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Factor Analysis of Negative Symptom Items in the Structured Interview for Prodromal Syndromes

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Background: **Negative symptoms occur early in the clinical high risk (CHR) state and indicate increased risk of conversion to psychotic disorder and poor functional outcome. However, while the negative symptom domain has shown to be parsimoniously explained by a 2-factor construct in schizophrenia, there has yet to be an established factor structure of negative symptoms in CHR.** ***Methods:*** **214 individuals meeting the Structured Interview for Psychosis-Risk Syndromes (SIPS) criteria for CHR were recruited through 3 active research programs in the United States. Exploratory Factor Analysis was conducted on the 6 negative symptom items of the SIPS, and factors were evaluated with respect to functional outcome and depression.** ***Results:*** **Factor analysis indicated a 2-factor hierarchical model with 2 negative symptom dimensions reflecting volition (Occupational Functioning and Avolition) and emotion (Expression of Emotion, Experience of Emotion and Social Anhedonia). Linear Regression showed that the emotion factor was associated with poor social function, and the volition factor was associated with poor role function and depression.** ***Conclusions:*** **Similar to factor solutions identified in adults diagnosed with psychotic disorders, results indicated that the SIPS negative symptom subscale is not a unidimensional construct. Rather, the SIPS negative subscale has 2 distinct factors that have different associations with clinical outcome and should be interpreted independently. Results have significant relevance for informing the valid assessment and conceptual interpretation of early clinical phenomenology in the psychosis prodrome.**

Key words: clinical high risk for psychosis/ultra high risk for psychosis/At Risk Mental State/psychosis/schizophrenia

Introduction

The identification of individuals at clinical high risk (CHR) of developing a psychotic disorder is key to the effectiveness of early intervention in psychosis. One of the primary approaches to understanding and evaluating the CHR state is based on severity of attenuated symptoms as measured by the Comprehensive Assessment of At Risk Mental State (CAARMS)[1] and Structured Interview for Psychosis-Risk Syndromes (SIPS),[2] both of which use positive symptoms to determine the threshold of CHR. Both scales, however, measure a wide range of symptoms that are clinically significant characteristics of the prodrome and indicative of increased risk. One symptom domain that has been the focus of investigation recently is negative symptoms—a core clinical feature of psychotic disorders as well as CHR.

A wide range of negative symptoms such as anhedonia, avolition, emotional withdrawal, social isolation, apathy and deterioration in role functioning are frequently reported in CHR for psychosis.[3,4] A recent large study showed that 85% or CHR individuals exhibit at least 1 negative symptom rated as clinically significant (3 or above on the SIPS),[5] they typically emerge several years prior to attenuated positive symptoms (APS) in the prodromal phase of psychosis,[6] and predict poor functional outcome.[7] Most notably, many studies have shown a strong link between negative symptoms severity and increased risk of transition to psychosis.[6,8–11] Thus it may be that negative symptoms represent a core vulnerability in individuals at CHR of developing psychosis as well as a wider range of clinical outcomes including poor social and role function[7] nonpsychotic disorder[12] or unemployment.[13] Furthermore, this may be the case above and beyond other presenting variables, such as depression or anxiety.[14] The early onset, high prevalence and poor prognosis of these symptoms mean that it is essential to understand their phenomenology and clinical relevance.

Compounding the importance of negative symptoms at clinical presentation, several studies have found that

these features are persistent over the 12 months following initial contact.[6] An unmet need also continues to exist for effective treatments of these symptoms—a recent meta-analysis in psychosis found few effective interventions focused on these symptoms and most treatments were not clinically meaningful as measured on Clinical Global Impression Severity Scale.[15] Therefore such symptoms can result in a dramatic reduction on quality of life. Before effective treatments can be implemented, it is crucial to be able to accurately track and interpret these symptoms, based on the commonly employed tools currently in use.

It is clear that negative symptoms represent clinically important phenomena in prodromal patients, and may provide insight into the pathology of the psychosis prodrome and possible preventive interventions.[16] Thus, it is crucial to fully understand the underlying structure of these symptoms. The first step in this process must be to determine what is included under the umbrella term "negative symptoms" and whether it is a unified construct, several distinct dimensions, or a hierarchical model. Appropriately interpreting the data from widely used instruments like the SIPS will help provide a foundation for understanding these symptoms, and in the light of previous exploration of negative symptoms in schizophrenia,[17–19] may be informative about risk states more broadly.

The approach to negative symptoms in schizophrenia has recently evolved to incorporate the 5 domains of negative symptoms in psychosis identified at the National Institute of Mental Health (NIMH, 2005).[20] In response to this, 2 rating scales have been designed to measure these 5 domains (the Clinical Assessment Interview for Negative Symptoms [CAINS][21] and the Brief Negative Symptom Scale [BNSS][22]). However, the unique presentation and the subtleties of newly emergent attenuated negative symptoms in CHR youth, mean that a scale for use specifically in this population is needed. This has been done using 2 approaches: Gur et al[23] adapted the CAINS for use in the CHR population while Strauss and Chapman[24] adapted the BNSS, and the Prodromal Inventory for Negative Symptoms (PINS)[25] was designed for specific use in the CHR population.

Although the primary aim of the SIPS is to determine CHR status, it measures a wide range of symptoms, including negative symptoms. The negative symptoms measured by the SIPS are not directly measuring the 5 domains of current consensus, and as a result, investigators have questioned the validity of the items (eg, some items conflate 2 distinct entities: N3 [Expression of Emotion] item conflates blunted affect, poverty of speech, and asociality, N4 [Experience of Emotion and Self] conflates depersonalization and a decrease in emotion and N5 [Ideational Richness] conflates the subject's lack of comprehension and poverty of speech[24,25]). However, despite these shortcomings, the comparatively recent development of the PINS and BNSS for CHR (2017), the current ubiquitous use of the SIPS, and relatedly, considerable resources spent on studies that have used the scale (eg, North American Prodrome Longitudinal Study), create a situation where it remains crucial to understand what is being measured under the heading of negative symptoms, even though the scale is not consistent with modern perspectives from affective science or consensus in the field.

Factor analyses of the BNSS and CAINS indicate that the 5 negative symptom domains load on to 2 dimensions: avolition-apathy (anhedonia, avolition, asociality) and diminished expression (blunted affect and alogia).[21,22,26] This confirms previous findings of a 2-factor structure using the previous approach as measured by the Scale for the Assessment of Negative Symptoms (SANS).[27,28] More recently, a large analysis of 2 samples confirmed this 2-factor structure and established clinically meaningful differences in presentation between the 2 dimensions, with greater severity of avolition -apathy symptoms being associated with more severe disorganization, poorer social functioning, and greater social cognition deficits.[19]

Although the 2-factor structure of negative symptoms has been established in patients with psychotic disorders, with the SANS and also with the 2 more recent measures designed to incorporate the 5 domains described by the NIMH,[20] there has been no consensus as to the structure of negative symptoms in CHR.

Previous factor analyses of the CAARMS[10,11] and SIPS[29,30] have examined the scales as a whole, including the wide range of symptoms to reveal a variation of 3-, 4-, and 5-factor structures, all of which include a negative factor; while a factor analysis including only positive and negative items of the SIPS found all negative items loaded on 1 factor.[6] However, the inclusion of items from constructs other than negative symptoms may cause items to aggregate together in factor analysis and artificially makes the negative symptom items appear unidimensional. This is similar to the phenomenon that has been observed with factor analytic studies of clinical rating scales in adults with schizophrenia. Specifically, when positive, negative, and disorganized symptom items are all entered into an Exploratory Factor Analysis (EFA) together, these items form separate dimensions for those domains.[29,31] Such evidence leads to the inaccurate conclusion that negative symptoms are unidimensional; however, when negative symptom items were evaluated in isolation, evidence for 2 factors emerged reflecting volitional and expressive pathology.[19,21,26,32] It is, therefore, necessary to assess negative symptoms without inclusion of other constructs to know if these symptoms are unidimensional or multidimensional in CHR. Failure to assess this domain of pathology with enough granularity can obscure pathophysiological correlates that are unique to the individual dimensions, as well as potential intervention and prevention effects specific to the separate

negative symptom domains. Only 1 study has examined negative symptoms alone in CHR, finding a similar 2-factor structure. However, this was using a scale not designed for use in the CHR population (SANS) and in a small sample with insufficient power for factor analysis.[14]

The current study evaluated the factor structure of the SIPS negative symptom subscale items in a large CHR sample. Clinical correlates of the factors were explored to determine whether factors identified were differentially associated with symptoms and functional outcome. Similar to the studies conducted on adults with psychotic disorders, it was hypothesized that the SIPS would produce a 2-factor solution consisting of volitional and expressive symptoms. These factors were expected to differ in their association with clinical outcomes, with a stronger association between the volitional dimension and functional outcome, and the expressive dimension and depressive symptoms.

Method

Sample

The sample included 214 individuals meeting SIPS criteria for CHR, aged 12–31 (M = 22.16, SD = 3.81) recruited through 3 labs in the United States between 2014 and 2018. Ninety-six participants were recruited through Adolescent Development and Preventative Treatment (ADAPT) program (University of Colorado Boulder, Northwestern University; PI: V.M.), 89 through North American Prodrome Longitudinal Studies (NAPLS) (Emory NAPLS2 site, PI: E.W.), and 29 via the New York Psychosis Risk Evaluation Program (State University of New York, Binghamton; PI: G.P.S.). All studies were IRB approved and all participants provided written consent and/or assent (for those under 18) for participation. Pre-established exclusion criteria for all groups included history of head injury, neurological disorder, DSM-IV-TR Axis I psychotic disorder or substance dependence and prescribed antipsychotic medication. Since the SIPS is a clinical rating scale, completed to establish eligibility for the study, all items for all participants enrolled in the study were completed and there were no outliers, all ratings on the scale are considered valid.

Measures

SIPS[2] interviews were conducted in person by site PIs or graduate students trained to reliability standards using gold standard interviews developed at each site. The scale has been shown to have good predictive validity[33] and all raters had inter-rater reliabilities that exceeded the minimum study criterion of Kappa ≥ 80 at each site.[34] The SIPS was administered to detect the presence of a prodromal syndrome in 3 possible ways:

1. the presence of APS and/or
2. decline in global functioning accompanying the presence of schizotypal personality disorder (SDP) and age <19 and/or
3. a family history of schizophrenia with decline in functioning.

Participants may meet criteria for 1 or more of the categories above. Items are scored on a scale of 0–6. A score between 3 (moderate) and 5 (severe but not psychotic) on 1 of the 5 positive items is considered to meet CHR criteria.

Global Functioning: Social (GFS-S) and Global Functioning: Role (GFS-R) scales[35] were also administered: these scales are specifically designed for use in the CHR population[36] and provide ratings of functioning on a 10-point Likert scale where a score of 10 reflects superior functioning and 1 indicates extreme dysfunction. Each scale generates 3 scores: current functioning which is the lowest level of functioning in the past month, lowest and highest level of functioning reported over the past year; current functioning scores were used for analysis. Both scales have been shown to have high reliability and good construct validity.[35]

The Calgary Depression Scale for Schizophrenia (CDSS) was used to assess symptoms of depression[37]—this is a 9-item questionnaire designed specifically for individuals with schizophrenia, with each item rated on a 4-point scale from 0 (absent) to 3 (severe). It has been shown to have good specificity,[38] reliability, and validity.[39]

Statistical Analysis

Levine's test of homogeneity of variance showed the data from the 3 sites did not differ on SIPS total, positive, negative or general, so data from the 3 sites was pooled to create 1 sample. Exploratory factor analysis was chosen, as negative symptom factor structure has not previously been established in this population. Due to the limitations of alpha,[40] omega was used to determine the internal consistency of the 6 negative symptoms items and omega hierarchical to determine general factor saturation[41] using the Psych package[42] in the R Statistical System.[43] Confirmatory Factor Analysis using the Lavaan package[44] was then used to determine the fit of the generated models.

A 1-way ANCOVA was used to evaluate differences between the dimensions by gender or ethnicity, Pearson's Product-Moment Correlation was used to test for correlations between factors and clinical presentation variables, age and education; and linear regression was used to determine the predictive relationships with function and depression symptoms.

Results

Sample Characteristics

The sample consisted of 214 participants, 53% male, the mean age was 22. Gender, age and ethnicity information

is shown in table 1 (demographic characteristics by site are available in the supplementary material). All subjects completed the full SIPS, 185 subjects completed GFS-R and GFS-S and 172 subjects completed the CDSS. Seventy-three percent of the sample reported 1 or more negative symptoms of moderate severity or above (score of 3 or above). Rates of current comorbid Axis I disorder in the CHR participants included 12% bipolar, 51% non-bipolar mood disorder, 38% anxiety disorder and 67% other nonpsychotic disorder. Comorbid Axis I disorders are typical of UHR individuals and the present rates are comparable to other samples.[45] Ninety-one percent of the sample met CHR inclusion criteria through APS, 16% through Genetic Risk, and 4% through SPD and a decline in function under the age of 19.

Exploratory Factor Analysis

Exploratory Factor analysis suggested a hierarchical model, with 2 group factors reflecting: volition—consisting of SIPS items for Occupational Functioning and Avolition; and emotion—including SIPS items for Expression of Emotion, Experience of Emotion and Self, and Social Anhedonia, as well as a general factor including all 6 items (correlations of SIPS items are shown in the supplementary material).

Table 1. Demographic and Clinical Characteristics

Sample size	214
Mean age (SD)	22.2 (3.8)
Gender	53% male (n = 113)
Ethnicity	1.9% First Nations (n = 4) 5.1% Asian (n = 11) 20.6% Black (n = 44) 9.3% Central or South American (n = 20) 54.7% White/Caucasian (n = 117) 2.3% Native Hawaiian or Pacific Islander (n = 5) 6.1% Interracial (n = 13)
Mean parental education in years (SD)	15.7 (2.8)
Mean total SIPS	35.7 (13.7)
Mean total SIPS positive	12.4 (4.2)
Mean total SIPS negative	10.4 (6.4)
Mean SIPS negative items (SD)	
N1 social anhedonia	2.14 (1.69)
N2 avolition	1.91 (1.59)
N3 expression of emotion	1.66 (1.53)
N4 experience of emotion/self	1.61 (1.54)
N5 ideational richness	1.02 (1.22)
N6 Occupational functioning	2.10 (2.01)
Mean CDSS (SD)	5.83 (4.48)
Mean global role function (SD)	6.56 (1.80)
Mean global social function (SD)	5.83 (1.48)

Note: CDSS, Calgary Depression Scale for Schizophrenia; SIPS, Structured Interview for Psychosis-Risk Syndromes.

Examination of the internal consistency of the data showed an alpha (α) of 0.74, omega total (ω_t) of 0.80, and omega hierarchical (ω_h) of 0.42[40,46] indicating that a hierarchical model is conceptually meaningful and fits the data. The Omega Hierarchical Asymptotic (a measure of ω_h given infinite number of items in the scale) was 0.53.

Although ω_h is uniquely defined only for cases where 3 or more subfactors are extracted, in this case a 2-factor solution was more appropriate, this was done by forcing the Schmid-Leiman extraction to treat the 2 subfactors as having equal loadings. Factor loadings above 0.2 are shown in table 2.

Confirmatory Factor Analysis

Confirmatory factor analysis was used to determine the comparative fit of a general factor only model (1 factor including all items), a group factor only model (the 2 volition and emotion factors, with no general factor, constrained to be orthogonal) and the hierarchical model (the general factor as well as the 2 volition and emotion factors). Since both the hierarchical model and the group factor model likely capitalize on equal sampling error (given that they were based on the EFA from the current sample), the comparative CFA is valid. However, the hierarchical model may have capitalized on sampling error more than the general factor model. This was corrected for by adopting a more stringent alpha level of 0.01 for their comparison. CFA Results showed that the general factor model was a poor fit according to all indices as indicated by CFI less than 0.95, SRMR of above 0.08 and RMSEA's that exceeded the 0.06 threshold[47]; both the group factor model and the hierarchical model met the CFI and SRMR cut-off, but neither met the criteria for RMSEA or Chi-Square, while AIC and BIC demonstrated a preference for the group factor model. The Chi-Square difference test showed that the hierarchical model was a significantly better fit than the general factor model ($\chi^2(5) = 39.09$, $P < .001$) and the group factor model ($\chi^2(3) = 10.12$, $P < .05$). Comparative fit indices are shown in table 3.

Correlates of Symptom Dimensions

An ANCOVA showed there was no statistically significant difference between gender or racial group on factor scores after controlling for the other factor (gender: $F(1, 0.523) = 0.06$, $P = .807$; race: $F(9, 14.284) = 1.69$, $P = .094$). Pearson's Product-Moment Correlation showed a significant correlation with both factors and both function scales as well as CDSS. However, the strength of correlations showed that factor 1—volition correlated more strongly than factor 2—emotion with all 3 variables and the strongest correlation was between factor 1—volition and GFS-R: r (183) = −0.67, $P < .001$. Correlations are shown in table 4.

Table 2. Factor Loadings Above 0.2 of all SIPS Negative Items

SIPS Item	General Factor	Factor 1 – Volition	Factor 2 – Emotion
N6 – occupational functioning	0.45	0.67	
N2 – avolition	0.53	0.65	
N3 – expression of emotion	0.45		0.64
N4 – experience of emotion and self	0.45	0.29	0.31
N1 – social anhedonia	0.40	0.24	0.30
N5 – ideational richness	0.27		0.25
Eigen value	1.13	1.02	0.67
Internal consistency (ω_t)	0.80	0.81	0.62

Note: SIPS, Structured Interview for Psychosis-Risk Syndromes.

Table 3. Comparative Fit Indices of 3 Alternative Models

Model	AIC	BIC	Chi-Square (df)	CFI	RMSEA	SRMR
General Factor Model	4542	4582	χ^2 (9) = 51.91***	0.851	0.150	0.085
Group Factor Model	3843	3880	χ^2 (4) = 12.82***	0.967	0.102	0.045
Hierarchical Model	4509	4576	χ^2 (1) = 2.71***	0.994	0.090	0.013

Note: AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; CFI, Confirmatory Fit Index; RMSEA, Root Mean Square Error of Approximation; SRMR, Standardized Root Mean Square Residual.
***$P < .001$.

Table 4. Correlations Between Factors 1 and 2 With Functional Outcome and Depression

	General Factor	Factor 1 – Volition	Factor 2 – Emotion
GF – Social	−0.47**	−0.37**	−0.33**
GF – Role	−0.59***	−0.66***	−0.22*
CDSS	0.47**	0.47**	0.21*

Note: CDSS, Calgary Depression Scale for Schizophrenia.
*Small correlation (.1–.3); **Medium correlation (.3–.5); ***Large correlation (>.5).

Multiple Regression showed a significant unique association between factor scores for the general factor and social and role function as well as depression. Of the 2 group factors, only factor 1—volition significantly uniquely predicted role function and depression, and only factor 2—emotion significantly uniquely predicted social function. Tolerance was greater than 0.1 and Variance Inflation Factor was lower than 10 for all regressions, indicating that multicollinearity was not an issue. Results are shown in table 5.

Discussion

Exploratory factor analysis was used to investigate the factor structure of SIPS negative symptom items. Contrary to how the negative subscale is currently conceptualized (a unidimensional construct that is almost exclusively evaluated using a single total score), results indicated the existence of 2 separate factors reflecting: volition (*Occupational Functioning*, and *Avolition)* and emotion *(Expression of Emotion, Experience of Emotion and Self*, and *Social Anhedonia*) as well as some evidence for a general factor. Notably, these findings are generally consistent with results of factor analyses on adults with psychotic disorders, but also suggest some potentially informative differences: the hierarchical model indicates that there is some underlying general variance, as well as the 2 differentiated factors, and the differentiation between experience and expression of emotion found in schizophrenia, is not found in CHR.

Initial exploration of the factor structure in psychosis had found 2 distinct factors.[17,19,32] However, these analyses have focussed on a simple factor structure—and the examination of the fit of less constrained, multidimensional models is possible. A hierarchical model can include a general factor that underlies all items on a measure as well as (in this case) 2 group factors that underlie a subset of the items, all of which are orthogonal to each other.[48] The model found in this analysis has a low ω_h value (0.42) which indicates that only 42% of the variance in SIPS negative items total scores is attributable to the general factor and the fit indices used in the confirmatory factor analysis also indicated that according to AIC and BIC, the group factor model (including the 2 factors without the general factor) was preferable. Despite the Chi-Square difference test showing the hierarchical model to be a better fit (indicating there may be a general factor), the omega hierarchical asymptotic was only 0.53. Thus, for an infinite length test with a structure similar

Table 5. Linear Regressions of Function and Depression Scales With Negative Symptom Factors

Factor		*B*	SE *B*	β	*t*	*P*	95% CI for EXP(B) Lower	95% CI for EXP(B) Upper
Global function - social	Factor 1 - Volition	−0.03	0.03	−0.05	−0.80	.425	−0.09	0.04
	Factor 2 - Emotion	−0.16	0.04	−0.32	−3.83	<.001	−0.24	−0.08
	General Factor	−0.13	0.04	−0.23	−3.72	<.001	−0.20	−0.06
Global function - role	Factor 1 - volition	−0.27	0.03	−0.58	−9.45	<.001	−0.33	−0.22
	Factor 2 - emotion	−0.01	0.04	−0.02	−0.28	.777	−0.09	0.06
	General factor	−0.19	0.03	−0.39	−6.11	<.001	−0.25	−0.13
Calgary Depression Scale	Factor 1 - volition	0.06	0.01	0.31	5.78	<.001	0.04	0.07
	Factor 2 - emotion	0.02	0.01	0.14	1.85	.066	−0.00	0.05
	General factor	0.06	0.01	0.32	5.69	<.001	0.04	0.08

to the observed test only 53% of the variance would be accounted for by the general factor, indicating that even given infinite items, the negative symptoms scale in the SIPS would just barely be an adequate measure of a general negative factor.[49]

The factors show distinct relationships with clinical features and functional outcomes that have been traditionally linked with negative symptomatology: whereas the general factor was associated with poor social and role function as well as depression, the 2 group factors showed distinct associations with clinical outcome: the emotion factor predicted poor social function, while the volition factor predicted poor role function and depression. Taken together, results suggest that prodromal research groups using the SIPS should consider evaluating extant and newly collected data in the context of the 2 group factors. Further, there is evidence to suggest distinct pathophysiology of the 2 dimensions, which has relevance for informing efforts to devise early identification strategies that center around negative symptoms—a domain that appears long before positive symptoms.[16]

Studies examining the BNSS, CAINS, SANS, Schedule for Deficit Syndrome (SDS), and Positive and Negative Syndrome Scale (PANSS) all indicate the presence of 2 factors, reflecting avolition-apathy (avolition, anhedonia, asociality) and diminished expression (alogia, blunted affect).[6,19,21,26,50] The experience of emotion and expression of emotion load on 1 factor in the SIPS, which differs from the factor structures found using the BNSS/CAINS in schizophrenia where the experience of emotion loads with volition into a motivation–pleasure factor, with a second factor incorporating emotional expressivity.[32] This may be due to the heterogeneity of the CHR population, with varying transition rates[51] and wide range of clinical presentations and outcomes[52]; or it may be due to the SIPS negative symptom scale not being consistent with modern perspectives from affective science or consensus in the field. However, this dichotomy of negative symptoms has been shown to present transdiagnostically from healthy, to high-risk, to clinical populations.[53]

SIPS negative symptom items do not evaluate the 5 domains of negative symptoms as they were defined in the NIMH consensus meeting (Kirkpatrick et al[20]), potentially explaining differences in which items load on each of the SIPS factors that differ from adults with psychotic disorders measured using scales incorporating the current consensus on negative symptoms. Despite these differences in content, and differences in negative symptom structure between CHR and diagnosed psychotic samples, an important conclusion can be drawn in CHR youth and adults with psychotic disorders: the negative symptom construct is clearly not unidimensional, but rather a multidimensional construct including group factors of volitional and emotional pathology.

The volition factor was associated with role function which may reflect the high degree of conceptual overlap between items included in the volition factor (eg, occupational function) and the GFS-R scale content. Previous links have been found between negative symptoms and both social and role function,[7,54,55] however, this study showed that whereas social function was associated with emotional pathology, role function was associated with volitional pathology. In psychotic disorders, higher scores on the volitional factor were found to associate with worse social function than patients exhibiting higher expressive deficits.[19] However, this was only the case in only one of the 2 studies included.

Depression measured by the CDSS was found to be predicted by only the volition factor, and not the emotion factor. Strauss et al[19] found no significant difference in depression,[56] between individuals scoring highly on volitional or expressive factors, so this may be a characteristic of the factors in CHR. Investigation of the correlates of other Axis 1 disorders may shed light on this association, as the emotion factor showed only a weak correlation with depression, and it did not predict it.

Notably the ideational richness item did not load on either factor, and had a low loading on the general factor, this could be due to the fact that this item was highly negatively skewed, with few participants receiving scores in the clinical range, or it may lead to the conclusion that

it is not clinically linked to the other items within the negative symptom construct. Older, first-generation scales developed for schizophrenia such as the PANSS included similar items, which are now not regarded as part of the construct. Therefore, if we can show that this is the case across samples, it may suggest that the ideational richness item could be dropped when calculating negative symptom outcome scores on the SIPS. Furthermore, the statistical differentiation of the 2 dimensions implies that they represent separate treatment targets. To conflate the 2 distinct dimensions may miss important clinical information, and by using the common SIPS procedure of totaling all 6 items, meaningful variance related to the distinct underlying factors is missed.

A limitation of this study is that negative symptoms were measured using the SIPS, as this is currently the most widely used measure of negative symptoms in this population. This scale is designed to examine attenuated psychotic symptoms determined by positive symptoms. The prominent role of negative symptoms in this population warrants specific scales to measure these symptoms in CHR, as has been the case in psychosis with the CAINS[21] and BNSS.[24] The PINS[25] is based on modern negative symptom definitions that cover the 5 NIMH domains and demonstrates good psychometric properties. A more detailed examination of the 2-factor split in CHR using this scale designed specifically for the examination for negative symptoms may shed further light on this construct in CHR and the psychosis continuum.

This study uses exploratory factor analysis, as it has not been previously investigated. However, there are necessary further steps to establish this factorial structure. The CFA used in this study was not a measure of absolute goodness of fit, rather a comparative fit of the hierarchical and simple models; therefore, the structure will need to be confirmed using CFA in an independent sample before it can be robustly determined. Furthermore, the factors determined in this study have not been considered longitudinally; it is key to explore the stability of these factors, their pathological development, prevalence, and relationship to outcome—in particular, whether the factors differ between those who transition to psychotic disorder and those who do not. Studies in First Episode Psychosis have shown differential pathways of symptom development, remission and maintenance over a 10-year follow-up, associated with different functional outcomes,[57,58] this has yet to be explored in CHR.

This study investigated the established 2-factor structure of negative symptoms present in adults with psychotic disorders in the CHR population, confirming the presence of volition and emotion symptom dimensions in a 2-factor model. The hierarchical model indicated that there may be an underlying general factor; however, further analysis of the structure indicated that the SIPS negative symptom scale is not satisfactory as a measure of a general negative symptom domain. This model allows for the distinction of the 2 theoretically distinct group factors, while also informing the degree to which we can consider the symptoms included in this scale as a meaningful group. The 2 dimensions represent distinct targets for studies examining pathophysiological mechanisms of negative symptoms and treatment while contributing to the understanding of the pathology of negative symptoms in the CHR population.

Supplementary Material

Supplementary material is available at https://academic.oup.com/schizophreniabulletin/.

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