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Aspects of Theory of Mind that attenuate the relationship between persecutory delusions and social functioning in schizophrenia spectrum disorders

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ABSTRACT

Background and objectives: Despite the apparent relevance of persecutory delusions to social relationships, evidence linking these beliefs to social functioning has been inconsistent. In this study, we examined the hypothesis that theory of mind moderates the relationship between persecutory delusions and social functioning.

Methods: 88 adults with schizophrenia or schizoaffective disorder were assessed concurrently for social functioning, severity of persecutory delusions, and two components of theory of mind: mental state decoding and mental state reasoning. Mental state decoding was assessed using the Eyes Test, mental state reasoning using the Hinting Task, and social functioning assessed with the Social Functioning Scale. Moderation effects were evaluated using linear models and the Johnson-Neyman procedure.

Results: Mental state reasoning was found to moderate the relationship between persecutory delusions and social functioning, controlling for overall psychopathology. For participants with reasoning scores in the bottom 78th percentile, persecutory delusions showed a significant negative relationship with social functioning. However, for those participants with mental state reasoning scores in the top 22nd percentile, more severe persecutory delusions were not significantly associated with worse social functioning. Mental state decoding was not a statistically significant moderator.

Limitations: Generalizability is limited as participants were generally men in later phases of illness.

Conclusions: Mental state reasoning abilities may buffer the impact of persecutory delusions on social functioning, possibly by helping individuals avoid applying global beliefs of persecution to specific individuals or by allowing for the correction of paranoid inferences.

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1. Introduction

Persecutory delusions in schizophrenia spectrum disorders have attracted interest in recent years as research has produced increasingly promising psychological models of the multiple factors which cause the formation and persistence of these unusual and distressing beliefs (Freeman & Garety, 2014; Salvatore et al., 2012). One puzzling finding across multiple studies is that persecutory delusions appear loosely linked with social function outcomes. While persecutory delusions should *prima facie* be a disadvantage

to the formation of working relationships with others and the management of change within the flow of life, only a few studies have found that persecutory delusions were correlated with poorer psychosocial outcomes (e.g., Dickson, Barsky, Kinderman, King, & Taylor, 2016; Mehl et al., 2010; Schaub et al., 2011). In fact, the majority of studies have found no significant link between persecutory or other delusions and functional outcomes (Kurtz, 2006; Tone & Davis, 2012; Ventura, Helleman, Thames, Koellner, & Nuechterlein, 2009), in contrast with negative and disorganization symptoms which show a robust link to how well persons can form and sustain relationships (Kurtz, 2006). Furthermore, reductions in delusions following interventions such as cognitive-behavioral therapy often are not accompanied by improvements in social functioning (Addington et al., 2011; Drury, Birchwood,

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Cochrane, & Macmillan, 1996; Lecomte et al., 2008).

One possible explanation for this paradox is that persecutory delusions do influence social function, but only under certain conditions. In other words, it may be that persecutory delusions only affect social functioning when there are other deficits present. Or, stated conversely, there may be certain abilities which if preserved have a protective effect which limits the impact of paranoia on function.

One such variable that might moderate the effects of paranoia on function is Theory of Mind (ToM). ToM is a facet of social cognition which refers to a group of related processes by which persons form ideas about the thoughts and feelings of others in order to explain or predict behavior (Premack & Woodruff, 1978). ToM seems promising as a moderator because it has been broadly observed in schizophrenia spectrum disorders (Bora, Eryavuz, Kayahan, Sungu, & Veznedaroglu, 2006; Bora, Yucel, & Pantelis, 2009; Henry, Bailey, & Rendell, 2008) and on its own has been linked social dysfunction (Brüne, 2005; Couture, Granholm, & Fish, 2011; Horan et al., 2012; Kalin et al., 2015; McGlade et al., 2008; Pinkham, Penn, Green, & Harvey, 2015).

Further, there would seem to be negative synergy between ToM deficits and persecutory beliefs such that persecutory beliefs might deeply impact social functioning when individuals lack the ability to come up with any kinds of ideas about the intentions and mental states of others which might at least partially titrate persecutory ideation. In contrast, individuals with persecutory ideation who are better able to assess others' intentions may be able to make a distinction between global beliefs of threat on the one hand and the actions of a particular individual on the other and so sustain relationships. Given recent pushes to develop treatment programs that specifically target different aspects of social cognition among people with psychotic disorders (e.g., MERIT, Lysaker and Buck et al., 2014, Lysaker and Olesek et al., 2014; SCIT, Roberts, Penn, & Combs, 2015; SCST, Horan et al., 2011), it is essential to develop a better understanding for how specific elements of social cognition interact with psychoses to affect patients' lives.

To investigate this issue we examined whether two domains of ToM—mental state decoding and mental state reasoning—moderated the impact of the relationships between ratings of suspiciousness and global social functioning. Mental state decoding refers to the ability to infer the feelings and emotions of others on the basis of multichannel information (Pell, Jaywant, Monetta, & Kotz, 2011), whereas mental state reasoning is the ability to make inferences about others' intentions and motives (Lysaker and Buck et al., 2014, Lysaker and Olesek et al., 2014). These constructs are theoretically distinct in that the former involves noticing something about what another person is experiencing (e.g., related thoughts and feelings) while the latter involves forming ideas about intentions and goals. Research suggests that although these processes are often correlated they have differing impacts on social functioning in psychotic disorders (Bora et al., 2006; Brown, Tas, Can, Esen-Danaci, & Brüne, 2014; McGlade et al., 2008; Wittorf et al., 2013) and could titrate the effects of persecutory ideation in different ways. For example, mental state decoding might allow some persons with ideas of persecution to recognize positive emotions in others whereas mental state reasoning might allow individuals to infer a multitude of different motives allowing for others to be seen as more complex beings who even if involved in some malicious acts may not have negative intentions towards them.

We predicted that mental state decoding and reasoning abilities would each moderate the effect of delusions severity on social functioning, such that a relationship between persecutory delusions and poor social functioning would only be observed among individuals with relatively low levels of either ToM ability. In order

to rule out the possibility that results were accounted for by general psychopathology rather than the influence of severity of persecutory delusions in particular, we controlled for overall psychopathology for each analysis.

2. Materials and methods

2.1. Participants

Participants were 76 men and 12 women diagnosed with schizophrenia (51) or schizoaffective disorder (37) as confirmed by the Structured Clinical Interview for DSM-IV (SCID), recruited from either a local VA Medical Center or Community Mental Health Center. All participants were receiving treatment which included taking antipsychotic medication. Participants were in a non-acute phase of illness, defined by no changes in medication, hospitalization, or housing within the last 30 days. Exclusion criteria were active substance dependence or a chart diagnosis of mental retardation. Participant characteristics are presented in Table 1.

2.2. Instruments

2.2.1. The hinting test

The Hinting Test (Corcoran, Mercer, & Frith, 1995) is a paper-and-pencil test that presents participants with a brief story and then instructs the participant to make a judgment about the intentions of one of the fictional characters on the basis of "hints" embedded within the story. We used an American English version of this test produced by Greig, Bryson, and Bell (2004). There are 10 items, with a score of 2 awarded if the intention is guessed correctly on the first try and a score of 1 given if a correct guess is made after an explicit hint. A previous paper demonstrated good test-retest reliability on this measure for a subset ($n = 36$) of the patients tested in this study (Lysaker et al., 2011). Additionally, a large ongoing study of psychometric properties of social cognition also suggest good reliability when used with patients (Pinkham et al., 2015).

2.2.2. Reading the mind in the eyes test

The Eyes Test (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) presents participants with 36 photographs of one set of eyes surrounded by four words which could be used to describe the feeling/thought expressed by the eyes. This measure was designed and tested on persons who did not have psychosis, but has been used successfully in studies involving participants with schizophrenia (McGlade et al., 2008; Shur, Shamay-Tsoory, & Levkovitz, 2008). As with the Hinting task, a previous paper demonstrated

Table 1
Participant characteristics.

	N	%
Gender		
Male	76	86.4%
Female	12	13.6%
Race		
African American	46	52.3%
Caucasian	41	46.6%
Latino	1	1.1%
Diagnosis		
Schizophrenia	51	57.5%
Schizoaffective	37	42.5%
Treatment setting		
VA medical center	72	81.8%
Community mental health clinic	16	18.2%
Age	Mean (SD)	Min-max
	49.58 (8.4)	22–66

good test-retest reliability for a subset ($n = 36$) of the patients tested for this study (Lysaker et al., 2011). A larger on-going study of psychometric properties of social cognition also suggest good reliability when used with patients (Pinkham et al., 2015).

2.2.3. Positive and negative syndrome scale (PANSS)

The PANSS (Kay, Fiszbein, & Opler, 1987) is a 30-item rating scale completed by clinically trained research staff at the conclusion of chart review and a semi-structured interview. Because we intended to explore the relationship between persecutory delusions and social functioning, we were interested in the Suspiciousness/persecution item of the PANSS-Positive syndrome scale. Scores for this item are decided on the basis of anchors ranging from (1) an absence of any indication of unusual suspiciousness of other people to (7) a network of systematized persecutory delusions that dominate the patient's thinking, social relations and behavior. To rule out the possible confounding effect of overall psychopathology, we used PANSS-Total score as a covariate. For the purposes of the present study, the PANSS-Suspiciousness/persecution item was removed from the PANSS-Total score in order isolate the effect of delusions severity (as measured by PANSS-Suspiciousness/persecution) on social functioning, thus yielding a PANSS-Total score with a possible range of 23–203.

2.2.4. The Social Functioning Scale (SFS)

The Social Functioning Scale (Birchwood, Smith, Cochrane, Wetton, & Copestake, 1990) is a multidimensional measure of social functioning designed for use with people who have schizophrenia. The scale has been shown to have strong reliability and validity in studies using both clinical and non-clinical populations (Burns & Patrick, 2007). The SFS is composed of the following seven subscales: Interpersonal behavior (e.g., number of friends, quality of communication), Social engagement/withdrawal (e.g., time spent alone, initiation of conversation), Pro-social activities (e.g., sports, concerts, visiting relatives), Recreation (common hobbies such as bicycling, cooking, shopping), Independence-competence (ability to perform skills necessary for independent living), Independence-performance (performance of skills necessary for independent living), and Employment/occupation (engagement in employment or other structured program of daily activity). The subscales may be added together to yield a total score, which is used as the outcome measure for the present study. Cronbach's alpha for the seven subscales in the present study was in the acceptable range (0.733).

2.3. Procedures

Following written informed consent, the SCID was administered by a clinical psychologist to determine diagnosis. All participants next completed the Hinting and Eyes tasks as well as the Social Functioning Scale. PANSS interviews were conducted separately by interviewers who were research assistants with at least a Bachelor's degree in a psychological field. These ratings were made blind to performance on all testing.

2.4. Data analysis

There were two stages of analysis. First, we performed preliminary analyses to determine whether the following demographic factors needed to be included as covariates: age, level of education, race (Caucasian versus African American), gender, and diagnostic category (Schizophrenia versus Schizoaffective). Second, we performed a series of mean-centered regression analyses to determine whether Hinting Task scores interacted with PANSS-Suspiciousness/persecution to impact scores on the SFS. Total

score on the Hinting Task, PANSS-Suspiciousness/persecution, and the interaction between these two variables were entered as independent variables, with social functioning score as outcome variable and PANSS-Total score entered as a covariate to account for the possible confounding effects of overall severity of psychopathology (Hayes, 2013). We planned to analyze significant moderating relationships between theory of mind and PANSS-Suspiciousness/persecution on SFS-Total scores using the Johnson-Neyman technique, a follow-up method for regressions containing interaction coefficients that enables the researcher to identify over what range of the moderator a predictor has significant versus non-significant effects on the outcome measure (Bauer & Curran, 2005). To determine whether scores on the Eyes Task moderated the relationship between PANSS-Suspiciousness/persecution and SFS-Total score, the previous regression was then repeated with Eyes Task scores used in place of scores on the Hinting Task.

3. Results

Total score on the SFS was not significantly related to age, $r(86) = -0.11$, $p = 0.306$, level of education, $r(86) = 0.147$, $p = 0.171$, race, $t(85) = -0.067$, $p = 0.947$, gender, $t(86) = 0.818$, $p = 0.416$, or diagnosis, $t(86) = 0.491$, $p = 0.625$. Therefore, these demographic variables were not entered as covariates in later analyses. Descriptive statistics for the variables of interest can be found in Table 2.

To test the hypothesis that theory of mind moderates the relationship between severity of persecutory delusions and social functioning, a mean-centered regression was carried out with the PANSS-Suspiciousness/persecution as the independent variable, SFS-Total score as dependent variable, and scores on the Hinting Task as a moderator (see Table 3, regression 1).

PANSS-Total score (minus Suspiciousness/persecution) was included as a covariate. The overall model was a statistically significant fit. Scores on the Suspiciousness/persecution item showed a strong negative relationship SFS-Total, whereas scores on the Hinting Task were not independently predictive of total score on the SFS. There was a significant interaction between Suspiciousness/persecution and scores on the Hinting Task, suggesting the presence of a moderating effect. The Johnson-Neyman technique revealed that Suspiciousness/persecution was predictive of decreased SFS-Total score for approximately 78% of study participants ($p < 0.05$). However, for those participants with higher scores on the Hinting Task (top 22nd percentile), Suspiciousness/persecution was not predictive of SFS-Total. This regression was repeated with the Eyes Task as the moderating variable (see Table 3, regression 2). Again the overall model was a significant fit, with Suspiciousness/persecution independently predictive of decreased SFS-Total. However, scores on the Eyes Task did not show a statistically significant independent relationship with SFS-Total and there was no significant interaction effect, suggesting that scores on the Eyes Task was not independently predictive of SFS-Total nor moderated the impact of Suspiciousness/persecution on SFS-Total.

Table 2
Descriptive statistics of study variables ($n = 88$).

Measures	Mean	SD	Range
PANSS- suspiciousness/persecution	3.89	1.13	1–6
Hinting total	12.99	4.29	1–20
Eyes total	21.13	5.51	7–31
SFS total	753.3	64.4	622–888.5
PANSS total (minus persecution)	72.08	13.16	42–103

Table 3
Summary of regression analyses for variables predicting social functioning.

Variable	B	t	p	F	df	p	R2
Regression 1							
Overall model**				19.13	4, 84	<0.0001	0.404
PANSS-suspiciousness/persecution**	−20.83	−3.94	<0.0002				
Hinting total	−0.299	−0.917	0.844				
Interaction*	2.43	2.33	0.02				
PANSS-total (covariate)**	−1.46	−2.86	0.005				
Regression 2							
Overall model**				20.03	4, 84	<0.0001	0.374
PANSS-suspiciousness/persecution**	−22.97	−3.81	0.0003				
Eyes total	−0.005	−0.006	0.995				
Interaction	−0.03	−0.04	0.969				
PANSS-total (covariate)**	−1.52	−2.987	<0.004				

*Significant at $p < 0.05$.

**Significant at $p < 0.01$.

4. Discussion

This study sought to examine whether two forms of ToM moderated the effect of persecutory delusions on social functioning. Consistent with predictions, mental state reasoning—an aspect of theory of mind pertaining to the ability to detect or infer others' knowledge or desires (Lysaker and Buck et al., 2014, Lysaker and Olesek et al., 2014)—attenuated the effect of persecutory delusions on social functioning. For participants with poor mental state reasoning abilities, more severe delusions of persecution were associated with significant deficits in social functioning. However, for participants with relatively strong mental state reasoning abilities, persecutory delusions did not negatively impact social functioning.

While the cross-sectional nature of this study precludes drawing conclusions about causality, these findings suggest the possibility that relatively greater abilities for mental state reasoning serve to buffer the impact of persecutory delusions on social functioning. It is possible that mental state reasoning helps people with beliefs about being persecuted to refrain from applying this general distrust to unique individuals who they interact with on a daily basis. For example, it is possible that the conviction that one is a target of systematic persecution may not affect functioning during individual interactions when persons are able to think about the motives of unique individuals and deduce that these people have non-malicious motives. For individuals able to reflect and reason about the intentions of others' mental states, it is conceivable that strongly held beliefs of general persecution might not be applied to certain individuals (e.g., friends, waiters, therapists, coworkers, etc.), allowing for relatively functional interpersonal relationships. Further research should investigate this hypothesis in order to rule out possible alternative explanations, such as that other variables not measured here account for the observed effects, or that causality is reversed and an impoverished social life leads to worse theory of mind and persecutory delusions rather than vice versa. Longitudinal and experimental studies may be able to better disambiguate these processes.

Contrary to initial hypotheses, mental state decoding did not moderate the effects of persecutory delusions on social functioning, as more severe persecutory delusions were associated with worse social functioning regardless of mental decoding abilities. Our findings, therefore, provide no evidence that mental state decoding plays a similarly protective role against the relationship between delusions severity and social functioning. It is possible that accurate emotional decoding does not resolve enough ambiguity to be very useful in the context of persecutory delusions. Even if one is able to correctly infer emotional states, poor reasoning could lead to any

number of interpretations about those emotional states. For example, is my friend happy because they are glad to see me, or because they are about to witness my downfall? Does my cousin look guilty because he did not call me earlier in the day despite promises, or because he has been speaking to friends about me behind my back? Overall, results are consistent with the suggestion that cognitive and affective empathy may differentially affect social functioning (i.e., the parallel process model; Ofir-Eyal, Hasson-Ohayon, & Kravetz, 2014). As with all non-significant findings, however, no firm conclusions should be drawn and these speculations should be taken only as fodder for future research.

There were several limitations to the present study that limit its generalizability. The majority of the sample was male, all were in treatment, and most were in a later phase of illness. Results may not generalize well to women, persons not in treatment, and others in early phases of illness. Given the cross sectional nature of this study, it is not possible to determine causality between the examined variables. Future studies should include a longitudinal element or experimentally manipulate variables in order to better elucidate the direction of influence these constructs have upon each other. Additionally, the present study used a broad measure of social functioning and our assessments of ToM were relatively simple and narrow tasks. Authors have noted that ToM measures such as these are limited in that they are laboratory-based and may not correspond to behavior in natural settings (Dimaggio, Popolo, Salvatore, & Lysaker, 2013). Finally, as we assessed paranoia using the Suspiciousness/Persecution item of the PANSS in which mid-range ratings reflect suspiciousness in the absence of formal delusions, future work is needed to more carefully examine whether it is the presence of a delusion per se or the intensity of suspiciousness which is at issue.

With replication, there may be clinical implications. Overall, our findings suggest that patients who are better able to reason about the intentions of other people are not as negatively impacted by the presence of persecutory delusions, suggesting that treatments aimed at strengthening this aspect of social cognition may be fruitful for people with these kinds of beliefs. Patients who can develop more comprehensive and integrated understandings of other people may be able to maintain better social relationships even in the presence of persecutory delusions. One promising set of treatments that target this process may be metacognitively oriented psychotherapies such as Metacognitive Reflection and Insight Therapy (MERIT) (Lysaker and Buck et al., 2014, Lysaker and Olesek et al., 2014). This treatment model is in the early stages of development but has shown some promising results in case reports and open trials (Buck & Lysaker, 2009; Hamm & Leonhardt, 2016; Hillis et al., 2015; Lysaker and Buck et al., 2014, Lysaker and

Olessek et al., 2014; de Jong, van Donkersgoed, Pijnenborg, & Lysaker, 2016). Metacognitively oriented psychotherapies do not focus on identifying and correcting delusions, but rather seek to strengthen the person's ability to reflect upon the thoughts and feelings of themselves and others, and integrate these discrete elements into a more complex representation of their personal and social worlds. Skills-based metacognitive training aimed at increasing one's awareness of cognitive biases may also be helpful (Hillis et al., 2015; de Jong et al., 2016).

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