



Symptom assessment in early psychosis: The use of well-established rating scales in clinical high-risk and recent-onset populations



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ABSTRACT

Symptom assessment in early psychosis research typically relies on scales validated in chronic schizophrenia samples. Our goal was to inform investigators who are selecting symptom scales for early psychosis research. We described measure characteristics, baseline scores, and scale inter-relationships in clinical-high-risk (CHR) and recent-onset psychotic disorder (RO) samples using the Positive and Negative Syndrome Scale, Brief Psychiatric Rating Scale, Scale for the Assessment of Positive Symptoms, and Scale for the Assessment of Negative Symptoms; for the CHR group only, we included the Scale of Prodromal Symptoms. For investigators selecting symptom measures in intervention or longitudinal studies, we also examined the relationship of symptom scales with psychosocial functioning. In both samples, symptom subscales in the same domain, across measures, were moderately to highly intercorrelated. Within all measures, positive symptoms were not correlated with negative symptoms, but disorganized symptoms overlapped with both positive and negative symptoms. Functioning was significantly related to negative and disorganized, but not positive, symptoms in both samples on most measures. Findings suggest strong overlap in symptom severity ratings among the most common scales. In recent-onset samples, each has strengths and weaknesses. In CHR samples, they appear to add little information above and beyond the SOPS.

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1. Introduction

Over the past decade there has been a surge of early psychosis research—which includes clinical high-risk (CHR) and recent-onset (RO) samples—to better understand predictors of psychosis onset and mechanisms of psychopathology, and to improve prevention and early intervention efforts. As the majority of this work spawned from research teams studying schizophrenia in primarily adult, chronic samples, assessment instruments were chosen from the broader literature. Research in RO or even some CHR studies use measures validated in these samples, under the assumption that the scales perform similarly with younger participants who are earlier in the course of illness (e.g., John et al., 2003; Yung et al., 2007). While there is a large body of research on the psychometric properties and utility of the most widely used symptom rating scales in schizophrenia generally, researchers in early psychosis are left little guidance in selecting measures that might best fit their needs.

No study to date has examined the symptom ratings of early psychosis samples across the most commonly administered measures. To assist researchers in their measure selection for clinical assessment in early psychosis studies, we describe the development of several prominent scales in detail, highlighting potential strengths and weaknesses for younger, early illness populations, and report on clinician ratings of two young groups (CHR and RO) on all four measures. We present data on the Positive and Negative Syndrome Scale (PANSS), Brief Psychiatric Rating Scale (BPRS), Scale for the Assessment of Negative Symptoms (SANS), and Scale for the Assessment of Positive Symptoms (SAPS) in both samples; in addition, we present data from the Scale of Prodromal Symptoms (SOPS), a widely used measure of attenuated psychotic symptoms, in the CHR sample only. We chose to focus on the three primary factors capturing symptoms of psychosis: positive, negative, and disorganized symptoms. Thus, while other symptom dimensions are undoubtedly important in understanding the phenomenology of individuals with early psychosis, we decided to limit our scope to those most relevant to research groups studying these populations.

We predicted that scales designed to measure the same symptom domains (e.g., positive symptoms) would be highly

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intercorrelated across measures, and that these individual domains would not be correlated with other distinct domains, either within or across measures. In addition, we examined the relationships between the symptom rating scales and developmentally appropriate measures of social and role functioning to assess the utility of these scales in early psychosis research. That is, we sought to provide information on how these measures might or might not overlap with clinically meaningful indicators of real-world functioning. We predicted that negative and disorganized, but not positive, symptoms would be associated with deficits in social and role functioning in both samples, consistent with the broader literature (Cornblatt et al., 2007; Niendam et al., 2007; Corcoran et al., 2011; Fulford et al., 2013). With these data we hope to provide guidance for early psychosis researchers in selecting among the most widely used symptom-rating scales to best suit the needs of their particular studies in this population.

2. Methods

2.1. Participants and procedures

Study participants ($N=180$) were recruited for one of two ongoing longitudinal studies at the University of California, San Francisco (UCSF) and the San Francisco Veterans Affairs Medical Center (SFVAMC). In the current report we include post-hoc exploratory analyses based on data from these existing studies. Participants were referred for the studies by outpatient clinics, community clinicians, the school district, family members, or self-referred. Eligible participants belonged to one of two diagnostic groups: 1) those at clinical high-risk (CHR) for developing psychosis (see below for a review of criteria; $n=82$) and 2) those with a recent onset (RO) of schizophrenia, schizophreniform, or schizoaffective disorder (disorder onset within the past 5 years; $n=98$). The latter sample included individuals with an average illness duration of less than 2 years (19.6 months; see Fisher et al., 2014). Exclusionary criteria for the ongoing studies includes the following: the presence of a neurological disorder, $IQ < 70$, significant drug use, and psychiatric hospitalization in the 3 months prior to study entry, for RO participants (to examine processes related to early psychosis not fully explained by current symptoms or distress). See Table 1 for an overview of demographic variables.

Participants in both studies were selected as part of ongoing longitudinal examinations of early psychosis in the Prodrome Assessment, Research and Treatment (PART) program: our early psychosis clinic that recruits both high-risk and recent-onset samples. Symptom rating scales were administered at baseline and follow-up assessments, although only baseline data are presented in the current study. All symptom rating scales were administered during the same interview session by the same interviewer and were discussed in regular reliability meetings. Interviewers included bachelor's, master's, or doctorate level researchers trained and supervised by an expert assessor.

Interrater agreement was computed for symptom rating scales (BPRS, PANSS, SAPS, and SANS) following the recommendations of Shrout and Fleiss (1979) for a two-way random effects model, Case 2 intraclass correlation (ICC). In the Case 2 class of ICC for reliability, the same set of raters (judges) rate each participant and are considered to be selected from a random sample of raters. Rater is considered a random effect, meaning that the raters in the study are considered a random sample from a population of potential raters. The intraclass correlation coefficients (ICC) of agreement for symptom rating scales, based on a subset of raters and participants, ranged from 0.91 to 0.97.

Table 1
Sample characteristics.

	CHR ($N=82$)	RO ($N=98$)
Age (M years [S.D.])	18.51 (4.38)	21.29 (3.86)
Parental Hollingshead SES* (M [S.D.])	38.39 (16.46)	35.57 (16.49)
Male (%)	56.10	74.50
Non-Hispanic Caucasian (%)	42.7	42.9
Hispanic/Latino (%)	12.2	6.1
African American (%)	4.9	9.2
Pacific Islander (%)	1.2	1.0
Asian American (%)	19.5	26.5
Multiracial (%)	19.5	14.3

Note: CHR=clinical-high-risk; RO=recent-onset.

2.2. Measurements

2.2.1. Clinical diagnosis and psychosocial functioning measures

CHR participants met at-risk criteria as assessed by the Structured Interview for Prodromal Syndromes (SIPS; Miller et al., 2003). The SIPS classifies three types of prodromal syndromes, listed in order of typical sample prevalence: (1) Attenuated Positive Symptom syndrome (APS): attenuated positive psychotic symptoms present at least once per week, started or worsened in that past year; (2) Brief Intermittent Psychotic Symptoms syndrome (BIPS): brief and intermittent fully psychotic symptoms that had started recently; (3) Genetic Risk and Deterioration syndrome (GRD): a decline of at least 30% on the GAF scale in the previous 12 months and either a family history of a psychotic disorder in any first-degree relative or criteria for schizotypal personality disorder are met. For participants aged 16 and above, the presence of DSM-IV (American Psychiatric Association, 2000) Axis I disorders was assessed by the Structured Clinical Interview for DSM-IV-TR (SCID; First et al., 2002); for participants under the age of 16, both the participant and one of the participant's caretakers were administered the Kiddie-Sads Schedule for Affective Disorders and Schizophrenia (K-SADS; Kaufman et al., 1996). Social and occupational functioning were measured using the Global Functioning: Social (GFS; Auther et al., 2006) and Global Functioning: Role (GFR; Niendam et al., 2006) scales, which are clinician administered measures developed specifically to capture the range of functioning in CHR or younger psychosis populations. Interrater reliability for the GFR and GFS is high, and both scales demonstrate construct validity (Cornblatt et al., 2007).

2.2.2. Psychosis symptom rating scales

Here we briefly describe the symptom measures included in this study. For details on scoring, measure development, and strengths and weaknesses, see [Supplementary Material](#).

2.2.2.1. Scale for the Assessment of Negative Symptoms (SANS). The SANS (Andreasen, 1982) measures negative symptoms and consists of 22 items divided into five subscales (Affective Flattening or Blunting, Alogia, Avolition-Apathy, Anhedonia-Asociality, and Attention). A global score for each subscale intended to summarize all of the symptoms within a subscale category is also included. A semi-structured interview is used to make some of the item ratings, with additional ratings based on direct behavioral observation.

2.2.2.2. Scale for the Assessment of Positive Symptoms (SAPS). The SAPS (Andreasen, 1984) consists of 34 items divided into four positive symptom subscales: hallucinations, delusions, bizarre behavior, and positive formal thought disorder. As with the SANS, each subscale also includes a global rating scale.

2.2.2.3. Brief Psychiatric Rating Scale (BPRS). The BPRS (Overall and Gorham, 1962) covers 24 items across all psychosis symptom domains and a total score is calculated by summing all items. The scale is sensitive to change (Ventura et al., 1993; Roncone et al., 1999; Kopelowicz et al., 2008).

2.2.2.4. Positive and Negative Syndrome Scale (PANSS). The PANSS (Kay et al., 1987) is a 30-item scale that combined the 18-item BPRS and 12 items from the Psychopathology Rating Schedule (Singh and Kay, 1975). The PANSS demonstrates strong psychometric properties, including good internal consistency, test-retest reliability, and validity (Kay et al., 1987). Ratings are summed scores on a 7-item positive scale, 7-item negative scale, and 16-item general psychopathology scale.

2.2.2.5. Scale of Prodromal Symptoms (SOPS). The Structured Interview for Prodromal Syndromes (SIPS; Miller et al., 2003) includes the Scale of Prodromal Symptoms (SOPS), a 19-item scale which allows researchers to rate symptoms on four subscales: 1) positive symptoms (e.g., unusual thought content/delusional ideas); 2) negative symptoms (e.g., social anhedonia); 3) disorganized symptoms (e.g., bizarre thinking); and 4) general symptoms (e.g., dysphoric mood). The scale was developed to assess for the presence of attenuated symptoms of psychosis, one of three prodromal syndromes (see above). While the Attenuated Positive Symptom (APS) syndrome is defined by positive symptoms alone, the SOPS provides information on other symptoms relevant to psychosis high-risk samples.

2.2.3. The 'Big Three' symptom factors in psychosis

As our goal in the current study was to provide guidance for early psychosis researchers on selecting scales for the assessment of the primary symptom of psychosis, we decided to focus on the "Big Three" symptom factors. Drawing from previous research (Brekke et al., 1994; Andreasen et al., 1995; Barch et al., 2003; van der Gaag et al., 2006; Klaassen et al., 2011; Jerrell and Hrisko, 2013; Fulford et al., 2013) following the work of Liddle (1987), we separated the SANS, SAPS, PANSS, BPRS and SOPS psychosis symptoms into the three major factors reflecting positive symptoms/reality distortion, negative symptoms/poverty, and disorganized symptoms (see Table 2). Details regarding factor analytic studies of these measures are described in detail in [Supplementary Material](#).

Table 2
Symptoms comprising the 'Big Three' psychosis symptom factors.

Scale	Symptom factor		
	Positive symptoms/reality distortion	Negative symptoms/poverty	Disorganization
BPRS	1. Grandiosity 2. Suspiciousness 3. Hallucinations 4. Unusual thought content	1. Emotional withdrawal 2. Motor retardation 3. Blunted affect	1. Conceptual disorganization 2. Mannerisms and posturing 3. Disorientation
SAPS	1. Global ratings of hallucinations 2. Global ratings of delusions	None	1. Global ratings of attention 2. Global ratings of positive formal thought disorder 3. Global ratings of bizarre behavior
SANS	None	1. Global ratings of anhedonia/asociality 2. Global ratings of avolition/apathy 3. Global ratings of alogia 4. Global ratings of affective flattening	
PANSS	1. Delusions 2. Hallucinations 3. Unusual thought content 4. Suspiciousness 5. Grandiosity	1. Lack of spontaneity 2. Blunted affect 3. Emotional withdrawal 4. Apathetic social withdrawal 5. Motor retardation 6. Poor rapport 7. Active social avoidance	1. Stereotyped thinking 2. Poor attention 3. Disorientation 4. Conceptual disorganization 5. Difficulty in abstraction
SOPS	1. Unusual thought content 2. Suspiciousness 3. Perceptual disturbances/ hallucinations 4. Grandiosity	1. Social anhedonia/withdrawal 2. Avolition 3. Decreased expression of emotion 4. Decreased experience of emotions and self 5. Deterioration in role functioning 6. Decreased comprehension/abstraction	1. Disorganized communication 2. Odd behavior and appearance 3. Bizarre thinking 4. Trouble with focus and attention 5. Personal hygiene

Note: BPRS= Brief Psychiatric Rating Scale; PANSS= Positive and Negative Syndrome Scale; SANS= Scale for the Assessment of Negative Symptoms; SAPS= Scale for the Assessment of Positive Symptoms; SOPS= Scale of Prodromal Symptoms.

Table 3
Symptom rating scale descriptive statistics.

	CHR (N=82 ^a)			RO (N=98)		
	Mean (S.D.)	Median	Range	Mean (S.D.)	Median	Range
SAPS Pos	2.10 (1.59)	2	0–6	3.61 (2.91)	3	0–10
BPRS Pos	8.35 (2.85)	8	4–17	9.80 (5.12)	8	4–21
PANSS Pos	10.58 (3.34)	11	5–18	12.50 (5.94)	11.5	5–27
SOPS Pos	8.98 (3.80)	9	0–18	–	–	–
SANS Neg	6.15 (3.43)	6	0–14	7.93 (3.79)	7	1–17
BPRS Neg	5.21 (2.37)	5	3–14	6.53 (3.01)	6	3–14
PANSS Neg	14.83 (5.98)	15	7–30	17.12 (6.70)	16	7–31
SOPS Neg	13.02 (6.08)	12	0–27	–	–	–
SANS/SAPS Dis	3.22 (2.08)	3	0–9	3.64 (2.17)	3.5	0–9
BPRS Dis	4.10 (1.38)	4	3–10	4.46 (1.60)	4	3–9
PANSS Dis	8.47 (2.92)	8	5–17	9.49 (3.41)	8.5	5–21
SOPS Dis	8.39 (4.94)	8	0–20	–	–	–

^a n=64 for PANSS.

2.2.4. Statistical analyses

We first tested variable distributions for normality and identified outliers, defined as falling three or more standard deviations from the mean. Outliers were Winsorized by replacing the extreme values by the highest recorded value within three standard deviations plus 5% of that value (Barnett and Lewis, 1978). We calculated descriptive statistics for each scale by sample. Because the samples were recruited separately for two different studies and were not intended to be directly compared to each other, we did not test differences between the RO and CHR sample values statistically. As most variable distributions were positively skewed, typical of symptom rating scale scores, we used Kendall's tau_b (τ_b) for tests of non-parametric correlations. The τ_b statistic has been found to perform best as a correlation coefficient when using psychosis symptom rating scale data (Arndt et al., 1999). That is, in comparison to Spearman's r, τ_b protects against type I errors, aids in simple interpretation, and provides a tighter confidence interval, leading to more replicable results. Bonferroni correction was applied to tests of significance to adjust for multiple comparisons. Analyses were performed using SPSS for Windows, Version 19.0.

3. Results

Means and standard deviations of each scale are presented in Table 3 for descriptive purposes. These values were consistent with previous studies (see Peralta and Cuesta, 2001; Emsley et al., 2003; Hawkins et al., 2004), although differences were not tested statistically. For both samples, scores were positively skewed for most scales, with the exception of the SOPS within the CHR sample and the SANS in both samples.

Correlations between symptom subscales within and across measures are presented in Tables 4 and 5. As expected, in both samples, scales designed to measure negative (τ_b's=0.38–0.74, p's < 0.0001), positive (τ_b's=0.44–0.86, p's < 0.0001), and disorganized (τ_b's=0.39–0.64, p's < 0.0001) symptoms were all moderately to highly positively inter-correlated with the same domains on other scales, and more highly correlated with each other than with other domains on the same scale, with two exceptions. In the CHR sample, SOPS disorganized symptoms were significantly positively correlated with SOPS negative symptoms (τ_b=0.38, p < 0.0001). In the RO sample, PANSS disorganized symptoms were moderately correlated with negative symptoms as measured by the PANSS (τ_b=0.33, p < 0.001), SANS (τ_b=0.30, p < 0.001), and BPRS (τ_b=0.29, p < 0.001).

Analyses of the psychosocial functioning data revealed that positive symptoms were not significantly associated with social or role functioning in either sample (see Table 6). Within the CHR sample, higher negative symptoms across all scales were associated with poorer social functioning as measured by the Global Functioning: Social scale (τ_b's=–0.33 to –0.51, p's < 0.002). Higher SANS negative symptoms were also associated with poorer role functioning as measured by the Global Functioning: Role scale (τ_b=–0.30, p < 0.002), while SOPS, BPRS, and PANSS negative symptoms were

Table 4
Correlations between scales for CHR participants.

	SAPS Pos	BPRS Pos	PANSS Pos	SOPS Pos	SANS Neg	BPRS Neg	PANSS Neg	SOPS Neg	SANS/SAPS Dis	BPRS Dis	PANSS Dis
BPRS Pos	0.44*	–									
PANSS Pos	0.55*	0.80*	–								
SOPS Pos	0.47*	0.49*	0.62*	–							
SANS Neg	0.07	0.12	0.19	0.12	–						
BPRS Neg	0.00	0.01	0.12	0.06	0.62*	–					
PANSS Neg	0.09	0.18	0.19	0.11	0.69*	0.74*	–				
SOPS Neg	0.08	0.15	0.17	0.14	0.55*	0.38*	0.48*	–			
SANS/SAPS Dis	0.06	0.08	0.16	0.20	0.09	0.00	–0.01	0.15	–		
BPRS Dis	0.09	0.16	0.25	0.25	0.17	0.13	0.16	0.23	0.52*	–	
PANSS Dis	–0.02	0.13	0.18	0.18	0.19	0.19	0.09	0.22	0.46*	0.64*	–
SOPS Dis	0.12	0.12	0.18	0.17	0.28	0.15	0.21	0.38*	0.42*	0.43*	0.39*

Note: Highlighted coefficients are scales expected to be correlated.

* $p < 0.0008$ (Bonferroni corrected for 66 comparisons).

Table 5
Correlations between scales for RO participants ($N=98$).

	SAPS Pos	BPRS Pos	PANSS Pos	SANS Neg	BPRS Neg	PANSS Neg	SANS/SAPS Dis	BPRS Dis	PANSS Dis
BPRS Pos	0.76*	–							
PANSS Pos	0.77*	0.86*	–						
SANS Neg	0.07	0.05	0.07	–					
BPRS Neg	–0.06	–0.03	–0.03	0.58*	–				
PANSS Neg	0.02	0.05	0.05	0.69*	0.67*	–			
SANS/SAPS Dis	0.19	0.21	0.23	0.26	0.17	0.17	–		
BPRS Dis	0.07	0.09	0.10	0.26	0.16	0.20	0.42*	–	
PANSS Dis	0.00	0.03	0.03	0.30*	0.29*	0.33*	0.44*	0.51*	–

Note: Highlighted coefficients are scales expected to be correlated.

* $p < 0.001$ (Bonferroni corrected for 36 comparisons).

Table 6
Correlations between symptom scales and functioning scales.

	GF: Role		GF: Social	
	CHR	RO	CHR	RO
SAPS Pos	0.03	–0.15	–0.04	–0.18
BPRS Pos	–0.06	–0.10	–0.12	–0.17
PANSS Pos	–0.07	–0.13	–0.16	–0.17
SOPS Pos	–0.06	–	–0.02	–
SANS Neg	–0.30*	–0.40*	–0.51*	–0.42*
BPRS Neg	–0.11	–0.17	–0.33*	–0.18
PANSS Neg	–0.13	–0.24*	–0.51*	–0.32*
SOPS Neg	–0.27	–	–0.42*	–
SANS/SAPS Dis	–0.17	–0.38*	–0.16	–0.20
BPRS Dis	–0.20	–0.30*	–0.23	–0.27*
PANSS Dis	–0.23	–0.26*	–0.07	–0.15
SOPS Dis	–0.19	–	–0.30*	–

Note: Highlighted coefficients are scales expected to be correlated.

GF: Role=Global Functioning: Role scale; GF: Social=Global Functioning: Social scale.

* $p < 0.002$ (Bonferroni corrected for 24 comparisons).

not. SOPS disorganized symptoms were associated with poorer social functioning ($\tau_b = -0.30$, $p < 0.002$), but none of the disorganized scales were significantly associated with role functioning.

In the RO sample, higher negative symptom scores on the SANS and PANSS were associated with poorer social functioning (τ_b 's = -0.42 and -0.32 , respectively; p 's < 0.003) and poorer role functioning (τ_b 's = -0.40 and -0.24 , respectively; p 's < 0.003), while BPRS negative symptoms were not related to functioning. All three disorganized scales were associated with poorer role functioning (τ_b 's = -0.26 to -0.38 , p 's < 0.003), and BPRS

disorganized symptoms were also associated with poorer social functioning ($\tau_b = -0.27$, $p < 0.003$).

4. Discussion

Overall, we found that subscales designed to assess the same domains of psychotic symptoms were moderately to highly inter-correlated across four of the most commonly administered psychosis measures, confirming basic construct validity across scales in these younger early illness samples. Nonetheless, the SOPS disorganized scale in the CHR group and PANSS disorganized symptoms in the RO group overlapped with some negative symptom subscales, suggesting overlap in measurement. As expected, and consistent with the general schizophrenia literature, psychosocial functioning scales were significantly related to negative and disorganized, but not positive, symptoms in both samples. More negative and disorganized scales were related to functioning in the RO sample, suggesting these symptom domains begin to impact functioning more strongly after full psychosis onset.

Despite moderate to high overlap, the different measures are not entirely redundant, with each containing some amount of unique information. That is, although scales within each symptom domain were highly correlated, there was enough variance explained by unique items within each scale that they were not completely overlapping. This finding is consistent with studies of individuals with chronic schizophrenia (e.g., Lyne et al., 2012; Welham et al., 1999) and points to the fact that combining scales in psychosis research is not straightforward—as each scale adds some amount of unique information to the phenomenology of psychosis, researchers should keep in mind the scales' individual strengths and limitations when selecting measures for their studies.

One issue to consider in measure selection is whether the scale adequately captures the full range of scores for a given population. In our study, the SANS provided more variability in negative symptom scores across both groups, suggesting it is more sensitive to the full range of negative symptom psychopathology, while the BPRS and PANSS negative symptom factors showed significant positive skew within both samples. This finding might be expected, given the greater number of items and breadth on the SANS. Distributions were also positively skewed for positive and disorganized symptom scores across all scales, with somewhat better normality for the SANS/SAPS disorganized subscale in both samples. This finding is consistent with studies of individuals with chronic schizophrenia who are relatively stable symptomatically (see [Arndt et al., 1999](#)), and thus may not be unique to early psychosis samples. Scales were originally designed to assess the full range of severity of psychosis and thus participants will only score in the higher range when experiencing acute symptoms. Therefore, investigators who are specifically interested in negative and disorganized symptoms in relatively stable recent-onset samples, or who wish to use the same measure across both CHR and RO samples, might consider the SANS/SAPS.

Within the CHR group, SOPS subscales exhibited wide variability in scores and relatively normal distributions, while other measures were highly skewed, suggesting a floor effect on scales originally meant for samples with diagnosed psychotic disorders. While scales such as the PANSS may be widely accepted as symptom measures for intervention trials in schizophrenia, they may have difficulty capturing symptom change in CHR studies. Indeed, [Shim et al. \(2008\)](#), in a pharmacological intervention study of CHR youth, found that while the Comprehensive Assessment of At-Risk Mental States (CAARMS; [Yung et al., 2005](#)) and BPRS revealed change from baseline to termination, PANSS Negative, SAPS, and SANS remained relatively static. Furthermore, the SOPS was both highly correlated with the other symptom rating scales and showed the expected relationships with psychosocial functioning measures in our CHR sample. Thus, in selecting psychosis symptom rating scales for studies using CHR samples only, researchers should consider that the SOPS might provide them with enough variability and utility without having to add additional measures that might increase study procedure time and participant burden.

While the BPRS and PANSS may be assumed to capture similar information (the PANSS was partly derived from the BPRS), and scales in the same domains correlate across measures in chronic samples ([Bell et al., 1992](#)), only positive symptoms correlated across measures in our early psychosis samples. As we describe in [Supplementary Material](#), items with the same name actually have different anchors on each scale, and the PANSS ratings emphasize impact on functioning. Of note, factor analysis reveals that the PANSS general symptom items tend to split, with some joining negative symptoms to form a factor, and others joining positive symptoms to form a disorganized factor, in recent onset samples (e.g., [Emsley et al., 2003](#)).

Regarding relationships with psychosocial functioning measures, findings were not uniform across scales, though there were some patterns. The SANS and PANSS negative symptom scales showed significant negative correlations with social and role functioning within the recent-onset sample, while the BPRS did not. As discussed in [Supplementary Material](#), the negative symptom subscale of the BPRS is limited in scope (three items), which might contribute to the lack of relationship with psychosocial functioning. All disorganized symptom scales were associated with impaired role functioning in the recent-onset sample, while only the BPRS disorganized subscale was associated with impaired social functioning. Thus, the BPRS may be more sensitive to relationships between psychosocial functioning and disorganized

symptoms, while the SANS and PANSS may be better for negative symptom-functioning relationships, in the RO population. Alternatively, these correlations may reflect overlap in the constructs, conflating symptoms and functioning. Nonetheless, associations between symptom rating scales and measures of psychosocial functioning provide some information on their utility for researchers examining early psychosis samples. Within the CHR sample, correlations between SOPS subscales and psychosocial functioning measures were comparable to those found with the SANS, BPRS, and PANSS.

Some additional issues should be mentioned. In general, inter-correlations within symptom domains across subscales were lower than those found in previous studies of individuals with chronic schizophrenia ([Thiemann et al., 1987](#); [Gur et al., 1991](#); [Bell et al., 1992](#); [Fenton and McGlashan, 1992](#); [Peralta et al., 1995](#); [Norman et al., 1996](#)), particularly for the CHR sample. It is possible that the limited range of scores (i.e., positive skew) within these scales among early psychosis participants might cause attenuation bias (a reduction in “true” size of the correlations ([Kendall and Stuart, 1958](#))). Thus, due to the masking of true relationships based on restricted range, agreement among various symptom rating scales may be an issue when used in early psychosis samples. In addition, at least some of the difference in these correlations may be due to the use of Kendall's tau *b* instead of Pearson's *r*. The fact that we conducted post-hoc analyses using participant samples recruited separately is a limitation of the current study. As such, findings should be interpreted as exploratory. In that regard, we adjusted *p* values using the conservative Bonferroni approach to minimize the occurrence of statistical significance by chance alone. Correlations among scales may also be overestimated based on our use of a single interviewer for each participant. In addition, as our exclusion criteria for the RO sample included no hospitalization within the past 3 months, rating scale scores might be artificially lower and more skewed than what might be expected in more acute psychosis samples; however, symptomatically stable participants make up the majority of non-intervention schizophrenia studies.

It is also worth noting that there are other instruments used in early psychosis studies. The other most widely used psychosis risk interview, the CAARMS ([Yung et al., 2005](#)), includes questions similar to those used in the SIPS/SOPS, though with some differences in duration/severity criteria in the latter measure designed to focus more narrowly on those patients considered at “imminent” risk (a recent meta-analysis shows no difference in transition rates between the two scales; [Fusar-Poli et al., 2012](#)). As both measures were designed to assess for subsyndromal symptoms of psychosis risk, the CAARMS would likely also show a ceiling effect when measuring psychosis in participants with recent-onset psychotic disorder. There are also other scales used to assess for symptoms of psychosis that we did not include in the current study, including the Clinical Global Impression (CGI; [Guy, 1976](#)), the Psychotic Symptom Rating Scales (PSYRATS; [Haddock et al., 1999](#)), and the Signs and Symptoms of Psychotic Illness (SSPI; [Liddle et al., 2002](#)) scale, among others. Each of these scales has unique qualities that early psychosis researchers should consider when selecting their measures.

Although we focused on the “Big Three” psychosis symptom dimensions in the current study, there are studies that do not support the three-factor solution in early psychosis. For example, [McGorry et al. \(1998\)](#), in a large first-episode psychosis sample, found a four-factor solution was most valid. This solution was comprised of depression, mania, a blend of negative symptoms, catatonic/motor symptoms and disorganization, and a blend of first rank symptoms, hallucinations and delusions. In a factor analysis of the SOPS in a CHR sample, [Klaassen et al. \(2011\)](#) found a similar solution, with positive, negative, disorganized, and

depression symptoms forming four distinct factors (although with overlap among some symptoms). Within the current study, the overlap among disorganized symptoms with negative symptoms is consistent with the conceptualization that these symptom domains are not clearly distinct. SOPS disorganized symptoms were nearly as strongly correlated with SOPS negative symptoms as they were with disorganized symptoms on the other scales in the CHR sample. In addition, PANSS disorganized symptoms were moderately correlated with all negative symptom scales in the RO sample. Thus, scales assessing disorganized symptoms may not provide as much unique information in early psychosis. In our sample, disorganized symptoms were generally mild in the CHR group, with relatively higher levels of negative symptoms, which may suggest differential timing of onset in each symptom domain as psychosis progresses.

Ultimately, the selection of clinical rating scales will depend on myriad factors, including the scales' psychometric properties, their relevance for the researchers' population of interest, or even simple familiarity with particular measures. We hope findings from this report can help guide early psychosis researchers in the selection of measures that best suit their needs to further research in this field.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.psychres.2014.07.047>.

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