody, L. R., & Hall, J. A. (2000). Gender, emotion, and expression. In M. Lewis & J. M. Haviland (Eds.), *Handbook of emotions* (2nd ed., pp. 447–460). New York: Guilford Press.

Brozgold, A. Z., Borod, J. C., Martin, C. C., Pick, L. H., Alpert, M., & Welkowitz, J. (1998). Social funcitoning and facial emotional expression in neurological and psychiatric disorders. *Applied Neuropsychology, 5*, 15.

Buckley, P. F., & Stahl, S. M. (2007). Pharmacological treatment of negative symptoms in schizophrenia: Therapeutic opportunity or cul-de-sac? *Acta Psychiatrica Scandinvica, 115*, 93-100.

Cannon, M., Jones, P., Gilvarry, C., Rifkin, L., McKenzie, K., Foerster, A., & Murray, R. M. (1997). Premorbid social functioning in schizophrenia and bipolar disorder: Similarities and differences. *American Journal of Psychiatry, 154,* 1544-1550.

Collins, A. A., Remington, G., Coulter, K., & Birkett, K. (1996). Depression in schizophrenia: A comparison of three measures. *Schizophrenia Research, 20*, 205-209.

Dickerson, R., Boronow, J. J., Ringel, N., & Parente, F. (1999). Social Functioning and neurocognitive deficits in outpatients with schizophrenia: A 2-year follow-up. *Schizophrenia Research, 37,* 13-20.

Dickerson, F. B., Ringel, N., & Parente, F. (1999). Predictors of residential independence among outpatients with schizophrenia. *Psychiatric Services, 50*, 515-519.

Dworkin, R. H., Clark, S. C., Amador, X. F., & Gorman, J. M. (1996). Does affective blunting in schizophrenia reflect affective deficit or neuromotor dysfunction? *Schizophrenia Research, 20*, 301-306.

Earnst, K. S., & Kring, A. M. (1997). Construct validity of negative symptoms: An empirical and conceptual review. *Clinical Psychology Review, 17*, 167-189.

Evans, J. D., Bond, G. R., Meyers, P. S., Kim, H. W., Lysaker, P. H., Gibson, P. J., et al. (2004). Cognitive and clinical predictors of success in vocational rehabilitation of schizophrenia. *Schizophrenia Research, 70*, 331-342.

Falkenberg, I., Bartels, M., & Wild, B. (2008). Keep smiling! Facial reactions of emotional stimuli and their relationship to emotional contagion in patients with schizophrenia. *European Archives of Psychiatry and Clinical Neuroscience, 258,* 245-253.

Fenton, W. S., & McGlashan, T. H. (1991). Natural history or schizophrenia subtypes: II. Positive and negative symptoms and long-term course. *Archives of General Psychiatry, 48*, 978-986.

Fischer, A. H. (1993). Sex differences in emotionality: Factor stereotype? *Feminism & Psychology, 3,* 303–318.

Forbes, C., Wilson, A., Baker, B., & Blanchard, J. (2009). *The negative symptom rating scale: Initial evaluation of reliability and validity.* Manuscript in preparation.

Gard, D. E., Kring, A. M., Gard, M. G., Horan, W. P., & Green, M. F. (2007). Anhedonia in schizophrenia: Distinctions between anticipatory and consummartory pleasure. *Schizphrenia Research, 93*, 253-260.

Harvey, P. D., Koren, D., Reichenberg, A., & Bowie, C. R. (2006). Negative symptoms and cognitive deficits: What is the nature of their relationship? *Schizophrenia Bulletin , 32*, 250-258.

Henry, J. D., Rendell, P. G., Green, M. J., McDonald, S., & O'Donnell, M. (2008). Emotion regulation in schizophrenia: Affective, social and clinical correlates of suppression and reappraisal. *Journal of Abnormal Psychology , 117*, 473-478.

Ho, B., Nopoulos, P., Flaum, M., Arndt, S., & Andreasen, N. C. (1998). Two-year outcome in first-episode schizophrenia: Predictive value of symptoms for quality of life. *American Journal of Psychiatry, 155*, 1196-1201.

Hofer, A., Baumgartner, S., Edlinger, M., Humer, M., Kemmler, G., Rettenbacher, M. A., et al. (2005). Patient outcomes in schizophrenia I: Correlates with sociodemographic variables, psychopathology, and side effects. *European Psychiatry, 20*, 386-394.

Hoffman, H., Kupper, A., Zbinden, M., & Hirsbrunner, H. P. (2003). Predicting vocational functioning and outcome in schizophrenia outpatients attending a vocational rehabilitation program. *Social Psychiatry and Psychiatric Epidemiology, 38*, 76-82.

Jablensky, A. (2000). Epidemiology in schizophrenia: The global burden of disease and disability. *European Archives of Clinical Neuroscience, 250*, 274-285.

Janicak, P.G., Davis, J.M., Preskorn, S.H., Ayd, F.J., Marder, S.R. & Pavuluri, M.N. Principles and practice of psychopharmacotherapy (4th ed.). Philadelphia: Lippincott, Williams & Wilkins.

Kay, S. R. (1990). Positive-negative symptom assessment in schizophrenia: Psychometric issues and scale comparison. *Psychiatric Quarterly, 61*, 163-177.

Kay, S. R., Fizbein, A., & Opler, L. A. (1987). The Positive and Negative Syndrome Scale (PANSS) for schizophrenia. *Schizophrenia Bulletin, 13*, 261-276.

Kay, S. R., Opler, L. A., & Lindenmayer, J. P. (1989). The Positive and Negative Syndrome Scale (PANSS): Rationale and standardization. *British Journal of Psychiatry, 155*, 59-65.

Keefe, R. S., Harvey, P. D., Lenzenweger, M. F., Davidson, M., Apter, S. H., Schmeidler, J., et al. (1992). Empirical assessment of the factorial structure of clinical symptoms in schizophrenia: Negative symptoms. *Psychiatry Research, 44*, 153-165.

Kelley, M. E., van Kammen, D. P., & Allen, D. N. (1999). Empirical validation of primary negative symptoms: Independence from effects of medication and psychosis. *American Journal of Psychiatry, 156*, 406-411.

Keltner, D., & Kring, A. M. (1998). Emotion, social function and psychopathology. *Review of General Psychology, 2,* 320-342.

Kopelowicz, A., Liberman, R. P., & Zarate, R. (2006). Recent advances in social skills training for schizophrenia. *Schizophrenia Bulletin, 32(Supplement 1),* S12-S23.

Kirkpatrick, B., Fenton, W., Carpenter, W. T., & Marder, S. R. (2006). The NIMH-MATRICS consensus statement on negative symptoms. *Schizophrenia Bulletin , 32*, 296-303.

Kring, A. M., & Neale, J. M. (1996). Do schizophrenic patients show a disjunctive relationship among expressive, experiential and psychophysiological components of emotion? *Journal of Abnormal Psychology, 105*, 249-257.

Kring, A. M., & Sloan, D. (1991). The Facial Expression Coding System (FACES): A Users Guide. *Unpublished Manuscript .*

Kring, A. M. & Sloan, D. (2007). The Facial Expression Coding System (FACES): Development, validation, and utility. *Psychological Assessment, 19,* 210-224.

Kring, A. M., Kerr, S. L., Smith, D. A., & Neale, J. M. (1993). Flat affect in schizrenia does not reflect dimished subjective experience of emotion. *Journal of Abnormal Psychology , 102*, 507-517.

Kring, A. M., Smith, D. A., and Neale, J. M. (1994). Individual differences in dispositional expressiveness: Development and validation of the Emotional Expressivity Scale. *Journal of Personality and Social Psychology, 66(5),* 934-949.

Lysacker, P., & Bell, M. (1995). Negative symptoms and vocational impairment in schizophrenia: Repeated measurements of work performance over six months. *Acta Psychiatrica Scandinavica, 91*, 205-208.

Martin, C. C., Borod, J. C., Alpert, M., & Brozgold, A. Z. (1990). Spontaneous expression of facial emotion in schizophrenic and right-brain-damaged patients. *Journal of Communication Disorders, 23,* 287-301.

McGlashan, T. H., & Fenton, W. S. (1992). The positive-negative distinction in schizophrenia: Review of natural history validators. *Archives of General Psychiatry, 49*, 63-72.

McGurk, S. R., & Meltzer, H. Y. (2000). The role of cognition in vocational functioning in schizophrenia. *Schizophrenia Research, 45*, 175-184.

Milve, P., Ho, B., Arndt, S., & Andreasen, N. C. (2005). Predictive values of neurocognition and negative symptoms on functional outcome in schizophrenia: A longitudinal first-episode study with 7-year follow-up. *American Journal of Psychiatry, 162,* 495-506.

Morlan, K.K. & Tan, S. (1998). Comparison of the Brief Psychiatric Rating Scale and the Brief Symptom Inventory. *Journal of Clinical Psychology, 54,* 885-894.

Mueser, K. T., Sayers, S. L., Schooler, N. R., Mance, R. M., & Haas, G. L. (1994). A multi-site investigation of the reliability of the scale for the assessment of negative symptoms. *American Journal of Psychiatry, 151*, 1453-1462.

Norman, R. M., Malla, A. K., Cortese, L., Cheng, S., Diaz, K., McIntosh, E., et al. (1999). Symptoms and cognition as predictors of community functioning: A prospective analysis. *American Journal of Psychiatry, 156*, 400-405.

Norman, R. M., Malla, A. K., McLean, T., Panth, L., Voruganti, N., Cortese, L., et al. (2000). The relationship of symptoms and level of functioning in schizophrenia to general wellbeing and the Quality of Life Scale. *Acta Psychiatrica Scandinavica, 102*, 303-309.

Overall, J. E., & Gorham, D. R. (1962). The brief psychiatric rating scale. *Psychological Reports, 10*, 799-812.

Patterson, T. L., Moscana, S., McKibbin, C. L., Davidson, K., & Jeste, D. V. (2001). Social skill performance assessment among older patients with schizophrenia. *Schizophrenia Research, 48*, 351-360.

Peralta, V., & Cuesta, M. J. (1999). Negative parkinsonian, depressive and catatonic symptoms in schizophrenia: A conflict of paradigms revisited. *Schizophrenia Research, 40*, 245-253.

Peralta, V., & Cuesta, M. J. (1995). Negative symptoms in schizophrenia: A confirmatory factor analysis of competing models. *American Journal of Psychiatry, 152*, 1450-1457.

Peralta, V., Cuesta, M. J., & DeLeon, J. (1995). Positive and negative symptoms/syndromes in schizophrenia: Reliability and validity of different diagnostic systems. *Psychological Medicine, 25*, 43-50.

Sass, H. (1989). The historical evolution of the concept of negative symptoms in schizophrenia. *British Journal of Psychiatry, 155*, 26-31.

Sayers, S. L., Curran, P. J., & Mueser, K. T. (1994). Factor structure and construct validity of the scale for the assessment of negative symptoms. *Psychological Assessment, 8*, 269-280.

Schuldberg, D., Quinlan, D. M., & Glazer, J. (1999). Positive and negative symptoms and adjustment in severely mentally ill outpatients. *Psychiatry Research, 85*, 177-188.

Shafer, A. (2005). Meta-analysis of the brief psychiatric rating scale factor structure, *Psychological Assessment, 17,* 324-335.

Shrout, P., & Fleiss, J. L. (1979). Intraclass correlation: Uses in assessing rater reliability. *Psychological Buletin, 86*, 420-428.

Siegal, S. J., Irani, F., Brensinger, C. M., Kohler, C. G., Bilker, W. B., Ragland, J. D., et al. (2006). Prognostic variables at intake and long-term level of function in schizophrenia. *American Journal of Psychiatry, 163*, 433-441.

Singh, M. M., & Kay, S. R. (1975). A comparative study of haloperidol and chlorpromazine in terms of clinical effects and therapeutic reversal with benzotropine in schizophrenia: Theoretical implications for potency differences among neuroleptics. *Psychopharmacologia, 43*, 103-113.

Taylor, R., Longdon, R. (2006). Understanding gender difference in schizophrenia: A review of the literature. *Current Psychiatry Reviews, 2,* 255-265.

Thorup, A., Petersen, L., Jeppesen, P., Ohlenschlaeger, J., Torben, C., Krarup, G. et al. (2007). Gender differences in young adults with first-episode schizophrenia spectrum disorder at baseline in the Danish OPUS study. *Joural of Nervous and Mental Disease, 195,* 396-405.

Tremeau, F., Malaspina, D., Duval, F., Correa, H., Hager-Budny, M., Coin-Bariou, L. (2005). Facial expressiveness in patients with schizophrenia compared to patients and nonpatient comparison subjects. *American Journal of Psychiatry, 162,* 92-101.

Troisi, A., Pompili, E., Binello, L., & Sterpone, A. (2007). Facial expressivity during the clinical interview as a predictor of functional disability in schizophrenia: A pilot study. *Progress in Neuro-Psychopharmacology & Biological Psychiatry, 31,* 475-481.

Walker, E. F., Harvey, P. D., & Perlman, D. (1988). The positive/negative symptom distinction in psychosis: A replication and extension of previous findings. *Journal of Nervous and Mental Disease, 176*, 359-363.

White, L., Harvey, P. D., Opler, L., & Lindenmayer, J. P. (1997). Empirical assessment of the factorial structure of clinical symptoms in schizophrenia: A multisite, multimodel evaluation of the factorial structure of the positive and negative syndrome scale. The PANSS study group. *Psychopathology, 30*, 263-274.

Wolf, K., Mass, R., Kiefer, F., Wiedemann, K., & Naber, D. (2006). Characterizaton of the facial expression of emotions in schizophrenia patients: Preliminary findings with a new electromyography method. *Canadian Journal of Psychiatry, 51*, 335-341.