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Initial development and preliminary psychometric properties of the Prodromal Inventory of Negative Symptoms (PINS)

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Abstract

In the psychosis prodrome, sub-threshold positive symptoms are often preceded by negative symptoms. Individuals exhibiting these attenuated symptoms are primarily adolescents and young adults at clinical high-risk (CHR) for developing a psychotic disorder. In the CHR state, negative symptoms are highly predictive of the transition to diagnosable illness, making the assessment of these symptoms very important. Existing scales used to evaluate negative symptoms in this critical population are informative but have conceptual and psychometric limitations and/or were not

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Contributors Authors Pelletier-Baldelli, Mittal and Strauss designed the study. All authors contributed to the revised assessment tool. Authors Pelletier-Baldelli, Strauss, and Frost undertook the statistical analysis, and author Pelletier-Baldelli wrote the first draft of the manuscript. All authors edited and contributed to the writing of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of Interest Author V.A.M is a consultant for Takeda Pharmaceuticals. Author G.P.S. is one of the original developers of the Brief Negative Symptom Scale (BNSS) and receives royalties and consultation fees from ProPhase LLC in connection with commercial use of the BNSS and other professional activities.

designed according to modern conceptions delineated in the 2005 NIMH Negative Symptom Consensus Conference. The current study reports the development of the Prodromal Interview of Negative Symptoms (PINS) – a next-generation scale designed in accordance with the consensus conference recommendations. Preliminary data on the psychometric properties of the PINS is reported as part of ongoing scale development that will use a data-driven, iterative process to generate a final scale. Analysis of data from 53 CHR cases, 30 of whom were re-evaluated at 12-months, indicated that the beta version of the PINS demonstrated good internal consistency, inter-rater reliability, convergent validity, and discriminant validity. These preliminary findings provide direction for a revision of this measure, which resulted in the PINS-2, a promising new measure for the assessment of negative symptoms in CHR populations. This manuscript presents both the initial scale and resulting untested instrument, as well as a series of plans and recommendations for future development.

Keywords

negative symptoms; psychosis risk; assessment; prodrome

1. Introduction

Negative symptoms are a core feature of schizophrenia and predict a number of clinically important outcomes, such as recovery, subjective well-being, quality of life, and functional outcome (Fervaha et al., 2014; Foussias et al., 2014; Millan et al., 2014; Strauss et al., 2010). The National Institute of Mental Health (NIMH) held a consensus conference in 2005 to promote progress in this area of psychopathology (Kirkpatrick et al., 2006). Among the key conclusions from this conference were: 1) there are at least 5 core domains of negative symptoms, including anhedonia (diminished intensity or frequency of pleasure), avolition (diminished initiation of and persistence in goal-directed activity), asociality (reduced frequency and/or desire for social interaction), blunted affect (diminished facial, vocal, and body expression) and alogia (reduced quantity of speech) and 2) new negative symptom rating scales are needed to assess these specific domains.

Two next-generation negative symptom rating scales resulted from the 2005 consensus conference: the Clinical Assessment Interview for Negative Symptoms (CAINS) (Horan et al., 2011; Kring et al., 2013) and the Brief Negative Symptom Scale (BNSS) (Kirkpatrick et al., 2011a; Strauss et al., 2012). The CAINS and BNSS have demonstrated good psychometric properties, and factor analytic studies indicate that the five negative symptoms load onto two dimensions: motivation/pleasure (MAP) (anhedonia, avolition, asociality) and diminished expression (EXP) (blunted affect and alogia) (Horan et al., 2011; Kring et al., 2013; Strauss et al., 2012). Subsequently, the CAINS and BNSS are becoming widely used in experimental psychopathology and clinical trial studies examining the chronic phase of schizophrenia (Gur et al., 2015; Johnson et al., 2011; Wolf et al., 2014).

Despite this progress, the NIMH consensus conference did not discuss development of negative symptom scales specific to youth at clinical high-risk (CHR) for developing psychosis. The development of such scales is important, as negative symptoms play a vital

role in the developmental trajectory of psychosis, predicting the transition to diagnosable psychotic disorders (Johnstone et al., 2005; Piskulic et al., 2012). In North America, negative symptoms are most commonly evaluated in CHR populations using the Structured Interview for Prodromal Syndromes (SIPS) (McGlashan et al., 2001). The SIPS is well-validated, commonly used, and has been vital to our understanding of CHR youth. However, the SIPS negative symptom items have some limitations with content validity (e.g., the social anhedonia item conflates asociality, social anxiety, and social skill, and does not evaluate pleasure specifically). Most notably, when examining the SIPS negative symptoms (social anhedonia, avolition, expression of emotion, experience of emotions and self, ideational richness, and occupational functioning), it is readily apparent that these items do not map onto the domains identified by the NIMH 2005 Consensus Conference. This is a significant issue, as it is not currently possible to assess negative symptoms in CHR youth in relation to the modern constructs delineated in the 2005 NIMH Consensus Meeting. Incorporating the CAINS or BNSS into an assessment battery for the prodromal syndrome is one potential option that has been done (Gur et al., 2015); however, these scales were developed for adults with formal psychosis already experiencing negative symptoms, and these scales may not pick up on the subtleties of newly emergent attenuated negative symptoms in CHR youth. Thus, there is still need for the development of a new negative symptom rating scale designed specifically for the prodromal phase of illness that incorporates modern conceptualizations of negative symptoms.

The current study reports the development of a new scale designed to address these limitations – the Prodromal Interview of Negative Symptoms (PINS). Preliminary psychometric properties are reported for the beta version of the PINS, which represents the first step of what will be an iterative and data-driven process to develop and validate a next-generation measure. Future efforts will include a series of multi-site psychometric studies designed to determine which items to add, modify, retain or eliminate.

2. Materials and Methods

2.1 Sample

The sample included 53 CHR adolescents/young adults, aged 12–21 who were recruited at the Adolescent Development and Preventive Treatment (ADAPT) research program as part of a larger protocol following previously reported recruitment and exclusion criteria (Pelletier-Baldelli et al., 2015). Participants underwent an initial baseline assessment and then a follow-up assessment approximately 12-months later. Of the 53 participants assessed at baseline, 46 passed the 12-month window at the time of these analyses. A total of 7 people have not yet been scheduled for their 12-month visit, and 16 never came back post-baseline, resulting in 30 CHR youth in the 12-month analyses.

2.2 Measures

2.2.1 PINS-Beta Scale Development—Guiding principles for the development of the PINS-beta were to: 1) cover the 5 domains in the 2005 NIMH consensus meeting (Kirkpatrick et al., 2006), 2) evaluate distinct components of pleasure identified in modern conceptualizations of anhedonia (e.g. anticipatory pleasure, frequency/intensity of past

pleasure) (Kring and Elis, 2013; Strauss and Gold, 2012), 3) include items that could allow for evaluation of whether the MAP and EXP dimensions are represented in CHR, 4) utilize the structure and format of the presiding prodromal measure – the SIPS, 5) ensure item content is relevant to an adolescent/young adult population, and 6) make rating anchors appropriate for a sub-clinical population.

The beta version of the PINS is a semi-structured clinical interview that includes 13 items (Supplementary Material). The PINS was developed in 2012 and modeled after existing next-generation measures (CAINS and BNSS) developed for the chronic phase of schizophrenia, and included a small number of items that closely mapped onto the existing scales. Item selection for the PINS-beta was conducted by authors A.P and V.A.M. Items were then edited to accommodate a CHR sample and the experiences of adolescence/young adulthood. PINS rating procedures were modeled after the SIPS to allow for integration of measures. Each of the 13 items is rated on a 0 (absent) to 6 (extremely severe) scale. The 13 items were designed to divide into MAP (9 items) and EXP (4 items) subscales. The MAP subscale includes 3 asociality items (frequency of interaction with friends and family, along with internal experience), 4 anhedonia items (role (e.g. work/school), recreation, and social anticipatory and past pleasure), and 2 avolition items (motivation for role and recreation). The EXP subscale contains 4 items: blunted facial affect, blunted vocal affect, gestural expression, and alogia. Similar to the SIPS, the PINS-beta version asks participants to incorporate their observations into the EXP rating along with the interviewer, while MAP items are based solely on self-report. Scores are obtained by summing the MAP items (range 0 to 54), EXP items (range 0 to 32), and all items (range 0 to 86). Lastly, we included an additional item that is not one of the 5 agreed upon negative symptoms included in the NIMH consensus meeting. This item evaluates the distress level of the individual with regard to the presence of MAP symptoms (termed *transitionary distress*), as it is hypothesized that a lack of distress in the face of MAP symptom onset is indicative of risk and a poorer prognosis.

The PINS interview typically takes 15–20 minutes. Seven graduate students conducted all assessments. Initial rater training was held before the study commenced, which consisted of the senior and first author meeting with raters to discuss negative symptoms, the purpose of the scale, and the directions for administering and scoring each items. Informal check-ins with raters were conducted in order to maintain reliability. Raters were unaware of baseline PINS scores in rating the 12-month assessment. At the end of this study, experienced raters participated in a reliability assessment to determine how well the PINS scale performed on inter-rater reliability. The intention behind this timing was to determine how well the scale would perform using raters with expertise. At this stage, formal inter-rater reliability was calculated by having experienced assessors rate six videotaped interviews. The PINS is designed to be self-taught, although consultation with the authors is possible, and there are plans for making gold-standard training videos and ratings available in the future.

2.2.2 Additional clinical and cognitive measures—The Structured Clinical Interview for the Diagnostic and Statistical Manual (First et al., 1995) was administered to evaluate the presence of psychotic and substance use diagnoses. The SIPS (McGlashan et al., 2001) was administered to determine CHR status. Convergent validity was evaluated via the SIPS

negative symptom subscale, the MATRICS Consensus Cognitive Battery (MCCB) (current cognition) (Nuechterlein and Green, 2006), WRAT-4 Reading Subtest (estimated premorbid intelligence) (Wilkinson and Robertson, 2006), The Global Functioning Scale-Social (GFS:S) (Auther et al., 2006), and The Global Functioning Scale-Role (GFS:R) (past month format) (functional outcome) (Niendam TA, 2006). Modest convergence with the PINS was expected to indicate validity (i.e. moderate correlations with some, but not all of the aforementioned measures) and high/numerous correlations would suggest redundancy.

Discriminant validity was assessed via the positive, disorganized, and general symptom subscale of the SIPS and the Beck Depression Inventory (BDI) (Beck et al., 1961). These measures used to evaluate discriminant validity were based on conventions common to the chronic phase of schizophrenia to allow comparison with measures used in the chronic phase (e.g. BNSS, CAINS) (Kirkpatrick et al., 2011b; Kring et al., 2013). We did not expect complete discrimination from these measures, as CHR youth often exhibit co-occurring diagnoses that create a complex clinical presentation (Fusar-Poli et al., 2014). However, we did believe that lower correlations with positive and depressive symptomatology would be indicators of good discriminant validity. Structured Interviews were administered by trained graduate student raters (Kappa > 0.80).

2.3 Statistical analysis

All analyses were conducted using SPSS v.23 (IBM, IBM Corp. Released 2015.). Individual PINS item means, skewness, and kurtosis were examined to determine descriptive qualities of the PINS. Internal consistency was calculated using Cronbach's alpha and item-total correlations. Temporal stability was evaluated via correlations between baseline and the 12-month assessment, although low correlations were expected given the fact that most CHR youth do not develop psychosis (Fusar-Poli et al., 2012). As such, high temporal stability values would suggest that the PINS is insensitive to the overall improvement in negative symptoms that should occur in a CHR sample (Piskulic et al., 2012). Inter-rater reliability (IRR) was assessed by examining the intra-class correlations (ICC) using a two-way random, absolute agreement, average-measures ICC (McGraw and Wong, 1996). Convergent and discriminant validity were evaluated via correlations, along with regression analyses for convergent validity. Other than baseline item-total and inter-rater reliability correlations, all correlational analyses were spearman bivariate analyses (due to non-normality of the PINS data).

3. Results

3.1 Demographics and Descriptive Statistics

The sample was predominantly male and white (Table 1). Roughly 10% were prescribed atypical antipsychotics at baseline and 20% at 12 months. Of the 53 CHR youth assessed at baseline, 5.7% would go on to transition to a formal psychotic disorder at the 12-month assessment.

Nine of the 13 items had skew >1.0 at time 1, and at time 2, 11 items had skew > 1.0. Thus, at both time points, most items were skewed toward the lower severity range. Similarly, the

transitionary distress subscale was generally skewed toward the lower range of possible scores (Table 2), suggesting that, on average, the CHR sample had a normative distress reaction to the presence of MAP symptoms.

3.2 Internal Consistency

At baseline, Cronbach's alpha on the full-scale was 0.90 indicating that PINS items measure a single latent negative symptom construct. Similarly, Cronbach's alpha for MAP (alpha = 0.89) and EXP subscales (alpha = 0.87) was also high.

Item-total correlations indicated that all PINS items were significantly correlated with the PINS total scale score at baseline and 12-months (Table 3). At baseline, all items in the MAP subscale were significantly correlated with the MAP total score and all items in the EXP subscale were significantly correlated with the EXP total score (Table 4).

Alpha if-item-deleted coefficients ranged from 0.89 (PINS item 1: asociality – internal experience) to 0.90 (PINS item 13: alogia), suggesting no benefit from excluding any individual items.

3.3. Inter-rater Reliability

ICCs exceeded 0.80 (Cicchetti, 1994), indicating that the MAP/EXP and PINS total scales were rated similarly across coders.

3.4 Stability of measurement

In examination of baseline PINS data, there was moderate temporal stability of the MAP subscale ($r_s = 0.30$, $p = 0.11$) and PINS total score ($r_s = 0.35$, $p = 0.06$), and high temporal stability of the EXP subscale ($r_s = 0.54$, $p < 0.01$). Of the 13 items, 3 were moderately to highly correlated between the two time points – blunted facial ($r_s = 0.48$, $p < 0.01$), vocal affect ($r_s = 0.66$, $p < 0.01$), and alogia ($r_s = 0.62$, $p < 0.01$). In comparison, the total baseline negative SIPS score was positively associated with the 12-month total SIPS negative score, and 4 out of the 6 SIPS items significantly correlated between time points (social anhedonia, avolition, expression of emotion, and ideational richness) (Table 5).

3.5 Convergent validity

The baseline PINS total score was significantly and highly correlated with the baseline SIPS negative symptom factor, suggesting good convergent validity with an existing negative symptom measure. Good subscale-level convergent validity was indicated by highly significant correlations between MAP subscale scores and the average of the SIPS social anhedonia and avolition items. Similarly, the EXP subscale showed significantly high correlations with the SIPS expression of emotion item (Table 6).

The MAP, EXP, and total PINS subscales also showed significant moderate to high correlations with the GFS:S functional outcome measure, such that higher PINS scores corresponded to poorer social functioning. The MAP and total PINS were moderately associated with the GFS:R measure, but the EXP subscale did not significantly correlate with this measure of role functioning. These results suggest good convergence, but not

redundancy with the other measures (Table 6). In individual regression models, both the PINS and SIPS accounted for a significant proportion of the variance of both the GFS:S (PINS: $R^2 = 0.44$, $B = -0.66$; SIPS: $R^2 = 0.45$, $B = -0.67$) and GFS:R (PINS: $R^2 = 0.11$, $B = -0.33$; SIPS: $R^2 = 0.27$, $B = -0.52$).

Both measures showed correlations with cognition. The PINS and the SIPS showed significant moderate relationships to the working memory subscale from the MCCB. Additionally, the SIPS was moderately associated with the WRAT-4 (Table 6).

3.6 Discriminant validity

PINS MAP and total scores were significantly correlated with the SIPS positive (medium effect), disorganized (strong effect), and general subscales (strong effect). PINS EXP scores were significantly moderately correlated with disorganized and general SIPS scores, but not with the positive SIPS domain. Similarly, the SIPS total negative score was correlated with positive (medium effect), disorganized (large effect), and general SIPS totals (large effect). PINS anhedonia was not significantly correlated with BDI scores. In contrast, the SIPS social anhedonia measure was significantly and moderately correlated with the BDI total (Table 6).

4. Discussion

The current study reports the development and preliminary validation of the PINS-beta, a next-generation negative symptom scale designed for use in CHR populations. Generally, results indicated that the PINS-beta shows good psychometric properties, as evidenced by inter-rater reliability, internal consistency, and convergent validity with existing negative symptom CHR scales and functional outcome measures. Descriptive statistics revealed that the PINS items to be positively skewed, potentially suggesting that the measure may be missing nuanced differences in negative symptoms at the lower end of the scale.

Discriminant validity results were complex. Little is known about the factors driving negative symptom expression in CHR youth, making the assessment of discriminant validity in CHR populations complicated. Our approach was to use measures of discriminant validity commonly implemented in studies focused on the chronic phase of schizophrenia. Results indicated moderate to large correlations between PINS subscales and measures of psychosis, disorganization, and general psychiatric symptoms. Specifically, the correlation between the PINS and SIPS Disorganization scale is large ($r = 0.55$), but it is considerably less than the observed relationship between the PINS and the SIPS Negative scale ($r = 0.86$), which supports discriminant validity of our measure. More complicated is the association between the PINS and General subscale of the SIPS ($r = 0.73$). Given the content of the General subscale including dysphoric mood (i.e. depression and anxiety), evidence for high co-morbid presentation with depression and anxiety in CHR youth (Fusar-Poli et al., 2014), and the overlap between negative symptoms and dysphoric mood (Millan et al., 2014), it is not surprising that the relationship between the PINS and this subscale was large. In our opinion, these correlations do not reflect poor discriminant validity of the PINS, but rather highlight that negative symptoms in the risk period are highly influenced by “secondary factors” such as depression and anxiety that need to be taken into account in future scale development. It

is noteworthy that although the SIPS anhedonia item correlated with depression, the PINS anhedonia measures did not, suggesting that the PINS may have improved ability to distinguish anhedonia related to negative symptoms as opposed to depression.

It is difficult to interpret the correlation(s) between the PINS and SIPS with cognitive measures. The NIMH 2005 Consensus conference concluded that negative symptoms are distinct from cognition, which would support the idea that correlations reflect poor discriminant validity. Alternatively, there is evidence that greater negative symptom severity is moderately associated with poorer cognition ($r = \sim -0.3$) (Harvey et al., 2006), and elevating cognitive demand increases severity of blunted affect and alogia (Cohen et al., 2014). Such associations are less defined in the CHR period, making it unclear whether one would expect a similar pattern in the prodrome. It is also possible that the present study was underpowered to test this relationship. Future research could provide insight into which of these explanations is viable by evaluating longitudinal changes in cognition and negative symptoms, as well as by experimentally manipulating cognitive load and observing its effects on negative symptoms (Cohen et al., 2014).

In regard to temporal stability, the PINS scores decreased over time, representing symptom improvement, which is consistent with research suggesting that the majority of CHR youth do not transition to psychosis (Piskulic et al., 2012). In support of this observation, combined social and role functioning significantly improved within the CHR sample over the course of the 12 months **(t =** 2.28, p = 0.03).Within this context, the PINS exhibited less temporal stability than the SIPS, which suggests that the PINS may capture this improvement in symptoms to a greater extent. It is also possible that the PINS-beta is a less stable measure. For example, it may be that anchor specificity and/or scaling of individual items influenced stability of the measure. Notably, two PINS items did maintained high temporal stability – blunted vocal affect and alogia, and blunted facial affect was moderately stable over the 12-month time frame. As these items are subsumed under a broad expression of emotion item in the SIPS, it may be that the PINS is better able to capture the emergence of specific negative symptoms. Yet another possibility is that blunted affect and alogia may represent expressions of anxiety more so than a true negative symptom, as there is some CHR work suggesting that alogia may directly map onto anxiety as opposed to negative symptoms (Demjaha et al., 2012). Future investigations should determine whether these items represent the initial stages of negative symptom development.

After completing this preliminary study and administering the measure over the course of several years, both our anecdotal opinion and the data from this study suggest that the PINS-beta did not adequately capture the full range or nature of pathology in CHR populations. Specifically, despite generally good psychometric properties, the very high correlation between the SIPS and PINS seen in the current study may be indicative of some redundancy and was motivation to edit the PINS items into a revised version. We also noted the positive skew in the data, suggesting item revision may be needed to capture subtle differences in negative symptoms at the lower end of the spectrum. It is our belief that the PINS-beta MAP items were not comprehensive enough to capture the range of hedonic, social, or goal-directed activities that occur in adolescence. The modified CHR version of the CAINS also

appears subject to these limitations (Gur et al., 2015), suggesting that a novel approach to item selection may be warranted.

4.1 Future Directions

In order to account for these results and create a new measure specifically for CHR youth, we have developed a revised version of the PINS (PINS-2, Supplementary Materials) and plan to conduct a multi-site psychometric study on this version using a large and representative CHR sample. Our approach to the revision was to be overly inclusive, generating a large number of items covering a breadth of constructs of relevance to the prodrome. We have also made additional efforts to enhance the developmental appropriateness of this scale. For example, we interviewed adolescents and young adults to survey them about the types of activities they perform and value, their goals, social interactions, and social media. To ensure our items were successful, we then surveyed an additional group to determine whether these items captured relevant content. We also considered the home environment as potentially being unique in this adolescent/young adults stage. For example, there is a focus on questions related to family involvement in task planning and motivation. We also emphasized the use of texting and social media in this age group, which is not specifically covered in previous scales. As an example, we have differentiated between the effort it takes to phone someone versus texting or posting on social media. Furthermore, we carefully considered the nature of romantic relationships in this age group, the types of efforts youth typically make in pursuit of relationships, and cultural/parental factors influencing whether an adolescent has a relationship. Lastly, wording of items and probes was kept at a developmentally appropriate level. Future iterations of the scale will include consulting with an expert in development to further improve this area of the PINS. Future item retention and revision will be based on an iterative data-driven process. The ongoing development of the PINS will allow for a stand-alone assessment tool for negative symptoms designed for CHR youth that will take into account the most recent advances in understanding symptom domains. The PINS can be used to aid in research focused on enhancing ability to identify psychosis risk and understand developmental trajectories, and could also be used in intervention trials. Although it is not yet validated, we would recommend groups interested in the PINS instrument to employ this newer version.

Certain limitations should be considered when interpreting these preliminary findings. First, the sample size did not permit us to evaluate the hypothesized 2 factor structure (i.e. EXP and MAP subscales). Future studies using factor analysis and item response theory are needed to evaluate the construct validity of the PINS and determine whether individual items and their associated anchors need to be refined or eliminated. We also did not examine test-retest reliability in this sample as we did not expect symptoms to be stable, nor did we re-assess within a 1-month time window, which are the general agreed upon criteria needed to assess this form of reliability (DeVon et al., 2007). While we did examine temporal stability of the scores given the nature of this population and common time frame for reassessing conversion, it will be important in future work to directly examine test-rest reliability of this measure. We also did not have a good measure of negative symptoms with which to assess convergent validity. There exist quality negative symptom assessments for chronic

schizophrenia, and good tools for assessing psychosis risk, but none for negative symptoms in CHR youth with which to compare our measure. Additionally, while the strategy of testing reliability later in the study allowed for an estimate of how well the PINS could perform with expert raters, estimates for initial reliability were not collected. Future stages in developing the scale should routinely assess reliability throughout the course of the study. In regard to our sample, there was an overall tendency of our participants to be male and white, which may limit the generalizability of the present results. Also, our percentage of CHR who transitioned to psychosis was not high enough to evaluate the predictive validity of the PINS in the development of a psychotic disorder. Multi-site studies are needed to achieve this purpose. Finally, very few studies have systematically examined negative symptoms in CHR youth. As such, decisions regarding measures selected for assessing convergent and discriminant validity are complicated and require future research.

In conclusion, this study highlights the PINS as a promising new measure for the assessment of negative symptoms in CHR populations. Preliminary results reported here were used to inform the development of a revised measure (see Supplementary materials), that will undergo an iterative, data-driven process to be further refined into a final version of the PINS.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Sample characteristics.

	Baseline (n=53)	12-months (n=30)
%Male	60.4	60.4
%White	66.0	66.0
Age	18.85(1.65)	19.87(1.57)
Parental Education (years)	15.05(3.29)	15.97(1.92)
%current antipsychotic	9.4	20.0
SIPS: Social Anhedonia	1.62(1.54)	1.57(1.43)
SIPS: Avolition	1.68(1.49)	1.83(1.53)
SIPS: Expression of Emotion	1.40(1.49)	1.37(1.56)
SIPS: Experience of Emotion/Self	1.68(1.59)	1.30(1.58)
SIPS: Ideational Richness	1.00(1.18)	0.83(1.23)
SIPS: Occupational Functioning	1.64(1.64)	1.30(1.66)

Unless otherwise indicated, values are mean (standard deviation).

Table 2

Scale descriptive characteristics.

Baseline (n=53)				
PINS Item	**Mean (SD)**	**Minimum-Maximum Value**	**Skew**	**Kurtosis**
Asociality - friendships	1.57(1.68)	0–5	0.70	−0.77
Asociality - family	1.09(1.44)	0–5	1.22	0.61
Asociality - internal experience	1.11(1.65)	0–5	1.28	0.36
Anhedonia - role	0.94(1.59)	0–5	1.42	0.50
Anhedonia - recreation	0.32(0.92)	0–4	2.90	7.50
Anticipatory anhedonia - social	1.49(1.83)	0–6	0.92	−0.28
Past pleasure anhedonia - social	1.23(1.45)	0–5	0.85	−0.20
Avolition – role	1.34(1.65)	0–5	0.95	−0.44
Avolition - recreation	0.64(1.23)	0–5	2.03	3.51
Total transitionary distress	3.82(3.47)	0–18	1.75	4.73
Blunted affect - facial	1.11(1.44)	0–5	1.05	−0.53
Blunted affect - vocal	0.83(1.19)	0–4	1.20	0.31
Blunted affect - gestural	0.58(1.02)	0–3	1.37	0.25
Alogia	0.85(1.35)	0–4	1.36	0.35
Total MAP severity	9.74(9.90)	0–39	1.17	0.63
Total EXP severity	3.38(4.26)	0–15	1.27	0.62
Total PINS severity	13.11(12.68)	0–47	1.24	0.94
12 months (n=30)				
PINS Item	Mean (SD)	Minimum-Maximum Value	Skew	Kurtosis
Asociality - friendships	1.10(1.40)	0–4	1.03	−0.28
Asociality - family	0.77(1.41)	0–4	1.56	0.89
Asociality - internal experience	0.90(1.42)	0–5	1.57	1.72
Anhedonia - role	1.00(1.51)	0–5	1.29	0.55
Anhedonia - recreation	0.73(1.48)	0–6	2.26	4.95
Anticipatory anhedonia – social	1.13(1.61)	0–5	0.98	−0.50
Past pleasure anhedonia - social	0.97(1.40)	0–4	1.19	0.53
Avolition role	1.13(1.33)	0–4	0.77	−0.64
Avolition - recreation	0.53(1.11)	0–4	2.04	3.18
Total transitionary distress	3.47(3.79)	0–14	1.44	0.83
Blunted affect - facial	0.97(1.63)	0–5	1.34	0.21
Blunted affect - vocal	0.77(1.50)	0–5	1.74	1.69
Blunted affect - gestural	0.43(0.90)	0–3	1.75	1.52
Alogia	0.50(1.17)	0–5	2.79	7.86
Total MAP severity	8.27(9.97)	0–38	1.55	1.99
Total EXP severity	2.67(4.79)	0–15	1.69	1.47
Total PINS severity	10.93(14.10)	0–52	1.67	2.24

Values are item means (standard deviation). Minimum-Maximum values gives the range of data responses. The total possible range for the individual 13 items is 0–6. The total transitionary distress range is 0–18. The total motivation/pleasure (MAP) severity indicates the sum of 9 MAP items (range 0–54), total Expressive (EXP) severity indicates the sum of the 4 EXP items (range 0–32), and the total PINS severity represent the sum of the total MAP and total EXP scores (range 0–86).

Table 3

Scale item-total correlations.

Baseline (n=53)	Item-Total Score Correlation (*r*)	12-months (n=30)	Item-Total Score correlation (*r*)
Asociality - friendships	0.76	Asociality - friendships	0.79
Asociality - family	0.68	Asociality - family	0.70
Asociality - internal experience	0.77	Asociality - internal experience	0.89
Anhedonia - role	0.69	Anhedonia - role	0.79
Anhedonia - recreation	0.60	Anhedonia - recreation	0.77
Anticipatory anhedonia - social	0.77	Anticipatory anhedonia - social	0.84
Past pleasure anhedonia - social	0.69	Past pleasure anhedonia - social	0.86
Avolition - role	0.70	Avolition - role	0.61
Avolition - recreation	0.64	Avolition - recreation	0.64
Blunted affect - facial	0.65	Blunted affect -facial	0.88
Blunted affect - vocal	0.69	Blunted affect - vocal	0.88
Blunted affect - gestural	0.64	Blunted affect - gestural	0.80
Alogia	0.57	Alogia	0.74

Item-total correlations are shown for each of the individual 13 items at baseline and 12-months. All correlations are significant at $p < 0.01$.

Table 4

Baseline MAP and EXP correlations.

MAP Correlations		EXP Correlations	
PINS Item	**Total MAP severity**	**PINS Item**	**Total EXP severity**
Asociality - friendships	0.82	Blunted affect - facial	0.87
Asociality - family	0.69	Blunted affect - vocal	0.91
Asociality - internal experience	0.79	Blunted affect - gestural	0.86
Anhedonia - role	0.73	Alogia	0.78
Anhedonia - recreation	0.60		
Anticipatory anhedonia - social	0.83		
Past pleasure anhedonia - social	0.73		
Avolition - role	0.71		
Avolition - recreation	0.62		

Correlation values (r) are represented showing the relationship between total MAP Severity (Motivation and Pleasure) and each individual MAP item and total EXP (expressive) severity and each individual EXP item (n = 53). All correlations are significant a $p < 0.01$.

Table 5

Stability of Measurement between baseline and 12 month follow-up.

Measure	Correlation between T1 and T2 (r)
PINS	
Total MAP Severity	0.30
Total EXP Severity	0.54**
PINS total	0.35
Asociality- Friends	0.28
Asociality- Family	0.25
Anhedonia- Role	0.01
Anhedonia- Recreation	0.21
Anticipatory Anhedonia	0.14
Consummatory Anhedonia	0.28
Avolition- Social	0.11
Avolition- Role	0.21
Avolition- Recreation	0.18
Blunted Affect- Facial	0.48**
Blunted Affect- Vocal	0.66**
Blunted Affect- Gestural	0.20
Alogia	0.62**
SIPS	
Total Negative Symptom Severity	0.58**
N1- Social Anhedonia	0.67**
N2- Avolition	0.39*
N3- Expression of Emotion	0.61**
N4- Experience of Emotions and the Self	0.31
N5- Ideational Richness	0.48**
N6- Occupational Functioning	0.36
Global Functioning	
Social Functioning Scale	0.67**
Role Functioning Scale	0.56*

Note: T1 (baseline assessment), T2 (12-month assessment)

* $p < 0.05$,

** $p < 0.01$

Table 6

Baseline convergent and discriminant validity.

Convergent Validity				
Measure	**Total MAP**	**Total EXP**	**PINS Total**	**SIPS Negative Total**
Functioning:				
GFS: Social	−0.70**	−0.51**	−0.73**	−0.65**
GFS: Role	−0.40**	−0.25	−0.42**	−0.55**
MCCB Domains:				
Processing Speed	−0.20	−0.25	−0.27	−0.21
Attention/Vigilance	−0.04	−0.04	−0.03	−0.01
Working Memory	−0.29*	−0.25	−0.29*	−0.36*
Verbal Learning	−0.16	−0.15	−0.21	−0.27
Visual Learning	−0.04	−0.05	−0.05	−0.14
Reasoning/Problem Solving	−0.11	−0.07	−0.10	−0.02
Social Cognition	−0.03	−0.18	−0.10	−0.07
Premorbid IQ:				
WRAT-4 Word Reading	−0.13	−0.13	−0.14	−0.30*
SIPS:				
SIPS Negative Total	0.83**	0.60**	0.86**	-
SIPS Average: Anhedonia and Avolition	0.90**	0.44**	0.86**	0.89**
SIPS Expression of Emotion	0.50**	0.70**	0.61**	0.71**

Discriminant Validity						
Measure	Total MAP	Total EXP	PINS Anhedonia Total	PINS Total	SIPS N1	SIPS Negative Total
SIPS Positive Total	0.32*	0.22	-	0.34*	-	0.34*
SIPS Disorganization Total	0.53**	0.29*	-	0.55**	-	0.57**
SIPS General Total	0.74**	0.46**	-	0.73**	-	0.84**
BDI Total	-	-	0.25	-	0.33*	-

Results show bivariate correlations (r_s); – = correlations not conducted; GFS = Global Functioning Scale; MCCB = MATRICS Consensus Cognitive Battery; WRAT = Wide Range Achievement Test; SIPS = Structured Interview for Prodromal Syndromes; BDI = Beck Depression Inventory

* $p < 0.05$,

** $p < 0.01$