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Highlights

- Metacognitive deficits were found in a sample of Chilean patients with schizophrenia
- Metacognitive deficits were greater in schizophrenia than in bipolar disorder
- Metacognitive deficits were correlated with negative symptoms in schizophrenia
- The presence of metacognitive deficits and their associations with outcomes may occur cross culturally

ACCEPTED MANUSCRIPT

Metacognition in schizophrenia disorders: comparisons with community controls and bipolar disorder: replication with a Spanish language Chilean sample

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Abstract

Metacognition refers to the activities which allow for the availability of a sense of oneself and others in the moment. Research mostly in North America with English-speaking samples has suggested that metacognitive deficits are present in schizophrenia and are closely tied to negative symptoms. Thus, replication is needed in other cultures and groups. The present study accordingly sought to replicate these findings in a Spanish speaking sample from Chile. Metacognition and symptoms were assessed among 26 patients with schizophrenia, 26 with bipolar disorder and 36 community members without serious mental illness. ANCOVA controlling for age and education revealed that the schizophrenia group had greater levels of metacognitive deficits than the bipolar disorder and community control groups. Differences in metacognition between the clinical groups persisted after controlling for symptom levels. Spearman correlations revealed a unique pattern of associations of metacognition with negative

and cognitive symptoms. Results largely support previous findings and provide added evidence of the metacognitive deficits present in schizophrenia and linked to outcome cross culturally. Implications for developing metacognitively oriented interventions are discussed.

Key words: schizophrenia, metacognition, social cognition, recovery, negative symptoms

1. Introduction

Recovery from schizophrenia requires that persons make sense of challenges related to their psychiatric condition and accordingly decide how best to move towards wellness (Leonhardt et al., 2017). One potential barrier to recovery, however, is deficits in metacognition (Dimaggio and Lysaker, 2015; Lysaker and Klion, 2007). The term metacognition initially referred to cognitions about other cognition (Flavel, 1979), and a broader integrative model of metacognition has emerged (Lysaker et al., 2018). Specifically, as metacognition has been studied in educational, cognitive, developmental and abnormal psychology (e.g. Semerari et al., 2003; Taricone, 2011), it has been proposed that metacognition refers to the processes which allow persons to have an integrated sense of themselves and others available in the moment. This integrative model proposes that these metacognitive processes comprise a spectrum of activities which, at one end, enable a basic awareness of embodied self-experiences, and at the other, allow their reflective integration into an extended sense of self and others (Lysaker and Dimaggio, 2014; Lysaker et al., 2018). The activities that take place on the different ends of the spectrum influence one another continuously and allow for the availability of a sense of oneself and others in the moment, which in turn allow persons to determine what is uniquely adaptive for them. Theoretically intact metacognitive capacities are essential for dealing with unexpected or

ambiguous situations in more than a stereotyped or rigid way and allow responses which can be thoughtful, strategic, introspective and imaginative.

Deficits in metacognition may be a barrier to recovery when they impede persons from developing a unique sense of what illness and wellness mean to them. This impoverished sense of illness and wellness in turn prevents individuals from determining what steps they could take that would lead to a fulfilling life for them, one in which they have a sense of direct immersion and participation in the world and with others (Lysaker and Klion, 2017). To date, research has found that many individuals in both earlier and later phases of schizophrenia struggle to form complex senses of self and others (Hasson-Ohayon et al., 2015; Lysaker et al., 2014; Masse and Lecomte, 2015; Trauelsen et al., 2016; Vohs et al., 2014). Relatively poorer metacognitive functioning has also been linked to poorer outcomes (Arnon-Ribenfeld, 2017), including lesser abilities to reject stigma (Nabors et al., 2014), seek social support (Kukla et al., 2014), function successfully in a work setting (Lysaker et al., 2010), cohesively link life events (Willits et al., in press), and experience intrinsic motivation (Luther et al., 2016; 2017). Lower levels of metacognition have also been associated with greater difficulties acknowledging psychosocial challenges (Lysaker et al., 2011; Vohs et al., 2016) and greater duration of untreated psychosis (Jansen et al., 2017).

While these insights have led to the development of metacognitive treatment approaches (Hasson-Ohayon et al., 2017a; Leonhardt et al., 2017; Lysaker and Klion, 2017), most of the work on metacognition in schizophrenia has taken place in North America with English-speaking samples. Replication is needed with more diverse samples that include individuals from other cultures, as cultural history and linguistic differences may potentially affect how persons integrate and use information about themselves and others. The current study thus sought to

replicate previous findings in a sample of Spanish speaking schizophrenia patients from Chile. We predicted that they would demonstrate greater levels of metacognitive deficits than individuals with bipolar disorder and community controls without mental illness. Consistent with this, Tas et al. (2014) and Popolo et al. (2017) have found greater metacognitive deficits in schizophrenia patients relative to patients with bipolar disorder in Turkish and Italian samples and Hasson-Ohayon et al. (2015) and Popolo et al. (2017) found greater metacognitive deficits in schizophrenia patients relative to community controls in Israeli and Italian samples. Inchausti and colleagues (2017a; 2017b) have also found the metacognitive capacities of patients with schizophrenia to be more impaired than those of patients with anxiety and substance use disorders in a Spanish speaking sample from Spain.

We also sought to replicate previous findings that metacognitive capacity would be related to higher levels of negative and cognitive symptoms (Hamm, 2012; Lysaker et al., 2005; Trauelsen et al., 2016). Previous research has suggested that cognitive symptoms may contribute to metacognitive deficits (Minor et al., 2014) while metacognitive deficits may be a risk factor for the development of negative symptoms (Lysaker et al., 2015; Mcleod et al., 2014). In particular, it is possible that negative symptoms are in part not truly primary phenomena, but instead are consequences of interpersonal difficulties rooted in metacognitive deficits or failures to form integrated ideas about self and other.

We also assessed self-reported levels of empathy, to rule out the possibility we were not merely assessing this related but not identical phenomenon. Empathy has been identified as a related construct to the current conceptualization of social cognition in schizophrenia (Pinkham et al., 2013), and has been cited elsewhere as a fundamental social cognitive concept (Corbera et al., 2013). Some researchers use terms such as metacognition and empathy interchangeably, but

there is a distinction to be made between experiencing one's self as distinct from the other (metacognition) and sharing another's affective and cognitive states (Hasson-Ohayon et al., 2009).

2. Methods

2.1 Participants

Participants were 88 adults diagnosed with bipolar disorder ($n = 26$), a schizophrenia spectrum disorder ($n = 26$), and a group of healthy control participants ($n = 36$). Both clinical samples were comprised of adults in a non-acute phase of illness who regularly attend treatment and were recruited from a Public Health Hospital in Santiago de Chile. Diagnoses of schizophrenia and bipolar disorder were determined according to ICD-10 by the treating medical staff following a standard diagnostic clinical interview that included personal, clinical and medical history and chart review. Further demographic information is included in Table 1. Exclusion criteria for the clinical samples were the presence of a cognitive impairment such that informed consent could not be attained due to a failure to be able to understand the study purposes and procedures, neurological disorders, drug abuse in the last 3 months, and hospitalizations or medication changes in the last 3 months, all determined by the clinical interview and thorough chart review. The non-clinical sample was recruited through advertisements in local media; participants underwent a structured interview to exclude any major mental disorders, drug or alcohol addiction or neurological condition.

2.2 Instruments

2.2.1 Indiana Psychiatric Illness Interview (IPII; Lysaker et al., 2002). The IPII is a semi-structured interview that asks participants to describe their understanding of their mental

illness and psychological challenges. The protocol for participants with vs. without mental illness differed somewhat from each other. First, all participants are asked to tell the story of their lives. Participants diagnosed with a mental illness were then asked whether they believed they have a mental illness, and about problems related to this, as well as how they felt about having a mental illness. The next set of questions concern how things may have changed since having a mental illness, such as cognitions, emotions, personality characteristics and psychosocial function. Next, participants with mental illness were asked about how they controlled their mental illness and in what ways it controlled their lives. Participants with mental illness were then asked how their condition both affects and is affected by others. Finally, participants are asked what may be the same or different for them in the future. Participants without a mental illness, were asked the same series of questions, however, by contrast, in place of being asked about a mental illness they were asked about an emotionally or psychologically challenging situation in the last several years. This involved asking them about problems related to an emotionally or psychologically challenging situation, as well as how they feel about having experienced this situation. The next set of questions concerned how things may have changed since this situation, such as cognitions, emotions, personality characteristics and psychosocial function. Next, participants without mental illness are asked about how they controlled that situation and in what ways it controlled their lives. Participants without mental illness were then asked how that situation both affects and is affected by others. Finally, participants are asked what may be the same or different for them in the future. Interviews are audiotaped at the time of the interview and are later transcribed. Interviews typically last for 30 to 60 minutes and are conducted by trained research assistants.

2.2.2. *Metacognition Assessment Scale-Abbreviated (MAS-A; Lysaker et al., 2005)*. The MAS-A is a rating scale used to assess the kinds of metacognitive capacities that enable an

integrated sense of self and others to be available to persons within the flow of life. The MAS-A was adapted on the basis of the original instrument, the Metacognitive Assessment Scale (Semerari et al., 2003) for use in studying metacognition in IPII transcripts (Lysaker et al., 2005). The MAS-A retained the original distinctions offered by Semerari et al. (2003) regarding the different domains of metacognition and so contained four scales: Self-reflectivity (S; with scores ranging from 0 to 9), Understanding other's minds (O; with scores ranging from 0 to 7), Decentration (D; with scores ranging from 0 to 3), and Mastery (M; with scores ranging from 0 to 9). Each of these scales is distinguished from each other on the basis of the foci of the metacognitive acts they are concerned with. S pertains to an integrated sense of oneself, O to an integrated sense of specific others, D to an integrated sense of one's place in one community, and M to the ability to use an increasingly complex and integrated sense of self and others to respond to challenges. Unlike the original MAS, the MAS-A is an ordinal scale in which the items of each scale describe a more complex metacognitive act than the one before it. Specifically, each item of each of the four scales (other than lowest item) requires the integration of a new kind of information that was not included in the previous item (e.g. level "4" would require the integration of a specific form of information not found in level "3"). Thus, metacognition is conceptualized and measured as a series of hierarchical steps. Once a given level is assessed as something the participant cannot perform or achieve, then higher levels of integration could also not be meaningfully achieved. For example, a person that cannot integrate the information described in level 3 of the S scale (forming a sense of one's mind as involving distinct mental activities) is judged to be unable to meaningfully integrate information at any of the higher levels of the S scale (e.g. grasping nuanced affects, seeing mental activities as changing, or thinking about all of that within the context of a specific narrative episode). Accordingly, the last level

achieved on the MAS-A would be conceptualized as the person's metacognitive capacity with lower MAS-A scores suggesting a greater degree of fragmentation in sense of self and others available to persons in the moment. Rater training for the MAS-A involves the completion of an established set of 16 transcripts followed by supervision.

Good to excellent levels of interrater reliability have been demonstrated in several studies (e.g., Lysaker et al., 2005, 2007), as has acceptable levels of test-retest stability (Hamm et al., 2012). The MAS-A has also demonstrated good validity across several domains, including associations between higher ratings and greater levels of awareness of illness (Lysaker et al., 2005; Nicolò et al., 2012) as well as better self-appraisal of one's memory (Fridberg et al., 2010). The Spanish version of the IPII along with the MAS-A codebook for scoring metacognition were used with the Chilean sample (Lysaker et al., 2016).

2.2.3. Interpersonal Reactivity Index (IRI; Davis, 1983). The IRI is a self-report measure of both cognitive and emotional empathy. It consists of 28 items; participants rate how well each item describes them using a five-point Likert scale (1 to 5, higher ratings indicate a greater degree of self-reported empathy). The 28 items yield four subscales: Perspective Taking (the tendency to take another's point of view), Empathic Concern (feelings of sympathy and concern for others), Fantasy (the ability to imagine oneself in the role of a fictitious character), and Personal Distress (feelings of anxiety and apprehension in interpersonal settings). It has demonstrated adequate internal consistency and validity in a Chilean sample of college students (Fernández et al., 2012).

2.2.4. Positive and Negative Syndrome Scale (PANSS; Kay, 1987). The PANSS assesses positive and negative symptoms of schizophrenia as well as general symptoms of psychopathology. It is a 30-item scale and items are rated on a scale of 1 (absent) to 7 (severe).

In the present study, the five-factor solution (Bell et al., 1994) was used to examine the degree of symptomatology across five symptom components: Positive, Negative, Cognitive, Excitement/Hostility, and Emotional Discomfort.

2.3. Procedures

All procedures were approved by the local ethics committee at the Psychiatric Institute of Santiago de Chile. Following informed consent and evaluation of inclusion and exclusion criteria, diagnoses were confirmed by senior clinicians, according to non-structured clinical interviews and after staff meetings. The IPII and the PANSS were completed by a trained interviewer with a medical degree who was currently a resident at the Specialization Programme in Adult Psychiatry at a local university. IPII interviews were later transcribed and then rated by trained raters who had received formal training of the MAS-A by one of the authors of the original MAS-A; they were blind to other test scores and did not conduct or transcribe the interview. PANSS ratings were performed blind to MAS-A scores.

2.4 Data Analysis

Analyses were conducted in five steps using SPSS version 24. First, we compared the demographic characteristics of the three groups as well as psychiatric symptoms as measured by the PANSS for the two clinical groups to determine if these needed to be included as covariates. Second, we correlated with MAS-A and IRI scores. Third, we compared groups on the MAS-A and the IRI, controlling for potentially relevant covariates. Fourth, we calculated Spearman correlations to explore whether metacognition and levels of empathy were related to symptomatology in the two clinical groups. Spearman correlations were used given scores were not expected to be normally distributed. Fifth, in cases in which both the IRI and MAS-A scores were associated with symptoms we planned to perform stepwise regression in which the IRI

subscales were forced to enter first, in order to determine whether the link of MAS-A scores with symptoms was independent of the effects of trait empathy.

3. Results

The means and standard deviations of participant demographic characteristics as well as the PANSS scores for the two clinical groups are reported in Table 1. ANOVAs indicated that the control group was significantly younger and also had significantly more education than both of the clinical groups. The majority of the schizophrenia spectrum group identified as male and had the highest percentage of single unmarried people, while the control group had the greatest percentage of employed individuals. The schizophrenia group also had significantly higher levels of symptoms than did the bipolar group on all PANSS subscales (Table 1). Follow-up analyses revealed that differences in symptom severity persisted after accounting for gender differences between the groups.

In the next step the MAS-A and IRI scores were correlated in the schizophrenia, bipolar and community control groups separately and no significant correlations were found. Given their independence we compared both the MAS-A and IRI scores between all three groups controlling for age and education using ANCOVA. As indicated in Table 2, the schizophrenia group had significantly lower MAS-A subscale and total scores than both the bipolar and community control groups. No differences were found for any IRI subscale between groups. Given the schizophrenia group had higher ratings of symptoms, we repeated the ANCOVA comparing the MAS-A scores between the bipolar and schizophrenia group this time controlling for the PANSS total score. In this analysis, groups continued to differ on self-reflectivity, decentration and the total MAS-A score, while differences between groups on mastery and awareness of the other

were reduced to trend level significance. The MAS-A scores of the bipolar and control groups were not significantly different.

Finally, PANSS subscale scores were correlated with the MAS-A and IRI scores for the schizophrenia and bipolar groups. As indicated in Table 3, in the schizophrenia group, cognitive and negative PANSS symptoms were broadly correlated with MAS-A scores, while positive and emotional discomfort scores were more sporadically linked with MAS-A scores. In the bipolar group, excitement scores were broadly correlated with MAS-A scores while cognitive symptoms scores were more sporadically linked with MAS-A scores. For both the schizophrenia and bipolar disorder groups, the IRI Personal Distress subscale was related to the PANSS negative and emotional discomfort factors and the IRI Perspective Taking subscale was related to PANSS negative symptoms. Given that specific IRI and MAS-A subscales were both related to the PANSS negative and emotional discomfort subscales in the schizophrenia group, we finally conducted two stepwise regressions to determine whether the IRI and MAS-A had unique or overlapping relationships to these symptoms. Specifically, the IRI variables were allowed to enter in the first step and the MAS-A variables in the second step. These revealed that after the Personal Distress and Perspective Taking subscales of the IRI accounted for 41% of the variance in negative symptoms, and the MAS-A subscales of awareness of the other, mastery, as well as the total, significantly accounted for another 36% of the variance ($F(3, 22)=10.21; p<0.001$). In the case of emotional discomfort symptoms, the Personal Distress and Perspective Taking subscales accounted for 51% of the variance. The decentration subscale of the MAS-A significantly accounted for another 10% of the variance ($F(3, 25)=4.391, p=0.14$).

4. Discussion

In this study we sought to examine the relative magnitude of metacognitive deficits in patients with schizophrenia, bipolar disorder and community controls without a major mental health condition, in a sample from a culture not previously studied. Consistent with initial predictions, we found that the MAS-A profiles of the schizophrenia patients suggested significantly poorer metacognitive function than the other two groups after controlling for demographic differences (i.e., age and education level). The schizophrenia group was significantly more symptomatic than the bipolar group; when symptom severity was controlled for, the schizophrenia and bipolar group continued to differ on overall metacognition as well as self-reflectivity and decentration, though not awareness of the other or mastery.

Findings thus replicate previous English language studies (Lysaker et al., 2013; Lysaker et al., 2014; 2017) as well as Italian (Nicolò et al., 2012; Popolo et al., 2017), Danish (Trauelsen et al., 2016), German (Bröcker et al., 2017); Chinese (WeiMing et al., 2015a), Turkish (Tas et al., 2014), Spanish (Inchaustiet al., 2017a; 2017b) and Hebrew (Hasson-Ohayon et al., 2015) language studies in a Spanish speaking group in Chile. This study thus adds to the literature that suggests that metacognitive deficits in schizophrenia can be detected cross-culturally. While this is not to say that metacognition is not affected by culture or language, it does suggest that the fundamental difficulties with integrating information into complex ideas about the self and others may be an aspect of schizophrenia in many different parts of the globe.

Concerning the psychosocial significance of differences between the clinical groups, the schizophrenia group was generally aware of their own emotional states, but struggled to perceive how those changed overtime and to see their own thoughts as subjective and fallible. They could perceive others had their own mental states but failed to be able to fully distinguish different emotional states in others; they could also see others had their own purposes in life but struggled

to see that others had their own valid and different perspectives on life events. Finally, they were able to frame a plausible psychological problem they were facing and could seek out support but were unable to take behavioral steps to effectively cope with that problem. Of note, these scores are somewhat higher than those reported in a Spanish sample from Spain (Inchausti et al., 2017a; 2017b). This may reflect a slight cultural difference, though it could also be the result of recruitment differences, as the samples from Spain were in part derived from a clinical trial. It may also reflect the use of a different interview, as the studies in Spain utilized one that was more present focused.

This paper secondarily sought to replicate previous findings linking metacognition with two specific forms of psychopathology: negative and cognitive, or disorganization, symptoms in schizophrenia. Findings largely confirmed these hypotheses. Greater levels of both negative and cognitive symptoms, as well as overall level of symptomatology, were associated with poorer overall metacognition as well as lesser abilities to think about the minds of other people and use metacognitive knowledge to respond to problems. Cognitive symptoms and overall symptomatology were also associated with lesser abilities to self-reflect. Taken as a whole, these findings are consistent with phenomenological observations that many individuals with schizophrenia experience a loss of agency secondary to the loss of their ability to take into account multiple viewpoints, which allows for the self to be perceived as not strictly determined by the past or the will of others (Stanghellini, 2016). It is also consistent with literature suggesting negative symptoms are not primary phenomena, but consequences of interpersonal difficulties rooted in failures to make sense of others' behavior both on perceptive-intuitive and reflective levels (Stanghellini & Ballerini, 2002; 2011a; 2011b).

Of note, our measure of social cognition, emotional reactivity, was also related to negative symptoms though not to metacognition, and the relationship of metacognition to negative symptoms was partially independent of the relationship of emotional reactivity or trait level empathy to negative symptoms. Finding thus replicate previously North American (Lysaker et al., 2013; 2015), and Scottish (McLeod et al., 2014) English language findings as well as Italian (Popolo et al., 2017), Danish (Trauelsen et al., 2016), Chinese (WeiMing et al., 2015b), Turkish (Tas et al., 2014) and Hebrew (Hasson-Ohayon et al., 2015) language studies suggesting metacognitive deficits are related to psychopathology in schizophrenia cross-culturally and can be separated from other social cognitive abilities.

There were unexpected findings. The bipolar group displayed metacognitive abilities similar to the community controls. This contradicts the findings of Popolo et al. (2017) and Tas et al. (2014). This may indicate that metacognitive capacities in this group are more variable or potentially state dependent. For example, during periods of low distress they may be better able to form integrated ideas about the self and others. The bipolar group also showed a unique pattern of significant correlations between excitement symptoms and metacognition, one not found in the schizophrenia group. This may suggest that psychopathology in bipolar disorder has a different kind of relationship to metacognition than what is found in schizophrenia.. Finally, groups did not differ on the IRI. This contradicts previous findings suggesting social cognitive deficits distinguish schizophrenia from bipolar and healthy controls (Bora et al., 2016a; 2016b). As with all unexpected and negative findings, any interpretation of them should be considered as speculative and fodder for future research.

There are limitations. The sample size was modest and clinical samples were drawn from individuals enrolled in treatment who then consented to this study. It is thus not clear how

generalizable results are to other groups including persons who refuse treatment or decline to participate in research. The cross-sectional nature of the study further precludes drawing any conclusions regarding causality and thus the nature of the relationship of metacognition and symptoms cannot be assessed. Additionally, factors not assessed here may contribute to the phenomena observed, including years of and stage of illness. Future research should consider comparing various groups of patients (e.g., early versus chronic illness) to determine if these differences exist. We also utilized only one measure of social cognition, a measure of trait-level empathy. Future research is needed which includes broader samples, longitudinal designs and a fuller battery of assessments.

Our measure of empathy, the IRI, was also a self-report measure. Others have suggested that these types of measures are limited, as they may not be accurate representations of empathic abilities in real-life situations (Derntl et al., 2009). The lack of correlation between the MAS-A and the IRI also suggest that metacognitive or mentalizing deficits in the schizophrenia sample may prevent individuals from accurately reporting on their mental state. Indeed, people with schizophrenia have been found to incorrectly assess their own ability to empathize with others (Lee et al., 2011). Future studies should consider using behavioral or performance-based instruments (e.g., Smith et al., 2013) to further investigate the potential relationship between empathy and the MAS-A.

Concerning the MAS-A scores, as in other studies, raters could not be fully blinded to condition as the content of the IPII and PANSS interviews often clearly contained evidence of the patient's clinical condition. The IPII also asks persons without serious mental illness about situations which may be less prolonged and severe; as such, responses may differ given what information is elicited from persons with and without serious mental illness. Thus, future

research is needed with more attention paid to blinded raters and perhaps more generic stimuli. Finally, our correlational analyses contained multiple correlations among groups with a small sample size. Thus, there was not adequate power to control for the full number of correlations performed and the possibility of spurious findings cannot be ruled out. Future research is needed with far larger samples and more stringent statistical controls.

With future replications in Spanish speaking and other samples, results may have important implications. If metacognitive capacities are a barrier to recovery cross-culturally, integrative interventions that target metacognition, including Metacognitive Reflection and Insight Therapy (MERIT; Lysaker and Klion, 2017), originally designed for English speaking patients, may be valuable on an international basis. Indeed, evidence exists that these kinds of interventions can be accepted by Dutch (de Jong et al., 2016), French (Dubreucq et al., 2016) and Hebrew (Hasson-Ohayon et al., 2017b) speaking patients as well as English speaking patients in Australia (Bargenquast and Schweitzer, 2013) with psychosis.

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Table 1
Comparisons of group demographics and symptom levels.

	1 Schizophrenia Spectrum (<i>n</i> =26)	2 Bipolar Disorder (<i>n</i> =26)	3 Control (<i>n</i> =36)	<i>F</i> ANOVA	Post-Hoc Comparisons	χ^2
Demographics						
Age (M, SD)	40.88 (11.99)	44.12 (13.53)	34.17 (7.37)	6.83**	3<1*,2***	
Gender (male/female)	19/7	8/18	11/25			13.44***
Marital Status (% single)	76.9	34.6	58.3			16.88**
Education (M, SD)	12.32 (1.70)	15.46 (1.07)	15.61 (1.15)	53.09***	1<2,3***	
Job Status (% employed)	26.9	50	94.4			32.84***
				<i>F</i> ANCOVA ¹		
Positive and Negative Syndrome Scale						
Positive	16.35 (4.95)	7.65 (2.38)		45.72***		
Negative	24.50 (4.47)	11.27 (5.48)		75.42***		
Cognitive	22.58 (4.64)	10.08 (4.23)		84.25***		
Excitement	8.62 (2.00)	5.12 (1.77)		37.19***		
Emotional Discomfort	11.12 (2.98)	9.08 (4.34)		3.91 ⁺		
Total	83.15 (11.33)	43.19 (12.78)		113.47***		

⁺*p*=0.054; **p*< 0.05; ***p*<0.01; *** *p*≤0.001; ¹controlling for gender.

Table 2
Comparisons between the groups on the MAS-A and the IRI.

		1	2	3	<i>F</i>	Post-Hoc
		Schizophrenia Spectrum	Bipolar Disorder	Control	ANCOVA ¹	Comparisons
Metacognition Assessment Scale Abbreviated	Self-reflectivity	4.60 (1.83)	8.46 (0.92)	8.85 (0.39)	36.01*** ²	1<2,3***
	Awareness of other	3.69 (1.45)	6.39 (1.01)	6.83 (0.34)	24.86***	1<2,3***
	Decentration	1.44 (0.89)	2.87 (0.39)	3.00 (0.00)	25.21*** ²	1<2,3***
	Mastery	4.62 (1.79)	8.29 (1.12)	8.32 (1.49)	14.77***	1<2,3***
	Total	14.35 (5.25)	26.00 (2.86)	27.00 (1.70)	35.72*** ²	1<2,3***
Interpersonal Reactivity Index	Perspective Taking	22.19 (6.29)	22.96 (5.19)	24.08 (4.02)	0.68	
	Empathic Concern	26.08 (3.95)	26.70 (4.73)	27.32 (4.99)	0.68	
	Personal Distress	19.92 (5.72)	20.19 (5.18)	17.84 (3.91)	1.97	
	Fantasy	19.92 (5.18)	20.15 (5.43)	20.14 (4.86)	0.12	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ¹controlling for age and education; ²group differences for Self, Decentration and Total remain significant at the $p < .05$ level after adding the PANSS Total score as an additional covariate.

Table 3
Spearman correlations of the MAS-A and the IRI with the PANSS in the patient samples.

	Schizophrenia Spectrum Disorder (n=26)						Bipolar Disorder (n=26)					
	PANSS Subscales											
MAS-A	Pos	Neg	Cog	Exc	ED	Total	Pos	Neg	Cog	Exc	ED	Total
Self-reflectivity	-0.35	-0.37	-0.55**	-0.13	0.29	-0.50**	-0.19	-0.20	-0.26	-0.49*	0.21	-0.13
Awareness of the other	-0.36	-0.52**	-0.44*	-0.03	0.26	-0.47*	-0.30	-0.26	-0.31	-0.62**	0.19	-0.18
Decentration	-0.42*	-0.24	-0.22	-0.24	-0.45*	-0.25	-0.18	-0.03	-0.10	-0.25	0.21	0.13
Mastery	-0.31	-0.70**	-0.57**	-0.24	-0.04	-0.68**	-0.13	-0.23	-0.43*	-0.48*	0.18	-0.26
Total	-0.39*	-0.54**	-0.55**	-0.17	0.25	-0.57**	-0.24	-0.20	-0.39*	-0.56**	0.11	-0.23
IRI												
Perspective Taking	0.06	-0.41*	-0.02	-0.07	-0.58**	-0.26	0.02	-0.48*	0.13	-0.06	-0.28	-0.09
Emaphic Concern	0.10	-0.12	-0.06	-0.26	-0.29	-0.09	0.07	-0.15	-0.04	0.09	-0.29	-0.23
Personal Distress	0.03	0.48*	-0.08	-0.08	0.45*	0.31	-0.11	0.40*	-0.15	-0.22	0.51**	0.14
Fantasy	-0.11	0.23	-0.11	0.29	-0.06	-0.02	-0.15	0.06	-0.18	-0.03	-0.07	-0.14

Pos=Positive; Neg=Negative; Cog=Cognitive; Exc=Excitement/Hostility; ED=Emotional Discomfort; * $p < 0.05$; ** $p < 0.01$.