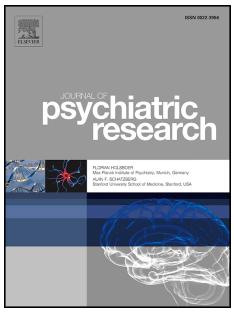
Accepted Manuscript



Metacognitive functioning predicts positive and negative symptoms over 12 months in first episode psychosis

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PII: S0022-3956(14)00091-0

DOI: 10.1016/j.jpsychires.2014.03.018

Reference: PIAT 2339

To appear in: *Journal of Psychiatric Research*

Received Date: 13 December 2013

Revised Date: 12 March 2014

Accepted Date: 19 March 2014

Please cite this article as: McLeod HJ, Gumley AI, MacBeth A, Schwannauer M, Lysaker PH, Metacognitive functioning predicts positive and negative symptoms over 12 months in first episode psychosis, *Journal of Psychiatric Research* (2014), doi: 10.1016/j.jpsychires.2014.03.018.

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ABSTRACT

The negative symptoms of schizophrenia are a major source of impairment and distress but both pharmacological and psychological treatment options provide only modest benefit. Developing more effective psychological treatments for negative symptoms will require a more sophisticated understanding of the psychological processes that are implicated in their development and maintenance. We extended previous work by demonstrating that metacognitive functioning is related to negative symptom expression across the first 12 months of first episode psychosis (FEP). Previous studies in this area have either been cross-sectional or have used much older participants with long-standing symptoms. In this study, forty-five FEP participants were assessed three times over 12 months and provided data on PANSS rated symptoms, premorbid adjustment, metacognitive functioning, and DUP. Step-wise linear regression showed that adding metacognition scores to known predictors of negative symptoms (baseline symptom severity, gender, DUP, and premorbid academic and social adjustment) accounted for 62% of the variance in PANSS negative symptom scores at six months and 38% at 12 months. The same predictors also explained 47% of the variance in positive symptoms at both six and 12 months. However, exploration of the simple correlations between PANSS symptom scores and metacognition suggests a stronger univariate relationship between metacognition and negative symptoms. Overall, the results indicate that problems with mental state processing may be important determinants of negative symptom expression from the very early stages of psychosis. These

results provide further evidence that metacognitive functioning is a potentially relevant target for psychological interventions.

Keywords

Metacognition, negative symptoms, First Episode Psychosis

1. INTRODUCTION

The negative symptoms of schizophrenia are associated with lower quality of life (Ho et al. 1998), reduced psychosocial functioning (Hunter and Barry 2012), objective carer burden (Provencher and Mueser 1997) and poorer recovery (Milev et al. 2005). These symptoms are evident from very early phases of presentation, including in people who are at high risk of developing psychosis (Piskulic et al. 2012) and in those experiencing their first episode (Lyne et al. 2012). Around one fifth of patients with an established diagnosis of schizophrenia will display enduring negative symptoms and improvement with pharmacotherapy is typically incomplete (Murphy et al. 2006; Buchanan 2007; Barnes and Paton 2011; Kendall 2012). This attenuated pharmacological response has contributed to the search for effective adjunctive psychosocial interventions. Although recent trial data provide mixed results, there is preliminary evidence that body-oriented psychological therapy (Röhricht and Priebe, 2006), cognitive-behavioural therapy (CBT; Klingberg et al. 2011; Grant et al. 2012; Staring et al. 2013), cognitive remediation therapy (CRT; Klingberg et al. 2011), social skills training (Elis et al. 2013), and loving kindness meditation training (LKM; Johnson et al. 2011) may all promote some improvements in negative symptoms and general functioning. However, the most appropriate therapeutic target for psychological interventions remains open to debate, highlighting a need for further refinement of the psychological models that can be used to guide effective and efficient treatment.

Current psychological models underpinning CBT-based interventions for negative symptoms emphasise the identification and modification of self-defeating cognitions (e.g. "If you cannot do something well, there is little point in doing it at all"; Rector et al. 2005; Grant and Beck 2009). These discrete thought patterns have been presented as a key factor in determining whether patients overcome other barriers to functioning such as neurocognitive impairment (Grant and Beck 2009; 2010) However, there is evidence that more complex *metacognitive* processes, such as the capacity to reflect on and understand one's own and others' mental states, are also implicated in the emergence and persistence of negative symptoms (Brune 2005; Nicolo et al. 2012). Though the term metacognition originally referred to the ability think about and monitor mental processes during learning tasks (Flavell 1979), contemporary definitions have been broadened to include processes involved in generating complex representations of the mental states of the self and others (Semerari et al. 2003; Lysaker et al. 2013b). As such, metacognition can be viewed as a spectrum of mental activities ranging from discrete acts, such as noticing cognitive errors and biases, identifying specific memories, and reporting beliefs (Koren et al. 2006; Moritz et al. 2010), through to more synthetic actions that entail integrating and combining multiple sources of information into complex ideas about the self and others as unique agents in the world (Dimaggio et al. 2009). Complex synthetic metacognitive acts may be particularly important in facilitating interpersonal social functioning and in spontaneously deriving meaning from personally experienced events. Current experimental evidence suggests that people with schizophrenia marked by prominent negative symptoms are less able than healthy controls to spontaneously derive meaning from significant events from

their past (Berna et al. 2011). Getting a clearer characterisation and understanding of these kinds of processes is highly relevant to explaining the disturbances of sense of self commonly seen in people with schizophrenia (Bennouna-Greene et al. 2012; Mishara et al. 2013).

A small number of studies have examined the link between negative symptoms and metacognitive functioning. These have mostly involved samples of older participants with long standing symptoms (Lysaker et al. 2005; Hamm et al. 2012; Nicolo et al. 2012) although one recent cross sectional study has included patients in their first episode (MacBeth et al. 2014). The examination of negative symptoms across studies has typically involved either the analysis of specific PANSS negative scale item scores or the total negative symptom subscale score. Metacognition has typically been measured with variants of the Metacognition Assessment Scale (MAS; Semerari et al. 2003; Lysaker et al. 2005). This scale indexes metacognition in four domains: the ability to understand ones own mind (self-reflectivity), the ability to understand the mind of others, the ability to adopt a non-egocentric view of the mind of others (decentration), and the ability to use metacognitive information to solve interpersonal problems (mastery).

In the earliest study (Lysaker et al. 2005), the capacities to understand one's own mind and the mind of others, plus the ability to use this information to solve interpersonal problems were correlated with the emotional withdrawal item on the PANSS (*r's* = -.31 to -.43). In a recent replication, these three aspects of metacognition were also found to be associated with blunted affect and disturbances of volition (*r's* = -.30 to -.39; Nicolo et al. 2012). Although Nicolo et

al. only detected correlations between metacognition and negative symptom scores, Lysaker et al. observed correlations between hallucinations and the understanding of one's own mind (*r*=-.26) and suspiciousness and mastery (*r*=-.36). This points to a possible dynamic interaction between metacognition and symptoms over time, possibly in response to interpersonal stressors and other factors that contribute to symptom provocation and exacerbation. Longitudinal studies are needed to clarify these interactions.

Only one study to date has longitudinally examined the dynamic interaction between negative symptoms and metacognition assessed with the MAS. Hamm et al. (2012) assessed a sample of people with a long established schizophrenia spectrum disorder (n=49) at two time points across six months. The total score on the MAS-A was used to index metacognition and negative symptoms were assessed with the total PANSS negative subscale score. Step-wise linear regression indicated that metacognition along with executive functioning (WCST score) were unique predictors of variance in negative symptoms at six-month follow-up. This relationship persisted after controlling for initial levels of negative symptoms. Because these data were obtained from people who have experienced many years of illness it is possible that the effects are a secondary consequence of chronicity. However, preliminary evidence suggests that this is not the case. MacBeth et al. (2014) have reported an association between PANSS negative symptoms and understanding others minds (r=-.44) in a cross-sectional study of an FEP sample (n=34). But the impact of metacognition on the unfolding of negative symptoms over the early course of psychosis is not yet determined.

Longitudinal exploration of the impact of metacognition on negative symptoms over time in a FEP sample will address this gap in the current data.

Any examination of the role of metacognitive factors in the longitudinal prediction of negative symptoms should also consider the number of other variables that have already been linked to negative symptom development. One of the most robust predictors of negative symptoms in early psychosis is premorbid functioning in academic/occupational and social domains (Cannon-Spoor et al. 1982). Poorer premorbid adjustment predicts negative symptoms in people at high risk of psychosis (Corcoran et al. 2010) and in those in their first episode (Macbeth and Gumley 2007; Chang et al. 2013), independent of DUP. Also, a positive family history of psychosis is associated with a more severe negative symptom profile, specifically for male patients with a longer duration of untreated psychosis (DUP; Esterberg et al. 2010; Esterberg and Compton 2012). Furthermore, meta-analytic evidence indicates that DUP longer than nine months is associated with more persistent and severe negative symptoms (Boonstra et al. 2012).

We sought to determine whether metacognitive capacity was associated with severity of negative symptoms assessed at three time points over the first 12 months of early psychosis and whether that association persisted after controlling for established predictors of negative symptoms. Specifically, we hypothesized that metacognitive functioning measured at six months into the first episode of psychosis would predict additional variance in negative symptoms at six and 12 months beyond that explained by baseline symptom

severity, gender, DUP, and premorbid adjustment. This work also included an exploratory component arising from the fact that previous studies have reported different patterns of relationship between metacognition and symptom subtypes. To clarify these relationships, we also conducted exploratory correlational analyses focused on the MAS-A and PANSS subscales.

2. METHODS

2. 1. Subjects

The participants were a subgroup taken from a 12-month prospective study conducted in first episode psychosis (FEP) services in Edinburgh and Glasgow, Scotland, UK. Ethical (REC: 04/S0703/91) and managerial approval for the project were obtained before commencement and the study was conducted in accordance with the Declaration of Helsinki. Included participants were: (a) inpatients or outpatients with (b) first presentation to mental health services for psychosis who (c) met DSM-IV-TR criteria for schizophrenia, schizophreniform disorder, schizoaffective disorder, delusional disorder, bipolar disorder (American Psychiatric Association, 2000). Individuals were not eligible for consent if substance misuse, head injury, or organic disorder were judged to be the primary cause of psychotic symptoms

One hundred and two eligible participants were approached, 21 declined consent at the outset and two withdrew before any baseline data was collected. The full cohort at baseline comprised 79 participants and 45 of these (57%) provided complete data on the critical study measures over 12 months. This subgroup did not differ from the main cohort on the key demographic and

clinical variables. The 45 participants were mostly male (31 versus 14 female) and average age at recruitment was 25.7 years (SD=7.01 years). The majority (71%) had only a high school education, 15.6% completed college, and 9% completed a university degree. Thirty one percent were in full time employment at recruitment and very few people were receiving inpatient care across the study period (3 at baseline, 1 at six months, and 1 at 12 months). The ethnic profile of the sample was consistent with the recruitment settings with the majority describing themselves as White British or White Scottish (93%). The diagnostic pattern was as follows: schizophrenia (48%), bipolar affective disorder (27%), schizoaffective disorder (16%), delusional disorder (2%), and "other" (7%).

2.2 Assessments

2.2.1. Clinical Variables & Psychopathology

Diagnoses meeting DSM-IV-TR criteria (American Psychiatric Association, 2000) were based on semi-structured interviews completed by Research Assistants and diagnostic decisions were reviewed and confirmed by qualified clinicians (AG and MS) at monthly research meetings. Psychiatric symptoms were assessed using the Positive and Negative Syndrome Scale (PANSS; Kay et al. 1987) from which five-factor subscale scores were calculated for positive, negative, disorganized, excitement and emotional distress symptoms (van der Gaag et al. 2006). PANSS assessments were conducted following entry to the service, at six-months, and 12-month follow-up. Inter-rater reliability checks for PANSS ratings were undertaken at 6-monthly intervals for which all *rho's* were above .80. DUP, was estimated using established methods (Beiser et al. 1993; Skeate et al. 2002).

Information about the development of psychotic symptomatology was collected from the individual and (where possible) a carer or loved one. The test-retest reliability of these DUP calculations was good (intraclass coefficient r = 0.96, $p<0.01$).

2.2.2. Premorbid Adjustment

Premorbid adjustment was assessed with the Premorbid Assessment of Functioning (PAS; Cannon-Spoor et al. 1982). This measure collates ratings of functioning in particular domains (e.g. social withdrawal/sociability, scholastic performance, peer relationships, intimate relationships) across the developmental periods of childhood (0 to 11 years), early adolescence (12 to 15 years), late adolescence (16 to 18 years), and adulthood (>19 years). The rating scale for each domain ranges from 0 (normal adjustment) to 6 (severe impairment). We calculated average adjustment scores in the social and academic domains across all of the developmental phases completed prior to the onset of psychosis. Ratings were based on information provided by participants and key informants such as family members.

2.2.3. Metacognitive Functioning

Metacognitive ability was coded using the Metacognitive Assessment Scale – Abbreviated (MAS-A; Lysaker et al. 2005). This coding system was adapted from the original MAS (Semerari et al. 2003) for use with people with schizophrenia. The MAS-A gives four subscale scores. First, the *Self-reflectivity* score indexes the subject's ability to recognize and differentiate one's own mental functions and integrate these into a coherent narrative. Secondly, *Understanding the other's*

mind conveys the ability to think about the mental states of others and distinguish these from one's own thoughts and feelings. The *Decentration* subscale captures the ability to take a non-egocentric view of the mind of others and recognize that others' mental states are influenced by a multitude of experiential, developmental, and contextual factors. The final subscale, *Mastery*, reflects the ability to use metacognitive awareness to identify, confront, and solve real world problems in context. For each scale, higher ratings reflect greater metacognitive capacity.

This multidimensional formulation of metacognition provides a structured approach to assessing the complex processes that underpin emotional, behavioural, and cognitive functioning in people with schizophrenia. The source material for these ratings is a naturalistic speech sample elicited through a semi-structured interview. We used transcripts obtained from the Adult Attachment Interview (AAI; Main et al. 2002), a semi-structured interview with 20 questions and follow-up probes. This provided narratives about interpersonal relationships with attachment figures. The interviews were transcribed verbatim and then coded with the MAS-A by an independent researcher blinded to all other subject details. The AAI was completed at the six-month point of the study.

2.3. Design & Data Analysis

This was a within subjects longitudinal study with data obtained at baseline, six months, and 12 months. The main planned analyses were based on the previous findings of Lysaker et al. (2005) and Nicolo et al. (2012). In the first phase, correlations between specific dimensions of metacognition and six and 12-

month PANSS subscale scores were determined. We then conducted linear regression analyses to determine whether metacognitive abilities predicted additional variance in negative symptom scores beyond that explained by established predictors such as DUP, gender, premorbid functioning, and initial symptom severity. In order to explore the specificity of the relationship of metacognition to negative symptoms, we conducted the same regression analyses using the PANSS positive symptom score as the dependent variable. These models were tested for the positive and negative symptom subscale scores at six and 12 months. Only participants with complete data for all variables were retained in these analyses. Also, because of skewness, DUP was transformed to its natural logarithm. Because the analyses were derived from results reported in previous studies we did not adjust alpha to control for multiple correlations. We used SPSS Version 19 to conduct all analyses.

3. RESULTS

The first set of analyses adopted the approach of previous studies (Lysaker et al. 2005; Nicolo et al. 2012) and correlated the four subscales assessed by the MAS-A with PANSS symptom subscale scores at six and 12 months (see Table 2). No simple correlations were observed between metacognition and positive symptoms at either time point. In contrast, negative symptoms at six months were significantly correlated with decentration and mastery and trends were evident for understanding other minds (r=-.292, p=.054) and self-reflectivity (r=-.272, p=.074). All correlations were in the expected direction. No significant effects were observed at 12 months but the association between negative

symptoms and decentration approached significance (r=-.275, p=.071) as did the relationship between decentration and disorganisation (r=-.293, p=.054).

The other predictors of negative symptoms showed a mixed pattern of correlations. Six and 12-month negative symptom ratings were correlated with PAS premorbid social functioning (r=.340, p=.022 and r=.329, p=.027). Negative symptoms at 12 months were correlated with PAS premorbid academic functioning (r=.299, p=.046) but this relationship was not significant at six months (r=.245, p=.105). DUP was not correlated with negative symptoms at either time. Overall, these results indicate a mixed pattern of relationships between negative symptoms and various predictors and correlates. We examined the combined effects of these relationships in more detail with regression analyses.

Step-wise linear regression was used to examine the association between negative symptom scores, other predictors (gender, DUP and premorbid adjustment), and metacognition. As expected, adding the MAS-A scores to the model predicting negative symptoms at six months increased the proportion of explained variance to nearly 62%, up from 49% and 55% at the first and second steps (see Table 3). This combination of predictors also explained 38% of the variance of negative symptoms at 12 months. The models for positive symptoms at six and 12 months were also significant with the same predictors accounting for approximately 47% of the variance in PANSS positive symptom scores at both time points.

In order to better understand the impact of specific predictors on the PANSS negative symptom subscale scores at six and 12 months, the beta coefficients for each model were scrutinised. At the six-month assessment, none of the beta weights for the MAS-A subscales were significant individual predictors of the overall variance in the PANSS negative symptom subscale score. In contrast, for the model predicting negative symptoms at 12 months, Understanding the Others Mind made a significant contribution to the model (β=.658, t=2.567, p=.015) but none of the other variables stood out as significant unique predictors.

4. DISCUSSION

We sought to replicate and extend previous research that has shown an association between metacognition and negative symptoms (Lysaker et al. 2005; Hamm et al. 2012; Nicolo et al. 2012). We found that 62% of the variance in the severity of negative symptoms assessed at the sixth month of a first episode of psychosis was explained by a model comprising metacognition, DUP, gender, and premorbid adjustment. Although positive symptoms were not a primary focus of this study, it is appropriate to highlight that this pattern was also evident for the prediction of positive symptoms, with 47% of the variance at six months explained by the full model. The same pattern was seen for the 12-month data with variance in both positive and negative symptoms being predicted by metacognition scores. To the best of our knowledge this is the first study to provide longitudinal evidence that metacognitive factors are implicated in the expression of positive and negative symptoms in the early stages of psychosis.

Interestingly, decentration emerged as the aspect of metacognition most strongly correlated with negative symptoms. The association between decentration and negative symptoms has not been investigated in previous studies so this effect represents a new finding that may be worthy of further investigation. The MAS-A decentration subscale indexes the ability to take a non-egocentric perspective on the thoughts, desires, and motives of others and, at more complex levels, reflects the ability to think about others' actions as arising from their own unique developmental history and experiences. One interpretation of this result is that negative symptoms are associated with increased self-focused attention with the accompanying distorted view that others are also focused on the patient. Difficulty perceiving events as unrelated to oneself may prompt the use of withdrawal and concealment strategies such as reducing affective expression, disengaging from others, and down-regulating goal pursuit (i.e. affective blunting, emotional withdrawal, and avolition). This interpretation is consistent with evidence that negative symptoms are associated with high levels of ruminative self-focus (Halari et al. 2009). It also fits with the proposition that negative symptoms arise from broader problems with simulating the mental states of others in a dynamic and "online" fashion (Salvatore et al. 2007). A diminished ability to rapidly select viable hypotheses about the mental states of others commonly provokes the use of withdrawal and avoidance strategies. This view is also consistent with the correlation between negative symptoms and the mastery scale, which indicates that worse negative symptoms were associated with greater difficulty using mental state information to solve interpersonal problems and challenges.

The regression analyses indicate that metacognitive functioning relates to the expression of symptoms both concurrently and prospectively. At six months, MAS-A scores explained additional variance compared to DUP, gender, and premorbid functioning. The same model for negative symptoms at 12 months only achieved significance when metacognition scores were included. These data suggest a persistent effect of metacognition on negative symptom maintenance and recovery. One preliminary conclusion that could be drawn from the pattern of beta coefficients for the models predicting negative symptoms at six and 12 months is that difficulties with representing and understanding the mind of others may be particularly relevant to the persistence of negative symptoms.

The regression analyses also indicate a link between metacognition and positive symptoms but the univariate correlations suggest that this effect may be less direct. When tested in the regression models, it was apparent that MAS-A scores predicted additional variance in the six-month and 12-month PANSS positive symptom scores despite the absence of simple correlations. The general finding that metacognitive processes are associated with positive symptoms is consistent with previous research but a lot of these previous studies have focused on discrete aspects of metacognition such as specific theory of mind tasks (Pickup and Frith 2001; Brune 2005; Bora et al. 2009). One possibility is that negative symptoms are more strongly related to disturbances of complex synthetic metacognitive functioning whereas positive symptoms arise from more specific discrete problems with making inferences about the mental states of others. Further refinement of multifactorial models of positive and negative symptoms should clarify these issues.

Future studies should also address the limitations of the current work. Although the sample size obtained here is larger than that achieved in previous cross-sectional work with FEP participants (MacBeth et al. 2014) and greater than other longitudinal studies using the MAS-A (Hamm et al. 2012), it would be desirable to replicate this result with a larger sample. Also, replication of the effects in a sample drawn from a generic mental health service context will help demonstrate generalizability of the findings beyond specialist FEP service contexts. Other improvements in future studies would include the assessment of metacognition longitudinally in order to better characterise the hypothesised dynamic interaction between symptom levels and metacognitive functioning. Acquiring a better understanding of any such interactions will be important for determining which aspects of metacognition are associated with specific fluctuations in symptom expression over time.

A final point that is left unaddressed by the current study is the degree to which the metacognitive abilities measured on the MAS-A are linked to deficits in broader domains of neurocognitive functioning. For example, problems with memory and executive functioning are well-established correlates of a diagnosis of schizophrenia (Heinrichs and Zakzanis 1998; Aleman et al. 1999) and so there has been some debate whether metacognitive problems such as impaired Theory of Mind can be attributed to deficits in more discrete cognitive domains (see Brune 2005 for review). Data from previous studies suggest that although metacognitive ability is associated with poorer performance in domains such as executive functioning, general intelligence, memory, and social cognition, these

relationships do not explain the associations seen between dimensional measures of metacognition (such as the MAS-A) and specific symptoms (Lysaker et al. 2007; 2008; 2013a). Furthermore, studies with non-psychiatric comparison subjects who are suffering adversity (e.g. HIV-AIDS patients) indicate that the deficits in metacognition are not simply explained by levels of life stress (Lysaker et al. 2012). Other studies using alternative assessment methods such as the Metacognitions Questionnaire (Cartwright-Hatton and Wells 1997) show clear differences between patients and controls, leading to the suggestion that disturbances of metacognitive ability may be a general vulnerability factor for mental health problems (Morrison and Wells 2003). The findings of the current study provide some support for this view. Metacognitive difficulties early in the ontogeny of psychosis may interact with other risk factors such as gender and premorbid adjustment to elevate the risk of arrested or attenuated symptom recovery. Future studies could extend this work by examining how much specific types of neurocognitive impairment add to the prediction of symptom expression and recovery beyond the variance explained in the models presented in the current work.

Overall, our results provide new evidence that greater difficulty with forming and integrating ideas about ones own mind and the mind of others affects negative symptom expression across the early phase of psychosis. This points to the potential benefit of applying metacognitively oriented psychotherapy for schizophrenia (e.g. Lysaker et al. 2010) to foster recovery. This approach may be particularly suitable for patients who have more severe metacognitive processing difficulties that undermine the performance of discrete metacognitive

tasks such as accurately differentiating specific thoughts and emotions. These kinds of more severe metacognitive difficulties may restrict the scope for engaging in standard CBT strategies that rely on promoting the detection and challenging of specific dysfunctional cognitions (e.g. defeatist beliefs; Rector et al. 2005). Also, the observed association between negative symptoms and decentration and mastery scores may also point to the need to explicitly help FEP patients to develop the capacity to understand others in a de-centred way. Examining these issues longitudinally in the context of a case series or treatment trial will provide the opportunity to test whether changes in metacognition occur prior to symptom change. Such temporal decomposition of the proposed mediators of therapeutic effect will be needed in order to demonstrate that metacognitive processes are relevant and viable targets for psychological interventions for psychosis (Kazdin 2007).

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Acknowledgement

The participants are warmly thanked for their contribution.

Table 1
Symptom, Functioning, and Metacognition Scores for Participants Followed-up over 12 months (n=45)

	Mean	SD				
Premorbid functioning						
Social	1.40	1.06				
Academic	2.13	1.35				
DUP (weeks)	46.34	86.18				
Metacognition						
Self-reflectivity	5.35	1.55				
Understanding others minds	4.41	1.11				
Decentration	1.58	.71				
Mastery	4.22	1.21				
	Baseline		6 Months		12 months	
	Mean	SD	Mean	SD	Mean	SD
PANSS Scores						
Positive	24.88	9.15	14.73	6.29	14.53	6.87
Negative	21.35	10.24	16.49	6.62	16.17	9.21
Disorganization	22.55	8.90	15.15	5.96	15.08	7.15
Excitement	17.75	6.78	11.44	3.47	11.37	3.89
Emotional distress	23.51	7.35	15.53	5.11	13.91	6.75

Table 2
Pearson correlations of metacognition scores with PANSS scores at 6 and 12 months (n=45)

	Self-Reflectivity	Understanding others minds	Decentration	Mastery
6 Month PANSS				
Positive	.037	-.055	-.099	-.010
Negative	-.272	-.292	-.422**	-.377*
Disorganisation	-.072	-.102	-.254	-.115
Excitement	-.115	-.283	-.309*	-.178
Emotional Distress	.111	-.132	-.041	-.033
12 Month PANSS				
Positive	-.098	-.044	-.225	-.142
Negative	-.143	-.038	-.275	-.189
Disorganisation	-.141	-.067	-.293	-.174
Excitement	-.028	-.063	-.153	-.139
Emotional Distress	.148	.133	.031	.021

Notes
*p<.05, **p<.005

Table 3
Step-wise Linear Regression Predicting PANSS Positive and Negative Scale Scores at 6 and 12 Months

	Negative Symptoms		Positive Symptoms	
	6 months	12 months	6 months	12 months
	R sq	*R* sq	*R* sq	*R* sq
Predictors				
Step 1. Gender, baseline symptoms	.487***	.124	.301**	.276**
Step 2. DUP, Academic Functioning, Social Functioning	.546***	.231	.417**	.332*
Step 3. Self reflectivity, Understanding others minds, Mastery, Decentration	.616***	.380*	.474**	.466**

Notes
*p<.05, **p<.005 ***p<.0005
DUP = Duration of Untreated Psychosis

Contributors

Gumley and Schwannauer developed the original research plan and study design. Macbeth contributed to the data collection and coding. Lysaker coordinated the MAS-A ratings. McLeod conducted the main statistical analyses and wrote the complete first draft. All authors contributed to and approved the final manuscript.

Role of funding source

This work was supported through the financial support of NHS Research Scotland (NRS), through The Scottish Government, Chief Scientists Office (Grant reference CZH/4/295).

Conflict of Interest

None