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Original Article

Factor analysis of the Scale of Prodromal Symptoms: data from the Early Detection and Intervention for the Prevention of Psychosis Program

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Abstract

Aim: The Scale of Prodromal Symptoms (SOPS) was developed to identify individuals experiencing early signs of psychosis, a critical first step towards early intervention. Preliminary dimension reduction analyses suggested that psychosis-risk symptoms may deviate from the traditional symptom structure of schizophrenia, but findings have been inconsistent. This study investigated the phenomenology of psychosis risk symptoms in a large sample from a multi-site, national study using rigorous factor analysis procedure.

Methods: Participants were 334 help-seeking youth (age: 17.0 ± 3.3) from the Early Detection and Intervention for the Prevention of Psychosis Program, consisting of 203 participants at clinically higher risk (sum of P scores ≥ 7), 87 with clinically lower risk (sum of P scores < 7) and 44 in very early first-episode psychosis (<30 days of positive symptoms). Baseline SOPS data were subjected to principal axis factoring (PAF), estimating factors based on shared variance, with Oblimin rotation.

Results: PAF yielded four latent factors explaining 36.1% of total variance: positive symptoms; distress; negative symptoms; and deteriorated thought process. They showed reasonable internal consistency and good convergence validity, and were not orthogonal.

Conclusions: The empirical factors of the SOPS showed similarities and notable differences compared with the existing SOPS structure. Regrouping the symptoms based on the empirical symptom dimensions may improve the diagnostic validity of the SOPS. Relative prominence of the factors and symptom frequency support early identification strategies focusing on positive symptoms and distress. Future investigation of long-term functional implications of these symptom factors may further inform intervention strategies.

Key words: factor analysis, prodrome, psychosis, schizophrenia, ultra high risk.

INTRODUCTION

Schizophrenia is a severe and chronic mental disorder that often requires long-term treatment and care. Data accumulated over the past decades have shown that duration of untreated psychosis is a reliable predictor of poor prognosis and long-term outcome,[1–4] providing a strong argument for early intervention. Treatment of psychosis at first episode or early on during the course has shown promising results, including reduced relapse rate and better psychosocial functioning.[5] More recently, it has been shown that prolonged untreated illness, including the symptomatic period just before the

onset of frank psychosis (i.e. the prodrome), also significantly predicts poorer outcome,[6] calling for efforts to identify and deliver treatment even earlier in order to prevent schizophrenia and improve outcome.[7]

A critical first step towards early identification and intervention is the development of a reliable and valid assessment tool. The Structured Interview for Prodromal Syndrome (SIPS) was one of several instruments developed to diagnose those at a high risk of developing psychosis.[8–10] It was renamed as Structured Interview for Psychosis-Risk Syndromes in 2009[11] to better reflect its function of prospectively identifying at-risk individuals (i.e. those displaying subtle psychotic-like symptoms who may or may not eventually develop psychosis). The North American Prodrome Longitudinal Study used the SIPS in a cohort of 291 individuals, finding a prospective conversion rate of 35% at 2½ years, supporting the predictive validity of the SIPS.[12] However, the modest positive predictive value of a psychosis risk syndrome diagnosis by the SIPS, along with other controversies on the diagnostic reliability in clinical practice, potential overuse of antipsychotics and stigma, led to heavy debates on the appropriateness of including psychosis risk syndrome as a diagnostic category in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V).[13] In the end, 'attenuated psychosis syndrome' was adopted and included in Section III of the DSM-V as a condition for further study.[14] Distinguished from psychosis risk syndrome (which primarily emphasizes the risk of developing full-blown psychosis), attenuated psychosis syndrome is 'a currently relevant clinical condition leading to help seeking, with many more clinical outcomes other than conversion to psychosis.'[14] The idea builds upon a common observation in clinical high-risk studies that although the majority of these individuals do not eventually develop psychosis, many of them otherwise present significant clinical symptoms, distress and/or functional impairment that fulfill DSM's general criteria for mental disorders and should receive clinical care.[15,16]

This shift, from preventing psychosis conversion to addressing the diverse clinical needs of at-risk individuals to improve outcome, necessitates a better understanding of the phenomenology of the clinical high-risk state. The current structure of the Scale of Prodromal Symptoms (SOPS),[11,17] a major diagnostic component of the SIPS, implies that the symptom structure of psychosis risk is similar to that of schizophrenia. Specifically, the SOPS consists of 19 items divided into four subscales – positive symptoms (P; five items), negative symptoms (N; six items), disorganization symptoms (D; four items), and general symptoms (G; four items) – with only the positive symptoms being considered diagnostic of psychosis risk. The empirical support for this symptom structure is unclear. Thus far, we are aware of only three studies published in English that examined the factor structure of the SOPS,[18–20] and the results varied remarkably. Hawkins *et al.*[18] reported a three-component (negative/general/positive symptoms) and a two-component (positive/negative symptoms) solution. Klaassen *et al.*[19] reported a four-component solution similar to the four dimensions inherent to the SOPS, though with four items failing to load satisfactorily on any components. Comparelli *et al.*[20] reported a three-component solution (negative/general/positive symptoms), but the constituent items of the three components were remarkably different from those reported by Hawkins *et al.*[18]

One source of these inconsistent results may be sample sizes. For principal component analysis (PCA), the dimension reduction method used in these three studies, a general rule of thumb is a sample size of at least 300,[21] or a subject-to-item ratio of at least 10:1.[22] This means at least 190 subjects are required given the 19 SOPS items. The sample sizes of these three studies were only between 77 and 128. Inadequate sample size and subject-to-item ratio are known to cause over-fitting of data, resulting in unstable factor loadings, unreplicable factors, and lack of generalizability to the population.[23] Thus, a larger sample is needed to reveal the factor structure of psychosis risk that is more stable and generalizable to the population.

Another limitation of previous studies is their use of PCA and varimax (orthogonal) rotation. Although PCA is a useful dimension reduction method, it is not truly a factor analysis. PCA is an extraction method that uses all variance, including random errors unique to individual items, thus producing inflated total variance explained and factor loadings compared with exploratory factor analysis that uses only shared variance to estimate latent factors. Further, since some of the symptom dimensions (e.g. positive symptoms and distress) are likely to be correlated rather than completely orthogonal, oblique rotation would be more appropriate than varimax rotation because it allows factors to correlate, and it will produce nearly identical solutions if the factors are truly orthogonal.[24]

With the above considerations in mind, we investigated the phenomenology of psychosis risk by examining the factor structure of the SOPS using principal axis factoring (PAF) with Oblimin rotation, based on a large sample from the Early Detection

and Intervention for the Prevention of Psychosis Program (EDIPPP).

METHODS

Participants

The participants of this study were enrolled in the EDIPPP, a national research programme modelled after the Portland (Maine) Identification and Early Referral (PIER) program.[25] EDIPPP included six participating sites: (i) PIER, Portland, ME; (ii) Recognition and Prevention (RAP) Program, Queens, NY; (iii) Michigan Prevents Prodromal Progression (M3P) Program, Ann Arbor, MI; (iv) Early Assessment and Support Team (EAST) Program, Salem, OR; (v) Early Diagnosis and Preventive Treatment (EDAPT) Clinic, Sacramento, CA; and (vi) Early Assessment and Resource Linkage for Youth (EARLY), Albuquerque, NM. The programme included a research protocol that consisted of clinical and neuropsychological assessments as well as clinical interventions including psychopharmacology, psychoeducational multifamily group therapy and supported education/employment interventions.[26,27]

Participants of EDIPPP were help-seeking youth aged 12–25 years and having at least a '1' on any of the positive symptoms or a '3' on any of the negative symptoms of the SOPS. Participants with a current psychotic episode > 30 days, a prior psychotic episode, prior antipsychotic treatment > 30 days, psychotic symptoms due to an acute medical or toxic aetiology, or an IQ < 70 were excluded. More details on identification methods and inclusion/exclusion criteria can be found in McFarlane *et al.*[28]

Participants and their families attended a research orientation and preliminary screening session in which they were provided with information about the research protocol and informed consent was obtained from participants (and their parents/guardians if under age 18). Comprehensive clinical and neuropsychological research assessments were conducted at baseline and multiple longitudinal follow-ups, but only the baseline data are reported in this paper.

A total of 520 participants were enrolled between September 2007 and June 2010, out of which 337 met the inclusion criteria. Based on a risk-based allocation study design, qualified participants were then classified, according to their SOPS scores, as clinically lower risk (CLR; sum of P scores < 7), clinically higher risk (CHR; sum of P scores ≥ 7), and early first-episode psychosis (EFEP; at least one P symptom rated 6, and all P symptoms rated 6 lasted < 30 days).[20] EFEP consisted of subjects who met criteria for the Presence of Psychotic Symptoms, modified to include subjects with less than 1 month of psychotic symptoms, but with greater duration and frequency than seen for Brief Intermittent Psychotic Syndrome. This sample was included because EDIPPP aimed at improving role and social functional outcomes in addition to the traditional emphasis of delaying/preventing psychosis.[25,28,29] SCID-derived diagnoses[30] showed that 84% of this sample met criteria for one or more current or lifetime Axis-I diagnoses, including major depressive disorder (42%), anxiety disorder (36%), psychosis (current only; 13%), substance abuse (8%) and other (5%; see for detail[28]). Three participants did not have complete SOPS scores and were excluded from the analysis. Characteristics of the remaining 334 participants are summarized in Table 1.

Assessments

The baseline assessment of EDIPPP included a developmental and treatment history interview, clinical research interviews, cognitive testing, family history interviews, a substance use survey, and current functioning assessments. For the purpose of this report, only data of the SOPS, the Positive and Negative Syndrome Scales (PANSS)[31] and the Global Functioning Scales[32] were used in the analyses. All assessments were administered by trained and independent research interviewers. Inter-rater reliability for SOPS is summarized in Table 2.

Statistical analyses

Baseline data on the SOPS from the entire EDIPPP sample were subjected to PAF with Oblimin rotation. Solutions were obtained based on the screeplot, residuals of reproduced correlations, and conceptual interpretability of the factors. The decision to include CLR and EFEP in addition to CHR participants was based on our theoretical assumption that psychosis is a continuum, cutting across normal experiences and pathology.[28,33] Separate PAFs were also performed for CHR participants only (n = 203), CHR plus EFEP participants (n = 247), and CHR plus CLR participants (n = 290) for comparison purposes. However, no satisfactory solutions were obtained using these subsamples due to suboptimal measures of sample adequacy (many items < 0.7), high proportion of residuals of reproduced correlations > 0.05, poor factor loadings of several items, and questionable interpretability of the extracted factors. These quality control measures suggested that factor analysis was inappropriate with the subsamples, likely due to the reduced sample size

TABLE 1. Participant characteristics

	Clinical lower-risk (n = 87)	Clinical higher-risk (n = 203)	Early first-episode psychosis (n = 44)	All (N = 334)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Age	16.7 ± 3.2	16.8 ± 3.3	18.4 ± 3.2	17.0 ± 3.3
Sex (male/female)	61/26	115/88	26/18	202/132
Race†				
African American	5 (5.7%)	16 (7.9%)	10 (22.7%)	31 (9.3%)
Asian American	4 (4.6%)	9 (4.4%)	–	13 (3.9%)
Caucasian	62 (71.3%)	124 (61.1%)	20 (45.5%)	206 (61.7%)
American Indian/Alaskan Native	2 (2.3%)	2 (1.0%)	–	4 (1.2%)
Native Hawaiian or other Pacific Islander	1 (1.1%)	–	1 (2.3%)	2 (0.6%)
Other	4 (4.6%)	17 (8.4%)	4 (9.1%)	25 (7.5%)
More than one race	6 (6.9%)	25 (12.3%)	7 (15.9%)	38 (11.4%)
Global functioning‡				
Social	6.45 ± 1.53	6.11 ± 1.39	5.97 ± 1.49	6.18 ± 1.46
Role	5.67 ± 2.31	5.46 ± 2.32	4.35 ± 2.73	5.41 ± 2.36

†<7% missing data.
‡15 cases missing.

TABLE 2. Inter-rater reliability (intraclass correlation) of the SOPS across the six EDIPPP sites

	Site						
	PIER (ME)	RAP (NY)	M3P (MI)	EDAPT (CA)	EAST (OR)	EARLY (NM)	All
Positive symptoms	0.94	0.88	0.89	0.93	0.90	0.82	0.91
Negative symptoms	0.90	0.93	0.91	0.91	0.90	0.92	0.92

and restricted range of scores. Therefore, these results are not included in this report.

Convergence validity of the factors yielded in the PAF was examined by correlating with their corresponding empirical factors of the PANSS based on a large recent-onset psychosis sample[34] – positive (P1, G9, P3, P6, P5, G12, G15), anxiety and depression (G6, G3, G1, G2, G4), negative (N4, N2, N3, G16, N6, N1, G13) and disorganized (G10, G11, N5, P2, N7). See Supporting Information Table S1 for item content of the PANSS.

Finally, symptom frequency among the CHR participants was examined. Only symptoms rated moderate or above (≥3) on the SOPS were included.

RESULTS

Item distributions

The distribution of the SOPS items of the whole sample, as well as broken down by CLR, CHR and EFEP, are displayed in Table 3. Overall, the mean and SD of the SOPS items of our sample showed remarkable resemblance to those reported in Hawkins *et al.*[18] and Klaassen *et al.*[19] The mean of D2 (bizarre thinking) in our sample (1.10 ± 1.32) was lower than that in Hawkins *et al.*[18] (2.10 ± 1.62), $t(426) = 6.12$, $P < 0.001$, but similar to that in Klaassen *et al.*[19] (0.92 ± 1.49), $t(409) = 1.05$, $P = 0.29$. In addition, G2 (dysphoric mood) was higher in our sample (3.91 ± 1.57) than in both Hawkins *et al.*[18] (2.95 ± 1.67), $t(426) = 5.16$, $P < 0.001$, and Klaassen *et al.*[19] (3.06 ± 1.51), $t(409) = 4.31$, $P < 0.001$. This may be due to the high prevalence of mood disorders in our sample, but direct comparisons were infeasible because these two studies did not report the scores or rate of depression.

Factor structure of SOPS

PAF yielded a four-factor solution with the most acceptability based on fit statistics and conceptual interpretability of the factors. Since item G3 (motor disturbances) had loadings <0.30 on all of the factors, it was removed from the analysis. PAF was re-performed and, again, a four-factor solution was yielded, explaining 36.1% of total variance (Table 4a). The factors were labelled as: (1) positive symptoms (P1, P2, P3, P4, D2; variance explained = 18.7%); distress (G1, G2, G4; variance

TABLE 3. SOPS item distribution

		Clinical lower-risk (n = 87)			Clinical higher-risk (n = 203)			Early first-episode psychosis (n = 44)			All (N = 334)		
		Mean	SD	Range	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range
P1.	Unusual thought content/delusional ideas	0.93	0.95	0–3	3.05	1.36	0–5	5.07	1.69	0–6	2.76	1.83	0–6
P2.	Suspiciousness/persecutory ideas	1.02	1.13	0–5	2.72	1.35	0–5	4.75	1.83	0–6	2.54	1.77	0–6
P3.	Grandiosity	0.43	0.80	0–3	1.12	1.28	0–5	2.11	1.92	0–6	1.07	1.37	0–6
P4.	Perceptual abnormalities/hallucinations	1.10	1.09	0–4	3.33	1.36	0–5	4.61	1.79	0–6	2.92	1.79	0–6
P5.	Conceptual disorganization	0.67	0.90	0–4	1.72	1.25	0–5	3.02	1.82	0–6	1.62	1.44	0–6
N1.	Social isolation and withdrawal	2.32	2.07	0–6	2.62	1.68	0–6	2.59	1.86	0–6	2.54	1.81	0–6
N2.	Avolition	2.84	1.83	0–6	2.92	1.62	0–6	2.80	1.65	0–5	2.88	1.67	0–6
N3.	Decreased expression of emotion	1.25	1.59	0–5	1.39	1.51	0–6	1.80	1.62	0–5	1.41	1.55	0–6
N4.	Decreased experience of emotion and self	1.11	1.49	0–5	2.06	1.65	0–6	1.80	1.76	0–5	1.78	1.67	0–6
N5.	Decreased ideational richness	1.08	1.31	0–4	1.50	1.43	0–5	1.86	1.46	0–4	1.44	1.42	0–5
N6.	Deterioration in role functioning	3.23	1.95	0–6	3.31	1.99	0–6	3.70	1.95	0–6	3.34	1.97	0–6
D1.	Odd behaviour or appearance	0.57	1.05	0–4	0.84	1.20	0–5	1.84	1.83	0–6	0.90	1.32	0–6
D2.	Bizarre thinking	0.31	0.65	0–3	1.15	1.18	0–5	2.45	1.69	0–6	1.10	1.32	0–6
D3.	Trouble with focus and attention	2.02	1.31	0–5	2.79	1.25	0–6	3.57	1.30	0–6	2.69	1.35	0–6
D4.	Impairment in personal hygiene	0.74	1.21	0–5	0.76	1.21	0–5	1.14	1.61	0–5	0.81	1.27	0–5
G1.	Sleep disturbances	2.21	1.86	0–6	2.75	1.66	0–6	3.57	2.02	0–6	2.72	1.80	0–6
G2.	Dysphoric mood	3.47	1.70	0–6	4.00	1.49	0–6	4.32	1.46	1–6	3.91	1.57	0–6
G3.	Motor disturbances	0.75	1.04	0–5	0.83	1.11	0–6	1.36	1.60	0–6	0.88	1.18	0–6
G4.	Impaired tolerance to normal stress	2.55	2.14	0–6	2.99	1.87	0–6	3.50	1.66	0–6	2.94	1.94	0–6

TABLE 4A. Rotated structure matrix of SOPS items (N = 334)

		Factor			
		Positive symptoms	Distress	Negative symptoms	Deteriorated thought process
P1.	Unusual thought content/delusional ideas	**0.80**			
D2.	Bizarre thinking	**0.74**			
P2.	Suspiciousness/persecutory ideas	**0.60**			
P4.	Perceptual abnormalities/hallucinations	**0.51**			
P3.	Grandiosity	**0.47**			
G2.	Dysphoric mood		**0.76**		
G4.	Impaired tolerance to normal stress		**0.62**		
G1.	Sleep disturbances		**0.47**		
N1.	Social isolation and withdrawal			**0.62**	
N3.	Decreased expression of emotion			**0.61**	
N2.	Avolition		0.51	**0.48**	0.39
D1.	Odd behaviour or appearance	0.37		**0.41**	
N4.	Decreased experience of emotion and self		0.39	**0.40**	
D4.	Impairment in personal hygiene			**0.39**	
P5.	Conceptual disorganization	0.45			**0.58**
N5.	Decreased ideational richness				**0.46**
D3.	Trouble with focus and attention		0.43		**0.46**
N6.	Deterioration in role functioning		0.37	0.32	**0.41**

Item G3 was removed from the analysis due to poor loading on all of the factors. Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.78. Items with loadings > 0.32 on more than one factor are assigned to factors that are most theoretically consistent (factor loadings bolded). Factor loadings <0.32 are not displayed for clarity.

TABLE 4B. Factor correlation matrix

	Positive symptoms	Distress	Negative symptoms	Deteriorated thought process
Positive symptoms	(0.75)			
Distress	0.16	(0.64)		
Negative symptoms	0.14	0.25	(0.66)	
Deteriorated thought process	0.24	0.18	0.32	(0.53)

Numbers in parentheses are Cronbach's alpha based on items assigned to the corresponding factor.

explained = 9.1%); negative symptoms (N1, N2, N3, N4, D1, D4; variance explained = 5.3%); and deteriorated thought process (P5, N5, N6, D3; variance explained = 3.0%). The four factors showed small to medium correlations with each other (r ranged from 0.14 to 0.32), and had fair to good internal consistency (Cronbach's α ranged from 0.53 to 0.75; Table 4b).

Convergence validity of the four factors was supported by the finding that they showed strongest correlations with their corresponding empirically derived PANSS factors,[34] with r ranging from 0.63 to 0.84 (Table 5).

Symptom frequency

Frequency of symptoms rated 3 or above on the SOPS in the CHR sample was examined. The most prevalent symptoms were mostly those loaded on the positive symptoms factor, including P4 (perceptual abnormalities/hallucinations; n = 122), P1 (Unusual thought content/delusional ideas; n = 104) and P2 (suspiciousness/persecutory ideas; n = 81). In addition, G2 (dysphoric mood; n = 109) of the distress factor, N6 (deterioration in role functioning; n = 106) of the deteriorated thought process factor, and N2 (avolition; n = 82) of the negative symptoms factor were also quite common.

DISCUSSION

Using a large sample from EDIPPP, we found four latent factors (positive symptoms, distress, negative symptoms, and deteriorated thought process) explaining 36% of total variance in the symptoms

TABLE 5. Convergence validity of the four empirical factors of SOPS (N = 334)

PANSS†	Factor 1 Positive symptoms	Factor 2 Distress	Factor 3 Negative symptoms	Factor 4 Deteriorated thought process
Positive	0.84	0.24	0.27	0.34
Anxiety and depression	0.41	0.63	0.26	0.22
Negative	0.17	0.31	0.73	0.32
Disorganized	0.37	0.14	0.31	0.63

Shaded cells are correlations that are expected to be strongest (relative to other cells in the same row or column) in order to support convergence validity of the four empirical factors of SOPS.
†Empirical factors of the Positive and Negative Syndrome Scales reported in Emsley *et al*.[34]

measured by the SOPS. Since the factors were estimated using shared variance only (i.e. excluding random errors unique to individual items), the % of total variance explained is bound to be smaller compared with PCA, which uses all (including measurement error) variance in component extraction. Given this, the amount of variance explained reported in this study is quite comparable to the 55% of total variance explained by the five principal components of PANSS reported in Emsley *et al*.[34] These four latent factors showed reasonable to good internal consistency and convergence validity, and they were not completely orthogonal. This four-factor solution resembles closely the four-factor structure implied by the SOPS and the widely accepted symptom structure of schizophrenia: positive symptoms (P), negative symptoms (N), disorganization (D) and general symptoms (G). However, we noted two major differences that have diagnostic and conceptual implications for the SOPS and the phenomenology of psychosis risk. First, the constituent items of the four empirical factors differ from those making up the four subscales of the SOPS. While the positive symptoms, distress, and negative symptoms factors consisted of mostly items from their corresponding SOPS subscales, they also consisted of items from other SOPS subscales. In addition, the deteriorated thought process factor consisted of a mixture of P, G, N and D items. Since the positive symptom subscale of the SOPS is the only subscale considered to be diagnostic of psychosis risk, its inclusion of an item (P5) that failed to load onto the positive symptoms factor and that the positive symptoms factor included a D item suggested that reassigning some SOPS symptoms to other subscales may improve the diagnostic validity of the SIPS.

Another noted difference was the relative prominence of the symptom dimensions. Consistent with the SOPS/schizophrenia symptom structure, positive symptoms were found to be the most prominent symptoms in this study, explaining 18.7% of total variance. However, while negative symptoms are considered a symptom dimension as important as positive symptoms in schizophrenia, our results showed that the distress factor (9.1%) accounted for more variance than the negative symptoms factor (5.3%) in this population. This was not surprising, given that 42% of this sample had a co-morbid major depressive disorder and 36% had a co-morbid anxiety disorder, similar to figures previously reported.[35] Dysphoric mood, in addition to functional decline and positive symptoms, was among the most common signs in our CHR sample. Loewy *et al*.[36] found that assessing distress associated with endorsed positive symptoms significantly increased the specificity of their psychosis risk syndrome screening tool, supporting the importance of assessing distress in early identification. Although baseline anxiety and depression do not seem to predict transition to psychosis,[35] they are associated with long-term functional outcome in psychosis risk syndrome.[37] Distress may reflect a failure to effectively regulate emotional response to psychotic symptoms, thus adversely affecting role and social functioning. Taken together, our findings lend further support to early identification and intervention strategies focusing on positive and distress symptoms (see also[38]).

As noted above, the deteriorated thought process factor consisted of a mixture of P, N and D items. Examination of the content of these items reveals that these items together tap into compromised but rather non-specific thought and attention functions. This suggests that disorganization symptoms manifest in a milder and more unspecific manner in psychosis risk compared with schizophrenia. Nevertheless, there is evidence that disorganized symptoms are highly predictive of functional outcome in a clinical high risk sample, suggesting that subtle disorganized symptoms warrants equal attention and monitoring as do other symptoms in psychosis risk.[39]

One potential limitation of this study was the characteristic of the sample. It consisted of CLR and EFEP individuals in addition to CHR, differing from the traditional approach of treating psychosis risk as a distinct entity.[18,19] Technically, for the factor analysis result to be considered reflective of the phenomenology of psychosis risk, it should be based on a CHR sample. However, despite the relatively large sample size of this study, the CHR sample was still not large enough to produce adequate statistical fit for valid factor analysis results. The validity of the factor analysis in this heterogeneous sample rests on the assumption that the latent factor structure is continuous across the range of symptoms assessed. Testing this assumption will require a much larger sample from the low-risk and very early psychosis groups. However, given the premise that pathology is continuous with normal variation, the current study provides a good first-pass analysis capturing a wider range of scores in a sufficiently powered sample. The results based on the entire EDIPPP sample should be considered as reflecting the phenomenology among help-seeking youth with suspected psychosis risk or very early psychosis.

To conclude, the empirical factor structure of the SOPS showed similarities but significant differences compared with the current SOPS structure as well as the traditional symptom structure of schizophrenia. This suggests that regrouping the SOPS items according to the underlying symptom dimensions may help refine the diagnostic validity of the instrument. Examination of the relative prominence of the empirical factors of the SOPS and symptom frequency supported the importance of early identification strategies focusing on positive symptoms and distress. Future investigation of long-term functional implications of these symptom factors may further inform intervention strategies.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table S1. PANSS item description.