THEORY OF MIND AND PERCEPTION OF EMOTION AS PREDICTIVE FACTORS OF SOCIAL FUNCTIONING IN PSYCHOSIS

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THEORY OF MIND AND PERCEPTION OF EMOTION AS PREDICTIVE FACTORS OF SOCIAL FUNCTIONING IN PSYCHOSIS

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Abstract

The relationship of social cognition with social functioning in schizophrenia has been well documented. Specifically, theory of mind and emotion perception impairments, that are common in people with schizophrenia, have been found to be good predictors of poor social functioning, which is one of the major disturbances of schizophrenia.

The aim of the present study is to investigate the relationship between those two types of social cognition and social functioning. We hypothesized that both ToM and PoE would be positively associated with social functioning and that those two types of social cognition would be independent predictors of social functioning for people with a diagnosis schizophrenia.

The Hinting Task and the Eyes Test were used as measures of social cognition. The Face Emotion Recognition Task was used to measure emotion perception. The SOFAS and RFS were used to measure social functioning. 43 rehabilitation patients with schizophrenia completed these measures of social cognition and social functioning and their symptomatology and social anxiety were also assessed. Their demographic characteristics were collected.

Both types of social cognition were significantly related with social functioning when Pearson’s correlation was used. Multiple regression analyses showed that ToM and emotion perception were not independent predictors of social functioning. Multiple regression analysis indicated that the variables that better predicted social functioning were negative symptoms and ToM as measured by the Hinting Task.
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Theory of Mind and Perception of Emotion as Predictive Factors of Social Functioning in Psychosis

Introduction

Schizophrenia

Schizophrenia is a chronic, severe and disabling mental disorder that has a significant cost to the individual, their immediate environment (family, other caregivers and close friends) and to society (Knapp et al., 2004). Some of the primary goals of psychological health professionals are to control individual’s symptoms and improve their social/occupational functioning in order for them to be re-integrated in the society. This re-integration includes, among others, a healthy relationship with their families, making and maintaining friendships and also a job (Goodman et al., 1993), preferably paid (Burns et al., 2007).

Costs of schizophrenia

Cost-of-illness studies classify the costs of an illness in 3 subcategories. The intangible costs are the ones relevant to the pain and distress caused by each illness. The indirect costs refer mainly to reduced productivity. In schizophrenia this may be caused because of premature death (and consequently the loss of estimated future earnings), unemployment and the time off caregivers take because of the illness (Knapp et al., 2004; Knapp et al., 2012). The direct costs are assessed as the cost of services used and include expenses of hospital care (the largest proportion), drugs, nursing home care etc. A study by Guest and Cookson, (1999), reported that in 1997 the UK annual total costs per patient were estimated to be £23,600 and the value of lost labor that year in UK was £82.4 million, but Knapp et al. (2012) estimated
this closer to £36,000 per person in public sector costs and £60,000 in total. This thesis will address the question of what causes this disability.

The nature of schizophrenia

Schizophrenia is characterized by a cluster of behaviors that significantly impact on the lives of its sufferers and their families. A combination of distinctive signs and symptoms characterize the disorder. These symptoms include delusions, hallucinations, disorganized speech, grossly disorganized or catatonic behavior and negative symptoms. According to DSM-IV (4th ed., text rev.; DSM-IV–TR; American Psychiatric Association, 2000) definitions (though now superseded by a subsequent edition), two or more of the symptoms must be present for a one month period. Alternatively, it can be either one or more bizarre delusions or one or more hallucinations consisting of “a voice keeping up a running commentary on the person’s behavior or thoughts, or two or more voices conversing with each other”. The disorder should have been present for at least 6 months with one month of active phase symptoms, as described above, and potentially including phases of prodromal or residual symptoms. These phases are characterized either by negative symptoms alone or by two or more of the symptoms described above but expressed in a lessened degree (4th ed., text rev.; DSM-IV–TR; American Psychiatric Association, 2000).

Incidence and prevalence

The among-adults prevalence of schizophrenia, has been found to be between 0.4-0.5% in the UK (McManus et al., 2007) while its incidence is about 1 to 2 onsets per 10,000 people in one year (Jablensky, 2003).

The onset of the disorder normally occurs between the late adolescence years and the mid-thirties and it seems to be more common in males than females (4th ed., text rev.; DSM-IV–TR; American Psychiatric Association,
Social and occupational functioning

Social functioning has been defined as the ability of an individual to perform adequately in different societal roles such as homemaker, wage earner, student, spouse, family member or friend. A secondary component of the definition is the individuals' satisfaction with their capacity to meet the above roles, and the presence and extent of their recreational activities (Priebe 2007). Although prominent symptoms of schizophrenia like delusions, mainly characterize the disorder, deficits in social functioning are a crucial feature. Social/occupational functioning in schizophrenia has consistently been found to be significantly impaired (Addington et al., 2003; Bellack et al., 1990; Couture et al., 2006) and does not tend to respond well to antipsychotic medication (Addington et al., 2000) especially in older patients (Bae et al., 2010). Along with its symptoms, it is one of the major disturbances of schizophrenia making it very challenging for people with the disorder to live and function in the community (Bellack, 1990).

Assessment of social functioning

A large number of scales have been developed to assess social functioning (Priebe, 2007). Commonly used scales include the Role Functioning Scale (Goodman et al., 1993), the Global Assessment Scale (Endicott et al., 1976) and the SOFAS (Spitzer, 2000). Such scales measure functioning on several areas of everyday living, mainly productivity (working/education), personal self-care and independent living (like maintaining a household and personal
hygiene), familiar/intimate relationships and self-esteem. A person with a good level of functioning is considered to be able to work and maintain employment/adapt to educational settings, have positive interactions in their family environment and in community, adequately maintain a household, etc. (Goodman et al., 1993).

Although impaired social functioning has repeatedly been found to be an important characteristic of schizophrenia, the assessment of it is still an area of debate and doubt (Figueira & Brissos, 2011). There are major differences between the scales of measurement and some of them measure different aspects of social functioning. For example, while the RFS looks at the areas of work, independent living and self-care, and immediate and extended social network relationships, the Interview Schedule for Social Interaction or ISSI (Henderson, et al., 1980) actually measures availability and adequacy of close relationships and friendships.

A wide range of different instruments that assess social functioning is available. The two social functioning measures with the highest ratings by the experts are the Social Functioning Scale developed by Birchwood et al. (1990) and the Social Behavior Schedule or SBS by Wykes et al. (1986) (Burns & Patrick, 2007). The SBS takes 15 min to be rated by a trained interviewer, and measures social functioning in 21 areas during the last one month. The SFS is actually a questionnaire completed by the patient or a relative, and it has 79 items. Both may well be too lengthy for routine clinical use, a common issue with social functioning measures (Burns & Patric, 2007). Also, the fact that the SFS is a self-completed questionnaire might be a drawback when administered to individuals with schizophrenia because of their symptomatology; for example currently experiencing hallucinations might lower their attention. Low motivation and apathy or tension and anxiety may make it difficult for them to concentrate.
A lot of social functioning scales are too lengthy. This is a disadvantage when used for individuals with schizophrenia for reasons described above. Such scales may require 30 minutes or more to be completed. Some examples are: the Community Adjustment Form or CAF (Stein & Test, 1980) that requires 45 minutes to be completed and covers 17 domains of community functioning including living situation, work and social functioning, family involvement and medication use, and the Social Adjustment Scale-II (SAS-II) and Self-Report Version (Paykel, 1971). The completion time of the last is one hour and includes eight domains some of which being quite unusual. The areas that the scale explores are: work, domestic relationship, parental role, relationship with external family, social and leisure activities, sexual activity, romantic involvement and personal well-being. Except from being very lengthy, the SAS-II’s domains sexual activity and personal well-being might not qualify as being representative of social functioning.

Being quick and simple to use, the Global Assessment of Functioning or GAF (Hall, 1995) has been the most used measure of social functioning (Brissos et al., 2011). The GAF is a 100-point, single-item scale. Scores range from 1–10 meaning “persistent danger” to 91–100 defined as “Superior functioning in a wide range of activities and no symptoms” (Endicott et al., 1976). However, the GAF scale includes psychological symptoms that can influence the rating, making it a less ‘pure’ measure of functioning. Studies have shown several problems with the GAF, concerning its validity and reliability (Aas, 2011). The Social and Occupational Functioning Assessment Scale (4th ed., text rev.; DSM–IV–TR; American Psychiatric Association, 2000) was derived from the GAF and developed in an attempt to eliminate this difficulty. It is included in the DSM-IV-TR and was designed specifically to assess an individual’s level of social and occupational functioning independent of the overall severity of psychiatric symptoms (Goldman et al.,
Although quick and easy to use, it is quite general and does not include clear operational instructions for rating the severity of functional disability (Figueira & Brissos, 2011). The Personal and Social Performance (PSP) scale was developed by Morosini et al. (2000) in an attempt to overcome the limitations of the GAF, and the SOFAS. It necessarily takes longer than the SOFAS to use though it measures socially useful activities (like work and study), personal and social relationships, self-care and disturbing and aggressive behaviors. Detailed operational definitions of all of the above concepts are provided to its users. The PSP has demonstrated good validity and reliability (Figueira & Brissos, 2011).

Performance-based instruments of social functioning ability, such as the University of California, San Diego (UCSD) Performance-Based Skills Assessment (UPSA), are becoming more widely used in individuals with a diagnosis of schizophrenia. They are considered to be most effective in predicting independent living and work but are usually time consuming and require special resources (Mausbach et al., 2009).

There is not sufficient assessment of the validity, reliability, and sensitivity of the majority of the social functioning scales in schizophrenia (Brissos, 2011; Burns & Patric, 2007) but this is not the case for the SOFAS. According to Patterson and Lee, 1995 the SOFAS is a valid and reliable measure. Also, the RFS seems to have good construct validity as it agrees with the global definition of social functioning; it is designed to measure the most relevant aspects of it (immediate and extended social network relationships, employment and independent living). According to Goodman et al. (1993), the RFS is a highly reliable and valid measure compared to other functioning scales like the Global Assessment Scale and the Global Personal Distress Scale. All three measures are also very simple to use and quick; they require only a few minutes to be completed (Burns & Patric, 2007). This last quality of theirs
is very important especially when administered to individuals diagnosed with schizophrenia.

In Goodman et al.’s (1993) study, a sample of women with a diagnosis of schizophrenia scored significantly lower on the Role Functioning Scale than a sample of women with no illness; the results again indicate that schizophrenia is characterized by impaired functioning. The RFS significantly differentiated participants with schizophrenia and non-psychiatric controls. Their sample size of 112 participants provided the investigators with confidence for their results.

**Predictors of social functioning**

Various factors have been found to be related to impaired social functioning in schizophrenia.

**Age**

Functional decline often begins before the onset of the first psychotic episode and typically gets worse as the disorder develops (Schennach-Wolff et al., 2009). Gibson et al. (2010), compared a group of adolescents (nine to eighteen years of age) who had genetic high risk (GHR) for psychosis (had a first degree relative with schizophrenia or schizoaffective disorder) with a group of demographically comparable non-psychiatric controls (NPC) among others on social functioning ability and found the GHR group to be significantly more impaired than NPCs in their social functioning. In addition, Bae et al. (2010), found social role functioning to be negatively associated with age and illness duration in schizophrenia. These results suggest that social functioning declines as patients with schizophrenia get older.
Social anxiety

As mentioned above, social anxiety has been associated with social functioning. Kingsep et al. (2003) found that a group of patients with schizophrenia that received a CBT-group treatment for social anxiety not only lowered their social anxiety scores but also improved their functioning. Braga et al.’s (2005) sample of schizophrenia sufferers with comorbid anxiety disorder (including social anxiety) had better social functioning than their counterparts without comorbidity. On the other hand, Voges et al. (2005) found that negative symptoms but not social anxiety, were significant predictors of social functioning for their group of patients with schizophrenia.

Negative symptoms

Negative symptoms of schizophrenia seem to relate closely to social functioning (Bora, et al., 2006). Kostantakopoulos et al. (2011) found that apathy, in particular, was the strongest of the negative symptoms in its ability to predict psychosocial functioning. Several decades ago, the most prominent hypothesis was the notion that social functioning disability was not directly connected with schizophrenia but was a byproduct of negative symptoms (Bellack et al., 1990). The greatest functional disability in the Bellack et al.’s (1990) study was observed on the participants with most negative symptoms but functional impairment was not absent in those patients without negative symptoms. These results suggest that poor social functioning may be directly associated with schizophrenia and not be a byproduct of negative symptoms because it can occur in the absence of them. The researchers compared a sample of patients with schizophrenia with prominent negative symptoms with non-negative patients with the disorder, patients with major affective disorder and controls. Patients with schizophrenia with prominent negative symptoms performed significantly worse than people with schizophrenia.
without negative symptoms, patients with major affective disorder and controls on each subscale of the Social Adjustment Scale and Quality of Life Scale that they used to measure social functioning. Patients with schizophrenia without negative symptoms scored lower but not significantly lower than major affective disorder patients and all patients scored significantly lower than controls.

Neurocognition

Attention, vigilance, executive function measures -like verbal fluency and card sorting- and secondary verbal memory are neurocognitive factors that are particularly related to social functioning (Green, et al., 2004), such as meaningful daily activity, community functioning and interpersonal skill learning. Brekke et al. (2007) found that the aspect of neurocognition that best predicted social networks and activity (as measured by the RFS) in a large sample of community dwelling rehabilitation patients in Los Angeles was perception of emotion. In fact, a global neurocognition measure had no independent, direct predictive effect on these or other aspects of social function in their path analysis. Emotion recognition is one of several forms of social cognition that have been found to be impaired in schizophrenia, as discussed below.

Social cognition

Social cognition has been described as the way we process information about ourselves and others in various social situations (Penn et al., 2008). Three main categories of social cognition have been described and studied and these are: Theory of Mind, Perception of Emotion and Attributional Style. In particular, theory of mind and emotion perception impairment has been associated with poor social functioning (Bae et al., 2010, Kern et al., 2009). The ability to understand a person’s goals, intentions and beliefs and
the basic knowledge that people have mental states that differ from other people’s mental states has been called theory of mind ability (Penn et al., 2008). Perception of emotion involves the ability to identify human emotion displayed in facial expressions or tone of voice or both of them in combination (Couture et al., 2006, Penn et al., 2008). Attributional style refers to the personal tendency individuals have to explain the causes of positive or negative life events (Couture et al., 2006). We can attribute responsibility either to ourselves, others, or a situation. Research suggests that people tend to attribute responsibility for a positive event to themselves and blame others or a situation for negative events (Kaney et al., 1992, Penn et al., 2008) although this has been shown to vary for people with various mental health problems and in healthy volunteers (the “self-serving bias”). People with paranoia and/or persecutory delusions have been shown to display a personalizing bias, according to which, most of the times they blame others rather than themselves or a situation for negative life events (Bentall, 2001).

Couture et al. (2006) presented a model which attempts to explain how social cognition disabilities in schizophrenia can affect social functioning. This can be demonstrated using an example of two coworkers in a short interaction. The example is based on the reaction of a person with schizophrenia at their workplace, when a coworker rushed past him without paying attention to his presence. Firstly, the individual with schizophrenia may misinterpret the co-worker’s facial expression to be annoyance, irritation or anger rather than stressed (impaired perception of emotion). Secondly, attributional style difficulties (personalizing bias) can lead him to the belief that he is angry at him. Finally, theory of mind deficits may disable him from putting himself in his coworker’s position, something that prevents the false attribution of anger to be corrected. This may lead to an inaccurate response towards the coworker as a reaction.
Social Cognition and other factors

There is little evidence of deficits in social cognition in schizophrenia being the product of demographic or several other personal characteristics. For example, McGlade et al., (2008) found theory of mind disability unrelated to age, gender, IQ, duration of illness or medication dosage.

Social cognition has been found to be related to symptoms of schizophrenia. Corcoran et al. (1995) associated negative symptoms with ToM ability as their participants with prominent negative symptoms performed poorly on the Hinting Task. Their subgroup of patients with schizophrenia with paranoid delusions and related positive features performed significantly worse that controls on the Hinting Task and this finding relates paranoia to ToM as well. Bora et al. (2006) found ToM to be associated with positive symptoms. Specifically, the better the performance of their sample of patients with schizophrenia on the Hinting task of theory of mind the less the severity of their positive symptoms was. Their ToM performance was unrelated to the duration of illness and the age at onset. Kern et al. (2009) found that performance on TASIT part III significantly correlated with positive but not negative symptoms for a sample of patients with schizophrenia. Perception of emotion and theory of mind impairment, as measured by TASIT, was associated with the presence of negative symptoms as well in a study conducted by Sparks et al. (2010).

Social anxiety has not been examined in relation to theory of mind, but is an attractive target. Although not a traditional part of the schizophrenia construct, anxiety is a key feature of one of the basic symptoms dimensions, of which studies of the comprehensive Positive and Negative Symptom Scale for schizophrenia (PANSS; Kay et al., 1987) suggest there are five (e.g. White et al., 1997). These are psychotic symptoms, negative symptoms, cognitive disorganization, excitement and depression-anxiety. Mazeh and colleagues
(2009) found that specifically social anxiety disorder was comorbid in 11% of their sample of schizophrenia sufferers; and the fear subscale was related to psychotic symptoms.

According to Freeman’s model of persecutory delusions anxiety plays an important role in forming and maintaining delusions in schizophrenia. For example a persecutory belief can be formed when people perceive others and the world as hostile and threatening. Furthermore, anxiety and depression can further influence the formation of persecutory delusions. According to the model the individual will form explanations based on such preexisting beliefs and other factors (ex. cognitive biases associated with psychosis). The explanations chosen will be mediated by several factors such as social factors. If the individual is socially anxious and thus mistrustful, isolated and/or reluctant to talk to others then they are unable to revise their thoughts and ideas of threat are more likely to flourish. It is an obvious question, in the context of the social cognition literature, how far poor theory of mind and other social cognitive deficits might drive misidentification of others’ intentions and consequent social anxiety. One might hypothesize that emotion recognition, implicit and explicit theory of mind deficits would predict heightened social anxiety; and that this would in turn predict isolation and poor interpersonal relationships. There is preliminary evidence of this from Achim et al.’s (2011) meta-analysis, linking poor cognitive empathy (but not affective empathy) to scores on the Liebowitz Social Anxiety Scale (Liebowitz, 1987) in first episode schizophrenia. Moreover, studies such as Lysaker & Hammersley’s (2006) show social anxiety on the LSAS to be related to poor cognitive flexibility, delusions and interpersonal dysfunction. This study was performed in schizophrenia sufferers in a rehabilitation service, an interesting group because they both manifest clear disability and yet their environment is designed to maximize their social function as far as possible.
This removes environmental confounding processes from any study of the effects of symptoms and social cognition on social function.

Poor social cognition has also been linked to neurocognitive deficits. McGlade et al. (2008) found theory of mind disability (as measured with the Hinting Task) to be related to working and episodic memory difficulties in their sample of outpatients with schizophrenia. Also, Brekke et al. (2007) and Couture et al. (2011) found a significant relationship between global neurocognition and emotion recognition and theory of mind, respectively.

**Theory of mind**

Theory of mind assessment

Theory of mind ability has been measured using a variety of tests. Most of them are tasks that require reasoning about mental states. One such instrument is the hinting task, developed by Corcoran (1995). The hinting task examines the ability of individuals to infer the real intentions behind indirect speech and uses ten brief stories describing interactions among two characters. These interactions end with one character hinting to the other and the person under evaluation is asked to guess what the character really meant. The hinting task is quick and easy to use. Furthermore it is a face valid test of theory of mind by definition. Indeed, the task requires the individual to comment upon the intentions and goals of the characters that use the hints in each story. However, there are no studies to our knowledge commenting to its psychometric properties.

Another test used to measure theory of mind ability is The Awareness of Social Inferences Test (Part III), (McDonald et al. 2003) which evaluates the comprehension of sixteen short video clips that present sarcasm and lying.
The test has good ecological validity (Sparks et al., 2010) in relation to verbal (i.e., stories or hints) or pictorial (cartoons/cartoon strips) tests that have lower ecological validity (Russell et al., 2006). The fact that it is videotaped can make it more attractive to the participants. It also assimilates real-life interactions better than the other types of theory of mind tests. On the other hand the test is limited in that it requires the participants to guess the intentions but only relative to sarcasm and lies.

As mentioned above, cartoon jokes have also been used as an alternative method to detect theory of mind ability in individuals diagnosed with schizophrenia. Corcoran et al.’s, (1997) study, was the first that used cartoon jokes as an attempt to measure theory of mind ability in a sample of patients with schizophrenia. The investigators used two sets of ten cartoon jokes that were taken from humor magazines. The one set involved behavioural/physical jokes and the other theory of mind jokes (these required the participants to analyze the main character’s mental state). After the images were shown to the participants, they were asked to describe the meaning of each joke. As stated above cartoon tests might be less attractive to the participants than video clips.

Another test of theory of mind is the animation test, designed by Abel et al., 2000. The test has to do with 2 triangles (a big, red one and a small, blue) that move on a white screen. Their motions are of three kinds: 1) Random animation: they move aimlessly and without interacting on the screen; 2) Goal directed sequence: they interact with each other but in a way like a character responds to another without being aware of their “mental states”; and 3) Theory of mind sequence that involves movement with interaction like a character responds to another as if knowing their thoughts and intentions. After a participant watches each animation the assessor asks them: “What happened in this animation?” and the participant’s response is recorded.
Participants with a diagnosis of schizophrenia are hypothesized to have difficulty giving a correct response to the third kind of movement as it requires theory of mind ability.

In addition to reasoning about mental states, decoding them seems to be another theory of mind skill. An instrument that tests this kind of theory of mind ability is the eyes test. The task uses photographs of people with facial expressions showing only the eyes region of the face. The pictures are presented to the participants and then they are asked to identify the emotion depicted in each of them.

Theory of mind research

Bora et al., (2006) compared the eyes test (Baron-Cohen, 1997), and the hinting task (Corcoran et al., 1995) in their power to predict social functioning as measured by the SFS (Birchwood et al., 1990). Fifty outpatients with schizophrenia participated in the study. The researchers found that both tasks significantly predicted social functioning. Performance on the eyes test though was a better predictor of social functioning than their hinting task performance. However, the correlations between each social cognition task and social functioning were very similar. Additionally, as they used a Turkish sample, their results cannot be generalized because the way that patients with schizophrenia are treated there, is not known and relative pieces of information are not provided by the authors.

Corcoran et al. (1995) used the hinting task in order to show that theory of mind deficits are symptom specific and also to replicate the consistent findings of the presence of theory of mind difficulties in patients with schizophrenia. Fifty five patients with schizophrenia (separated in 6 subgroups according to their symptomatology) and 44 controls (this group consisted of 30 non-psychiatric controls and 14 psychiatric controls that were
service users for the relief of anxiety and depression; both of these subgroups were used as one because their responses on the hinting task were similar) participated in the study. Both groups were demographically similar. The two groups were different in their performance on the hinting task with the patients’ with schizophrenia performance being significantly lower than controls. Also, patients with schizophrenia were significantly more impaired in their levels of functioning than controls. The investigators also confirmed their hypothesis that theory of mind difficulties in schizophrenia are symptom specific. Specifically, schizophrenia sufferers with negative symptoms and those with paranoid delusions and related positive symptoms had problems performing the task compared to controls. In addition, patients that had no symptoms at the time of testing performed similarly than controls at the hinting task. This study indicates, among others, that people with schizophrenia have theory of mind deficits and that the hinting task effectively differentiates those with schizophrenia and those without according to their theory of mind ability. As the majority of their participants were in-patients on acute psychiatric wards their results apply to individuals with those specific characteristics.

Corcoran et al. (1997) used a task comprised of two sets of jokes (physical and ToM) to measure theory of mind ability of their sample of 44 patients with schizophrenia, split according to their symptomatology in 4 subgroups (behavioural signs, paranoid symptoms, passivity phenomena and remission/other symptoms group) and 47 controls (40 non psychiatric and 7 non psychotic – psychiatric). The investigators hypothesized that theory of mind ability would be symptom specific. In general controls performed similarly in both types of jokes. Participants with schizophrenia had significantly greater difficulty in understanding theory of mind jokes and this effect was more marked for those with behavioural signs. Patients with
schizophrenia who reported passivity experiences and paranoid delusions also performed significantly worse on theory of mind than physical jokes. Finally, symptom free patients with schizophrenia performed similarly on physical and theory of mind jokes.

Marjoram et al. (2005) also used single image cartoon jokes (physical and ToM) as a measure of theory of mind ability. Forty participants were used. Twenty of them were schizophrenia patients (clinically stable inpatients awaiting discharge and outpatients) and the rest were controls (healthy volunteers). All the participants were asked to describe the meaning of each joke. The researchers hypothesized that patients with schizophrenia would perform significantly worse than controls and that the severity of specifically hallucinations and delusions would be most strongly related to theory of mind impairment. They also included negative symptoms as a predictor variable. Patients with a diagnosis of schizophrenia performed significantly poorer than controls in both ToM and non-ToM jokes, but this difference was most marked when trying to explain ToM jokes. Also they found no relationship between positive symptomatology and theory of mind impairment. The task significantly detected theory of mind disability in patients with schizophrenia but failed to detect a possible relationship between positive or negative symptoms and theory of mind disability. Again the results refer only to clinically stable patients with schizophrenia.

Bae et al. (2010) investigated the factors that predict social functioning in people with schizophrenia. They used the animation test (Abel et al., 2000), described above, as a measure theory of mind ability. The cluster of variables, that best predicted good social functioning, included good continuous attention, good theory of mind, and low sensitivity of disgust emotion (meaning difficulty in recognizing the disgust emotion during an emotion perception test). The animation test seems to have the power to detect
difficulties in theory of mind ability but on the other hand it might be oversimplified and basic, as human interactions are more complicated than what the instrument presents. Also, the participants were Korean patients diagnosed with schizophrenia; and again, pieces of information are not provided relative to the treatment and care patients with schizophrenia receive in Korea.

Kern et al. (2009) compared an American sample of 50 patients with schizophrenia and 44 controls in their ability to comprehend sarcasm and lies using the TASIT part III. The RFS (Goodman et al., 1993) was used to assess social functioning. Patients with schizophrenia performed significantly worse than controls on sarcasm but not lies scenes. They also performed significantly worse on sarcasm than lie scenes while controls performed similarly on both kinds of scenes. Performance on TASIT significantly correlated with positive but not negative symptoms. Overall, social functioning had a significant positive correlation with theory of mind and positive symptoms.

Couture et al. (2010) used the hinting task in a comparison of complex models of social functioning in 177 rehabilitation patients. The study was conducted in the USA. They found that theory of mind as measured by the hinting task significantly correlated with a social skills measure and also had a weak relationship with a self-report measure of social functioning. In the best fitting model, theory of mind directly predicted social skills with some confounding by global neurocognition. Neurocognition and theory of mind only predicted self-reported functioning indirectly, confounded by negative symptoms. However, the self-reported assessment of social functioning represents an important limitation and there were methodological limitations to their structural equation modeling. These limitations make it difficult to generalize from their sample.
Overall, past research indicate that theory of mind impairment is consistently associated with social functioning in individuals diagnosed with schizophrenia across various samples (in-patients, out-patients, patients in rehabilitation services and individuals from various cultural backgrounds).

**Emotion Perception**

Emotion perception assessment and research

Perception of emotion ability has been also found to be a predictor of social functioning. Brekke et al. (2007) measured perception of emotion of 125 rehabilitation out-patients diagnosed with schizophrenia and schizoaffective disorder using the sum of three separate scales: the Facial Emotion Identification Test (Kerr & Neale, 1993), the Voice Emotion Identification Test (Kerr and Neale, 1993), and the Videotape Affect Perception Test (Bellack et al., 1996). The tests use photographs, audiotape and video clips respectively that display six different emotions (happy, angry, afraid, sad, surprised and afraid). The participants are required to identify the emotion that is best demonstrated in each photograph. The researchers’ hypothesis, that better emotion perception scores would be significantly associated with better social functioning scores (as measured by the Role Functioning Scale), was confirmed. The researchers used well selected measures of emotion perception and social functioning. Their results are limited to rehabilitation out-patients with schizophrenia. Cohen et al., 2006, found low emotion perception scores at FEIT to be significantly correlated with low scores at occupational and social functioning at patients with schizophrenia (measured by the Social Adjustment Scale-second edition and the Role – Play Test).

Sparks et al. (2010) used all three parts of TASIT and FEEST (Facial Expressions of Emotion – Stimuli and Tests; Young et. al., 2002) in order to measure theory of mind and perception of emotion ability of people with
schizophrenia and a control group. Theory of mind was measured by parts II
and III of the TASIT. Its second part is composed of fifteen video vignettes
that display sincere (mean what they say) and sarcastic (simple sarcasm and
paradoxical sarcasm – nonsensical dialogues) interactions between two
characters. Perception of emotion was measured by TASIT, Part I and FEEST.
For TASIT, Part I the participants are required to watch 24 short video clips.
In each of them an actor displays one of six basic emotions (happiness,
sadness, anger, fear, surprise and disgust). The participants are asked to
identify the emotions in each video-clip. FEEST is a computerized test that
uses still photographs that depict six basic emotions (happy, sad, fear,
disgust, surprise and anger) that participants have to identify. People with
schizophrenia were found to have impaired perception of emotion as
measured by FEEST and TASIT, Part I. They also had difficulty
understanding sarcasm and lies compared to controls. Perception of emotion
and theory of mind impairment, as measured by TASIT, was associated with
the presence of negative symptoms. Their results are also consistent with
previous findings connecting social cognition and social functioning:
Particularly, difficulty in the ability to detect sarcasm was associated with
lower recreational functioning and good perception of emotion with high
satisfaction derived from activities. This is one of the very few studies that test
the ability of both theory of mind and emotion perception to predict social
functioning in schizophrenia. Their functioning measures though are more
related specifically to leisure activities than general social functioning.

Researchers have been started to investigate the relationship between
emotion perception and social functioning after research had already shown
that theory of mind is a significant predictor of it; thus, fewer studies have
been conducted exploring the relationship between emotion perception and
social functioning. Several instruments have been developed to measure
emotion perception ability. Emotion perception measures are not too different from each other like theory of mind measures are. All of them require the participants to identify individuals’ emotions. The major difference between them is that some of them use photographs, others video clips and others audio.

Overall, both theory of mind and emotion perception have been found to be good predictors of social functioning in schizophrenia. Research has been conducted using various kinds of samples. Very few studies though have compared theory of mind and emotion perception in their ability to predict social functioning. Furthermore, there are no studies to our knowledge that have used those two variables in one model while accounting for potential confounders which is the main goal of the present study.

**The current study**

Theory of mind and perception of emotion have something in common. They are two of the three primary domains (theory of mind, perception of emotion and attributional style) of social cognition (Penn et al., 2008). In this paper we investigate the relationship between them and social functioning. Our hypotheses were: that both theory of mind and emotion perception would be positively associated with social functioning and that those two types of social cognition would be independent predictors of social functioning for people with a diagnosis of schizophrenia.

To explore the relationship between perception of emotion and theory of mind we chose to use two theory of mind measures. One explicit, the hinting task, where the participant has to understand the intention behind indirect speech acts and one implicit, the reading the mind in the eyes test, which is based on the recognition of an individual’s emotion by looking at pictures depicting only the eyes region of the face. The hinting task is considered to be
an explicit test of theory of mind as it requires the participant to think first (evaluate and translate the character’s behavior) and then respond about what their intentions are. These kinds of theory of mind tasks require thought, executive functioning and language ability. Thus, they are slower for the participant to respond and based on logic and reasoning. On the other side, the eyes test is less based on linguistics but is more based on intuition and sensitivity to gesture. Therefore, the response is automatic and does not require much thought and it is then considered to be an implicit test (de Villiers et al., 2012). The eyes test is also chosen as it is comparable to our emotion of perception test (FERT). The task is based on the presentation of faces displaying different emotions that the participant has to identify. This is an implicit task as well that is based on the innate human ability of basic emotion recognition. We also included measures to assess potential confounding variables of negative symptoms and demographic characteristics.

We had a secondary hypothesis that social cognitive deficits would predict social anxiety and we in turn intended to model this as a potential confounder for and mediator of the relationship between theory of mind and social dysfunction. Whereas the social functional consequences of psychotic symptoms such as paranoia have often been investigated, those of anxiety have rarely been examined, perhaps given the distance from the core features of the disorder. However, whereas anxiety in other contexts has been found to predict poor social function, (Kingsep et al., 2003; Braga et al., 2005) psychotic symptoms are generally poor predictors of social functioning in schizophrenia.

The Liebowitz Social Anxiety Scale (Liebowitz, 1987), which is a self-completion questionnaire, has been chosen to measure social anxiety. The LSAS has been found to have good psychometric properties and to be suitable
for patients with schizophrenia. Specifically, Baker at al. (2002) used the instrument to 175 participants diagnosed with social phobia and found the LSAS to have overall good psychometric properties as indicated by the results of test–retest reliability, internal consistency, and convergent and discriminant validity. The LSAS also showed good psychometric properties in a sample of 144 patients with schizophrenia. The study concludes that the LSAS can be used in this patient group to assess social anxiety in both clinical settings and in research (Romm et al., 2011). We chose the negative subscale of the PANSS (Kay et al., 1987) to measure the severity of negative symptoms. Two measures of social functioning have been selected for the present study. These are the RFS (Goodman et al., 1993) and SOFAS (Spitzer et al., 2000). The measures have good psychometric properties (Patterson & Lee, 1995; Goodman et al., 1993) and are quick and simple to use.

Method

Participants

The sample was recruited from the Manchester Mental Health and Social Care NHS trust rehabilitation services. Settings included an inpatient rehabilitation service that provides intensive care and support to enable patients to successfully move back into the community, 24-hour community rehabilitation services that aim to provide recovery focused support to empower service users to develop and sustain life skills and coping strategies, and a Community Rehabilitation Scheme which provides residential care and supporting housing services. With regard to the latter, service users live there together in 2-3 bedroom houses and are responsible for maintaining the household and take care of themselves with some support from NHS staff. The former facilities encourage independence but provide more support.
Inclusion criteria for participating to the study were a diagnosis of schizophrenia, schizoaffective disorder, delusional disorder and PNOS according to DSM-IV and a chronological age between 18 and 65. There was not a restriction according to ethnicity but poor fluency in spoken English constituted an exclusion criterion. They had to be symptomatically stable as evidenced by lack of change in antipsychotic or antidepressant medication in the last 3 months. Exclusion criteria also embraced absence of organic brain disease according to ICD-10, learning disability (Verbal IQ<70), poor fluency in spoken English (insufficient to complete assessments and consent) and without capacity to give informed consent.

A clinical diagnosis of current DSM-IV substance abuse or dependence was an exclusion criterion as well. Not only might the long term effects of intoxication affect task performance (e.g. for long acting drugs such as cannabis and MDMA) but active abuse by definition reflects impairment of social functioning, and dependence is well established to cause exacerbation of symptoms including negative symptoms, paranoia and anxiety, so inclusion of these groups introduces a potential confounding variable. Active substance misuse is usually a criterion for exclusion from rehabilitation services for these reasons. Apart from that, there are numerous studies that support the notion that substance abuse may lead to cognitive deficits. Memory and executive functioning impairment has been associated with abuse of alcohol, opioids and stimulants (Oscar et al., 2007). Verbal fluency, pattern recognition, planning and the ability to shift attention were impaired in a group of long term amphetamine and heroin users (Ornstein et al., 2000). Such cognitive disabilities could impair our participants’ ability to complete the tasks and/or confound our results.
**Procedure**

Participants were initially approached by a member of the NHS staff and briefly informed about the study. If the participant agreed to talk to the investigators, an information leaflet (Appendix) was given that was also verbally explained by the investigator. Time was devoted to make sure that all the questions about taking part had been adequately answered and then at least 24 hours was given to the patient to decide whether they want to participate or not. An appointment was arranged between the investigator and the participant and a member of the staff was informed. All measures were completed then, through an interview. The interviews took place either to NHS sites (a quiet room was provided to ensure privacy) or to the participants’ house. The total duration of the assessments was about an hour.

Five investigators recruited and interviewed the participants. The investigators were trained by the supervisor, Dr. Richard Drake before that. Their preparation included theoretical and applied training to use the instruments for the participants’ assessment. All the measures were very simple to use except for the PANSS so the greatest emphasis was given to that. Most of the participants (25 out of 34) were interviewed by the author, Konstantina Bardamaskou, and Dr. Anneka John Kamen (Junior Doctor, Foundation year training) - 3 of these participants were seen by both Konstantina Bardamascou and Dr Fawad Razaq (3rd year Specialist Trainee, or ST3 Doctor). The rest of the participants (9) were interviewed by Dr. Nasir Ilias (ST3 Doctor), Dr. Wakil Ahmed (ST5 Doctor) and Dr. Fawad Razaq.

The present study was approved by the Proportionate Review Subcommittee of the NRES Committee North West – Lancaster (Reference: 12/NW/0583) and all the investigators were allowed to use the service (a
research passport and honorary contract was provided to the investigators that didn’t have access to the NHS services).

Materials

Theory of Mind measures

Theory of mind ability was measured by the Eyes Test and the Hinting Task. The Eyes Test is a valid test of theory of mind (Baron-Cohen, 1997) and measures one’s capability to detect an individual’s mental state by looking at the 36- pictures of people’s facial expressions that shows only the eyes region. Participants are asked to select the right word out of the four choices offered. One can score between 0 and 36 at this task. A score of 36 indicates that the participant correctly identified the emotion on all 36 pictures of the task. There are computerized and paper versions available. The paper version was used in the present study in which photos of the eyes region of different individuals are printed on A4 paper. Four different words (emotions) are also printed on the sheets and the participant is asked to choose the one that best describes the emotion depicted in the picture.

The Hinting Task (Corcoran, 1995) is a more explicit type of theory of mind tasks. Specifically, it measures the ability of people to infer real intentions behind indirect speech utterances. It is composed of ten short stories describing interaction between two individualss. Their conversation in each story ends with the one person hinting to the other. After that, the participants are asked to say what the character really meant. If the participant gives a correct answer then they get 2 points but if they don’t further information is given to them. A correct response is then awarded with 1 point. If the participant fails to respond correctly the second time they don’t get any points. A person can score between 0 and 20 (maximum performance
indicating good theory of mind ability) in this task. The stories and subsequent questions are read aloud by the interviewer.

Perception of Emotion

The perception of emotion ability of each participant was measured by the Face Emotion Recognition Task (Anderson, 2011). The task is comprised of seventy six photographs that demonstrate different intensities (30%, 50%, 70% and 100%) of six basic facial emotions (anger, disgust, fear, happiness, sadness and surprise). The Face Emotion Recognition Task is a modification of the facial expression recognition task developed by Harmer et al., 2001, which comprised of 250 pictures. The task also presented the six basic emotions featured in the Face Emotion Recognition Task (Anderson, 2011) taken from the Ekman and Friesen Pictures of Affect Series (1976). Each emotion was presented in 11 different intensities (0%-neutral- to 100%-full emotion-). The Face Emotion Recognition Task is a computerized task but in this study a paper version was used because the NHS assessors (N.I, F.R., and W.A) were unable to run the software for licensing reasons. After each picture’s presentation the participants were asked to choose one of the six basic emotions provided and the interviewer was responsible for circling the answer on the answer sheet. One can score on this task between 0 (no correct responses) and 76 (correctly identifying the emotion on all pictures).

Measurement of social functioning

Two different measures of social functioning were used at the present study. Both have been widely used. The first, the Role Functioning Scale (Goodman et al., 1993) scale has been used in other studies of social cognition and social function in rehabilitation of schizophrenia (e.g. Brekke et al, 2009). It is an objective scale that contains four subscales that measure a person’s functioning in four different areas of everyday life (immediate and extended
social network relationships, employment and independent living). The score of each subscale ranges from 1 (minimal level of functioning) to 7 (optimal level of functioning). The sum of the subscales represents the Global Role Functioning Index with values ranging from 4 to 28. The higher a person scores on this scale the better their functioning is. It not only has demonstrated validity and psychometrics (e.g. Goodman et al., 1993) but is relatively structured, comprehensive and assesses the traditional targets of rehabilitation, making it suitable for a sample some of whom were in the community but others in in-patient wards, yet all supported in the type of activities the RFS assesses.

Social functioning was also assessed using the SOFAS (Spitzer et al., 2000). Its scores range from 0 to 100. The higher the score the better the participant’s functioning is. The score administered to each participant is an objective one based on assessment of interpersonal, vocational and role functioning. A score of 100 is described as superior functioning in a wide range of activities. The SOFAS has well studied properties as stated above, is very rapid to complete, makes comparison with a wide range of other studies possible and was routinely completed by senior staff in some of the services involved (e.g. the CRS), allowing comparison with scores by staff familiar with the participants.

Furthermore, while the RFS still measures working productivity and self-care it gives more weight to social relationships while the SOFAS weights work or school productivity and functioning in family or social roles; but arguably gives little priority to function in wider social networks. Thus, the RFS measures function more rigorously against a broader social standard (work, personal function, close and extended social networks). The SOFAS’ greater flexibility in weighting may better reflect changes in interpersonal
performance and social function in a group who are particularly socially excluded, e.g. from work and wider society.

Using these two scales to measure social functioning gives us the opportunity to see if they behave in the same way or not as the dependent variables in our analysis and maybe to comment upon their importance and significance as measures of social functioning.

Measurement of negative symptoms

PANSS (Kay et al., 1987) was used to assess the severity of negative symptoms. The measure is composed of 4 subscales (positive, negative, general psychopathology and composite) and 30 items. A score of 7, at the negative symptoms subscale, (which is the lowest one can get) shows absence of negative symptoms. The highest score one can get is 47 which indicate extreme psychopathology relative to negative symptoms. The PANSS is an interview based instrument which takes into account the participant’s reports as well as their family reports and the interviewer’s observations. The PANSS is considered a highly reliable, valid and stable measure (Bell, 1992, Kay, 1987). The interrater reliability between K. B. and A. K. for the PANSS negative subscale was .84, for the positive subscale was .93, for the general psychopathology subscale was .90 and for the total score was .95.

Measurement of social anxiety

The Liebowitz Social Anxiety Scale (LSAS) (Liebowitz, 1987) was used to assess social anxiety. The LSAS is a 24-item self-completion questionnaire that measures the degree of fear and avoidance in various social situations. The lower score one can get is 0, indicating absence of social anxiety in various social situations and the higher 144. A score above 95 indicates very severe social phobia and one below 55 indicates no psychopathology or social anxiety being in the normal limits.
We were unable to include copies of the instruments due to copyright law.

**Analysis**

Correlational analysis was conducted to determine the associations between all variables. Multiple regression analyses were performed to determine whether both types of social cognition are independent determinants of RFS and SOFAS scores. This allowed for adjustment of the potential confounders (negative symptoms subscale on PANSS, age and social anxiety) that have a significant association with independent and dependent variables (p<0.1).

**Power calculation**

35 participants were estimated to give 80% power to detect a correlation of 0.5 between social cognition variables and social functioning, with an alpha of 0.05. It also allowed at least three variables in a multiple regression with an expected medium effect size (Field, 2009).

**Results**

**Demographic characteristics**

Of the 64 patients that met the criteria for participation 42 were approached and the 34 of them agreed to participate in the study. Staff indicated that 22 were too unwell (i.e. lacked capacity to consent) or declined approach. Thirty three of the participants were males. See table 1 for other demographic characteristics. All the participants were people with enduring illness and were receiving anti-psychotic medication. They were all diagnosed with schizophrenia except one who had a diagnosis of schizoaffective disorder. All the participants were unemployed and single. Eight of the participants were rehabilitation service inpatients, and 26 were outpatients in rehabilitation services.
Table 1
Demographic Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>36.6</td>
<td>10</td>
<td>20</td>
<td>56</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Percent</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
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<tr>
<td>Male</td>
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<td>33</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White British</td>
<td>61.8</td>
<td>21</td>
</tr>
<tr>
<td>African British</td>
<td>29.4</td>
<td>10</td>
</tr>
<tr>
<td>Asian British</td>
<td>8.8</td>
<td>3</td>
</tr>
</tbody>
</table>
The mean and standard deviation values of all variables are presented below.

Table 2
Means and Standard Deviations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>36.6</td>
<td>10.0</td>
</tr>
<tr>
<td>Hinting</td>
<td>13.9</td>
<td>4.9</td>
</tr>
<tr>
<td>Eyes</td>
<td>18.2</td>
<td>5.9</td>
</tr>
<tr>
<td>FERT</td>
<td>26.9</td>
<td>8.5</td>
</tr>
<tr>
<td>LSAS</td>
<td>43.9</td>
<td>31.8</td>
</tr>
<tr>
<td>PANSSpos</td>
<td>14.5</td>
<td>4.9</td>
</tr>
<tr>
<td>PANSSneg</td>
<td>20.2</td>
<td>7.0</td>
</tr>
<tr>
<td>PANSSgen</td>
<td>33.0</td>
<td>10.0</td>
</tr>
<tr>
<td>PANSSTot</td>
<td>67.8</td>
<td>18.3</td>
</tr>
<tr>
<td>RFS total</td>
<td>13.6</td>
<td>2.9</td>
</tr>
<tr>
<td>SOFAS</td>
<td>54.6</td>
<td>7.4</td>
</tr>
</tbody>
</table>

Relationship between variables

Initially, the relationships between all variables were investigated using Pearson’s correlation. Correlations between all variables are presented below.

Table 3
Pearson’s Correlations between all variables

<table>
<thead>
<tr>
<th></th>
<th>HINTING</th>
<th>EYES</th>
<th>FERT</th>
<th>AGE</th>
<th>LSAS</th>
<th>PANSSneg</th>
<th>RFS</th>
<th>SOFAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HINTING</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EYES</td>
<td>.39*</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>FERT</td>
<td>.52**</td>
<td>.66**</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>AGE</td>
<td>.14</td>
<td>.34*</td>
<td>.12</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>LSAS</td>
<td>-.12</td>
<td>-.43**</td>
<td>-.31*</td>
<td>-.00</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PANSSneg</td>
<td>-.31*</td>
<td>-.24</td>
<td>-.34*</td>
<td>-.37*</td>
<td>.15</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>RFS</td>
<td>.52**</td>
<td>.32*</td>
<td>.43**</td>
<td>.24</td>
<td>-.24</td>
<td>-.47**</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>SOFAS</td>
<td>.40**</td>
<td>.14</td>
<td>.24</td>
<td>.22</td>
<td>-.36*</td>
<td>-.60**</td>
<td>.58**</td>
<td>1</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (one-tailed)
** Correlation is significant at the 0.01 level (one-tailed)
Multiple regression of the Social Cognition measures with Social Functioning

Multiple regression analysis was conducted using our three measures of social cognition as the independent variables and social functioning (using the RFS) as the dependent variable. The analysis was conducted to identify the relationship of each of our social cognition measures with social functioning while controlling for the effects of the others. Assumption testing was conducted to check for normality, linearity, multicolinearity, heteroscedasticity, homogeneity of variance and leverage with no serious violations. Using the enter method a significant model emerged (F3,30=4.35, p<.05). Adjuster R= .233. The only significant variable was ToM (measured by the Hinting Task) b=.40 p<.05. When the analysis was conducted using SOFAS as the dependent variable the results were very close to those of the previous analysis with the relationship between social functioning and the Hinting task being very close to reaching significance while the other two predictors were unrelated to social functioning. The model didn’t reach significance.

Multiple regression for the Hinting Task, LSAS and negative symptoms with RFS and SOFAS

Social functioning (measured by RFS) was used as the dependent variable. ToM (measured by the Hinting Task), and the confounding variables (negative symptoms and social anxiety) were entered as the independent variables. The analysis was conducted to determine the effect that our possible confounders will have on social functioning while controlling for the effects of the only significant social cognition variable that emerged at our previous analysis, the hinting task. Age was not entered in the model as it was found to have no significant relationship with both measures of social functioning when using Pearson’s correlations. Assumption testing was
conducted to check for normality, linearity, multicolinearity, heteroscedasticity, homogeneity of variance and leverage with no serious violations. Using the enter method a significant model emerged (F3,30=6.60, p<.05) Adjusted R=. 337. Significant variables are presented below:

Table 4
Multiple regression for the Hinting Task, LSAS and negative symptoms with RFS and SOFAS: Significant variables

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Beta</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory of Mind (Hinting Task)</td>
<td>.40</td>
<td>p&lt;.05</td>
</tr>
<tr>
<td>Negative Symptoms</td>
<td>-.33</td>
<td>p&lt;.05</td>
</tr>
</tbody>
</table>

The same multiple regression analysis was conducted with social functioning, as measured by SOFAS, being the dependent variable. Again, ToM (measured by the Hinting Task), and the confounding variables (negative symptoms and social anxiety) were entered as the independent variables. Assumption testing was conducted to check for normality, linearity, multicolinearity, heteroscedasticity, homogeneity of variance and leverage with no serious violations. Using the enter method a significant model emerged (F3,30=9.23, p<.001) Adjusted R=. 428. Negative symptoms was the only significant variable (b= - .49, p<.05)

Social anxiety was very close to reach statistical significance (p=.055). This means that this variable is an important confounder when social functioning is measured by the SOFAS.
Multiple regression for the Hinting Task, The FERT, LSAS and negative symptoms with RFS

The analysis was repeated by adding PoE to the independent variables used above in order to identify also if ToM and PoE are independent predictors of social functioning when controlling for the effects of the other important predictors and confounders identified above. Four independent variables were used: ToM (measured by the Hinting Task), PoE, Social Anxiety and Negative Symptoms. The dependent variable was social functioning (measured by the RFS). Assumption testing was conducted to check for normality, linearity, multicolinearity, heteroscedasticity, homogeneity of variance and leverage with no serious violations. Using the backwards elimination method with criterion for removal p>0.2 a significant model emerged (F2,31= 9.363, p<.005). Adjusted R squared= .336. PoE was eliminated first and social anxiety was eliminated by the model and the next step. The variables that were retained in the final model were ToM, as measured by the Hinting Task and negative symptoms and were both significant predictors of social functioning.

Table 5

Multiple regression for the Hinting Task, The FERT, LSAS and negative symptoms with RFS: Significant variables

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Beta</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory of Mind (Hinting Task)</td>
<td>.441</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Negative Symptoms</td>
<td>-.347</td>
<td>&lt;.05</td>
</tr>
</tbody>
</table>
The same procedure was followed using again social functioning as our dependent variable but measured with SOFAS this time. Multiple regression analysis was performed using the backwards elimination method with criterion for removal \( p > 0.2 \). Assumption testing was conducted to check for normality, linearity, multicolinearity, heteroscedasticity, homogeneity of variance and leverage with no serious violations. The independent variables used were: ToM measured by the Hinting Task, PoE, Negative symptoms, and social anxiety. A significant model emerged (\( \text{F3,30}= 9.233, p<.001 \), adjusted R squared= 0.428). Theory of mind measured by the Hinting Task, social anxiety and negative symptoms were retained in the final model. Only negative symptoms though significantly predicted social functioning (\( b = -0.49, p<.05 \)).

**Discussion**

To summarize the results, only the Hinting (of the social cognition tasks) had a significant independent relationship with social functioning as measured by the RFS. None of the social cognition tasks was related to social functioning as measured by the SOFAS.

**Participants’ performance**

The mean score of our sample for the hinting task indicated moderate performance in the task. The hinting task may be culturally sensitive and so the mean scores for similar samples may differ depending on the cultural background and the country of origin of the sample. Couture at al., 2011 used a modified version of the hinting task (Greig et al., 2004) -that was not too different from the original version of Corcoran et al.’s (1995) - and they studied a North American sample rather than a British one. The modifications
were made to suit their American participants. The mean score of the modified hinting task was very close to our sample’s mean score. Bora et al.’s (2006) Turkish sample of people with schizophrenia scored a lot lower than the mean score of our sample which may be accounted for by the UK/Western nature of some of the items which may not apply to a Turkish sample. The fact that Bora et al.’s (2006) sample scored very similarly at the eyes test compared to our sample’s mean is not surprising because the eyes test is considered to be a more implicit test of theory of mind. Corcoran et al.’s sample of 55 patients with schizophrenia (the study was carried out in the UK) scored higher than our sample at the hinting task. This may be explained by different characteristics of their sample, i.e. they were relatively younger and were all in-patients on acute psychiatric wards while our participants were long-term rehabilitation patients.

The mean score of the PANSS subscale for the negative symptoms was very close to Bora et al.’s (2006) sample mean score on the same subscale. Their mean age was very close to our sample’s mean age and they were clinically stable outpatients as the majority of our participants were. Voges & Addington (2005) examined the relationship of social anxiety and social functioning in first episode psychosis. Their participants’ mean score of the PANSS subscale for the negative symptoms was lower than ours which means that they had fewer negative symptoms or that their negative symptoms were of lower severity. This deviation from our participants’ PANSS negative mean score is not surprising as their participants were a lot younger. As schizophrenia develops through time the negative symptoms usually become more prominent (Davidson et al., 1995, 4th ed., text rev.; DSM–IV–TR; American Psychiatric Association, 2000).

The mean score for social anxiety measured by the LSAS for our sample was relatively low and it indicated social anxiety within normal limits (no
psychopathology). Mazeh et al. (2009) studied a cohort of 117 patients with schizophrenia to investigate the prevalence and correlates of social phobia in schizophrenia sufferers. The LSAS mean score for their sample was very close to ours. Again their participants’ mean score indicated absence of psychopathology relative to social anxiety.

Relationship between Social Cognition measures and Social Functioning

The first hypothesis, that both emotion perception and theory of mind will both be positively associated with social functioning was confirmed when it was measured by the RFS and when Pearson correlation was used. Theory of mind as measured by the hinting task was the only variable that was significantly correlated with social functioning, when measured by SOFAS. When our social cognition variables were entered into a multiple regression analysis, theory of mind as measured by the hinting task was the only social cognitive factor that significantly predicted social functioning using the RFS but not the SOFAS. The results indicate that the hinting task was the better predictor of social functioning. So, a good performance at the hinting task of theory of mind is more possible to predict good social functioning in people with a diagnosis of schizophrenia. Several researchers have investigated the relationship between social cognition and functional outcome in schizophrenia patients and most of them have found that their social cognition has been significantly associated with social functioning (Marjoram et al., 2005, Corcoran et al., 1997, Bae et al., 2010, Kern et al., 2009, Brekke et al., 2007, Cohen et al., 2006, Sparks et al., 2010).
Perception of Emotion and Theory of Mind as independent predictors of Social Functioning (RFS)

The results of our analysis indicate that the combination of variables that best predicted social functioning were theory of mind (as measured by the hinting task) and negative symptoms. The variance of social functioning that seems to be accounted by perception of emotion (when using simple correlations) is lost when using multiple regression analysis (i.e. when controlling for the effects of theory of mind, as measured by the hinting task and negative symptoms). This can be interpreted in several ways. A possible explanation could be that negative symptoms might impair the ability of the patients to perform well at those types of tasks (the FERT and the eyes test that are similar) but not at the hinting one. Another possible explanation could be that theory of mind (measured by the hinting task) effects might be responsible for the effect (real Person’s correlation) that perception of emotion has on social functioning. This might mean that the ability to recognize emotions requires theory of mind skills and in this case, theory of mind ability is what really accounts for the variance in social functioning. The multiple regression analysis showed that, when the effect of theory of mind is kept constant, emotion perception does not predict social functioning. When using emotion perception and theory of mind as independent variables of social functioning in a multiple regression analysis, again, only theory of mind (as measured by the hinting task) significantly predicted social functioning while the other variables were unrelated to it. We can conclude from that, that emotion perception and theory of mind when measured by the hinting task are not independent predictors of social functioning as theory of mind lessens the predictive ability of emotion perception. It follows from this statement that the second hypothesis (that theory of mind and emotion perception are independent predictors of social functioning) is rejected.
Comparison of Social Cognition measures

The Eyes Test of theory of mind is comparable to the PoE measure (FERT). They both require the participants to identify the emotion depicted to a set of pictures. Their main differences is that the eyes test has pictures that show only the eyes region of the face while the FERT has pictures where the whole face is shown and that the emotions depicted in the FERT are basic emotions while a lot of those depicted in the eyes test can be described as emotions/intentions. This is what makes the eyes test a theory of mind measure and not an emotion perception one. Examples of such words depicting emotions/intentions illustrated in the eyes test are: interested, decisive, flirtatious, thoughtful and anticipating. According to the present study, the hinting test of theory of mind proved to be better in predicting social functioning in schizophrenia patients than the eyes test, both when using Pearson’s correlation (the hinting task was strongly correlated with social functioning while the eyes test was moderately correlated with social functioning) and multiple regression analysis (only the hinting task was in the final model as a significant predictor of social functioning when the effects of the other variables were held constant). This indicate that the hinting task might have better construct validity as it requires the participant to guess what the other person is thinking, what are their real intentions while the eyes test seems to be more based on a more implicit ability of emotion recognition. Emotion perception failed to predict social functioning as well when the effects of theory of mind (measured by the hinting task) and negative symptoms were held constant.

We can see that the eyes test and the FERT behaved similarly in predicting social functioning although they are supposed to measure two distinct social cognition abilities. A possible explanation for this could be that the eyes test might better qualify as a measure of emotion perception than a theory of
mind measure or more accurately, the shared features of these tasks, as described above, might account for their inability to predict social functioning.

Of the social cognition tasks only the Hinting Task significantly predicted social functioning and this means that it obviously measures something distinct from the other two measures. The FERT and the Eyes Test are non-verbal, implicit measures of social cognition. On the other hand, the Hinting Task is composed of vignettes, describing interaction (conversation) between two characters that the interviewer is reading aloud to the participant. Only the Hinting Task had a meaningful relationship with social functioning and a possible explanation for this could be that inability to perform the Hinting Task also implies a pragmatic language impairment along with a theory of mind one. As an explicit measure it is very much concerned with interpersonal function in social situations and this might reflect the most important deficits in shaping rehabilitation of social function. It might alternatively be pragmatic language ability rather that theory of mind that is associated with social functioning.

Bora et al. (2004) found that the hinting task had less power in predicting social functioning than the eyes test. Each task though had similar raw correlations with social functioning. It is unclear why the hinting task had less predictive power in their study, but still their Turkish sample performed poorly on what may be a culturally sensitive task. Their mean scores were substantially lower than ours, whereas their scores of the two social cognition tasks were very similar. It is also unclear how much support and in what conditions the out-patients in this study lived.
Emotion Perception and Theory of Mind as independent predictors of Social Functioning (SOFAS)

When SOFAS was used, instead of RFS, as the outcome measure of social functioning, there were differences in the results. Negative symptoms only, significantly predicted social functioning while social anxiety and theory of mind as measured by the hinting task were confounders. Emotion perception was not included in the final model. The differences (from the results of the analysis where RFS was used to measure social functioning) were the following: theory of mind (measured by the hinting task) did not significantly predict social functioning but was retained in the final model with p<0.20. Social anxiety was in the final model this time but only as a confounder. Negative symptoms significantly predicted social functioning in both analyses, as expected.

Comparison between SOFAS and RFS

As we can see from the findings of the two analyses, where social functioning was measured by different methods, the results were not the same. This may not be surprising though as, although the two scales measure aspects of social functioning, they have important differences. The RFS is more precise as it requires the interviewer to rate the participant on 4 different subscales (Working Productivity, Independent Living, Self-Care, Immediate Social Network Relationships and Extended Social Network relationships). The instrument also provides its users with a detailed description for all the possible ratings (1 to 7) of all four subscales. When an interviewer is using the SOFAS, on the other hand, they just have to assign a percentage of functioning for the participant where 100% is described as superior functioning in a wide range of activities. It provides the interviewer with a brief description of 10 percentages, for example 50- 60% should be
assigned to an individual who has: “Moderated difficulty in social, occupational, or school functioning (e.g., few friends, conflicts with peers or co-workers)”. The RFS seems to be a more reliable measure of social functioning as it is much more detailed, and in this way it minimizes the possibility of false judgments. On the other hand, as mentioned above, the two measures may be designed to identify different aspects of functioning and this could be the reason that they behaved differently when used to measure the functional outcome of our sample.

Social Anxiety and Negative Symptoms relationship with Social Functioning

Social functioning was not predicted by social anxiety. Similarly, Voges et al. (2005) found that social anxiety was not a significant predictor of social functioning as measured by RFS for their group of people with schizophrenia. When social functioning was measured by scales other than RFS it was negatively associated with social anxiety (Kingsep et al., 2003, Braga et al., 2005). The findings of these studies suggest that the better one functions socially, the less anxious they are in various social situations. Negative symptoms was a significant predictor of social functioning. The variables were negatively correlated. This finding suggests that the more negative symptoms one has or the more severe their negative symptoms are the worse they function socially. This has been confirmed by a number of investigators. For example, Voges et al. (2005) found that negative symptoms (as measured by the PANNS negative subscale) were significantly and negatively associated with social functioning, as measured by the RFS, in sample of people with a diagnosis of schizophrenia.

Other factors that may affect social functioning

Theory of mind disability and prominent negative symptoms were the variables that significantly predicted poor social functioning in our sample of
patients with schizophrenia. We can see though that these two variables do not account for the majority of the variance explained in the regression models. Thus, other variables might be important to account for the non-explained variance. Such variables could be social support, number of friendships and marital status, level of motivation and socioeconomic status. As described in the Freeman’s model of persecutory delusions being close to others enables the individual to revise their thoughts and thus prevent persecutory delusions from developing. Persecutory delusions can affect the social functioning of people with schizophrenia as they might make them more mistrustful and isolated.

Limitations

The present study has several limitations. These limitations are mainly relative to the measures and the sample of the study. First of all, there are no studies, to our knowledge aimed to comment on the psychometric properties of the hinting task, although it has good face validity and has been widely used in similar populations. Furthermore, the hinting task was the only social cognition variable that significantly predicted social functioning for our sample. Also, the Facial Emotion Recognition Task of emotion perception ability that was used has never been used in people with schizophrenia. However, very similar tests of emotion perception ability, like the FEIT used by Brekke et al. (2007), have been used to people with schizophrenia with success at predicting social functioning. One important difference that the FERT has compared to the FEIT is that it requires the participants to recognize the emotion in a large number of photographs (seventy six). Individuals with a diagnosis of schizophrenia may have neurocognitive difficulties such as limited attention and other symptoms like avolition and apathy that may make it difficult for them to complete a long task like this one. Indeed most of the participants asked for a short break in the middle of the task or showed
signs of fatigue, tension and/or frustration. Another limitation could be that we didn’t measure a potential confounder, global neurocognition which have been found to be a significant predictor of social functioning in other studies (Green, et al., 2004, Bae et al., 2010). However, when Couture et al.’s (2010), used the hinting task in a similar sample, they found that theory of mind predicted social skills independently of global neurocognition and that social skills mediated the relationship between theory of mind and community functioning. This implies an independent (in relation to neurocognition) relationship between social cognition and social functioning in our sample.

As described above the two scales that we used to measure social functioning are considerably different in that SOFAS is much more open to bias than the RFS. Indeed, it was noted that some of the interviewers scored in a slightly different way than the others. Specifically, they ascribed greater importance in the social rather than the occupational aspects of disability or vice versa. Interrater reliability scores for the SOFAS were not obtained and this constitutes another limitation for the above reasons.

Additionally, it would be better if we had a larger sample (although our sample was sufficient) that would give us more confidence to comment about the generalization of our results. On the other hand, our sample is highly representative of individuals with longstanding psychosis with all the participants being in rehabilitation services. Also it is important to note that all our participants except one were males and therefore our results refer to males with schizophrenia.

Rehabilitation services were chosen because they are more likely to maximize social functioning even in this impaired group. A general community service might not have the resources or expertise to do this. In that case, service inadequacy would confound the results but be very difficult
to measure. Therefore, the results of this study may not generalize to other types of service, but on the other hand, the sample makes it possible to assess social cognitive deficits with adequate service support.

The sample may also be considered to be biased as some of the patients that met the criteria chose not to participate in the study. The group of people that agreed to participate may share certain characteristics that those who refused do not and this might have biased our sample. This selection bias is difficult to assess.

Conclusion

The main outcome of the present study is that theory of mind and not perception of emotion significantly predicts social functioning in schizophrenia patients. The two variables were both associated with social functioning when simple correlations were used but when the effects of theory of mind were held constant emotion perception lost its predictive power. More specifically the hinting task and not the eyes test of theory of mind (which is comparable with the emotion perception test) was associated with social functioning. The hinting task seems to be a more direct and valid measure of theory of mind by definition as it requires the participants to think and comment about other’s intentions and goals. Apart from that, the hinting task proved to be the best social cognitive predictor of social functioning in the present study. These results are important for two reasons. By evaluating rehabilitation patients’ with schizophrenia theory of mind ability using the Hinting Task we could predict how easy it would be for them to improve their social functioning in the future through various interventions. Furthermore, researchers could design therapeutic plans like social cognitive remediation, for schizophrenia sufferers with poor social functioning, based
on what the hinting task is asking that the patients fail to answer. Role play in various social situations could be an idea of how this could be applied.
References


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Appendix

INFORMATION LEAFLET

Social Cognitive Predictors of Social Function in Psychosis

Thank you for agreeing to talk to us. This information sheet gives you some details of the study we are doing.

Why have you come to see me?
For our study we are asking for help from people who have had difficulties like hearing voices, or worries other people do not share, or difficulty motivating themselves, or difficulty thinking clearly. We are asking you because NHS staffs have told us that you might be able to help.

What does the study involve?
We want to look at what things make a difference to how you get on with other people and get on in day to day life. We want to see how easy you find it to guess what other people think and feel or if you feel anxious when you meet new people. We will ask you to do some tests to see how easy you find guessing what other people think and feel. The idea of the tests is to see how easy things are, not to get everything right. You cannot pass or fail. Then we can see if these things make a difference to how you get on day to day.

To find out more about that, we will also ask if you have a job, how much you see other people and what activities you do. We will ask you if you have any trouble with voices, or worries, or motivation. We only need to ask you these questions and do the psychological tests once. This is a student project for an MPhil in Medicine for Miss Konstantina Bardamascou. The present Participant Information Sheet is from her and her supervisor, Dr Richard Drake.

Will I benefit from being in the study?
Although there is no direct benefit to you, we hope that if we know more about these things then we can find ways to help with them and make our services better. We need to talk to at least 35 people for this study.

Do I have to take part?
You do not have to take part to our study. Taking part will not affect your other treatment and support. If you decide to help we will give you this information sheet and we will give you at least 24 hours to think it over. We are happy to answer any questions you have. Then we will check you are still happy to take part and ask you to sign a consent form. You can
stop at any time if you feel tired or stressed. If you decide not to take part or decide to stop, stopping will not affect your care or treatment in any way.

**Will what I say be confidential?**
All the information you will give us will remain strictly confidential. We will store any details that can be linked to you securely. We will only tell staff things if you give us permission or if there is a high risk of harm to you or others. This is unlikely. We will tell your consultant and GP that you are taking part, if you give us permission.

We would like to be able to check some details that are related to the study in your hospital records, if you give us permission. Staff from the ethics committee and the University might also need to check your records, to make sure we are doing the study properly, but they will keep all the information confidential in the same way we do.

**Can I complain and can I talk to someone else?**
If you are harmed due to someone’s negligence, then you may have grounds for a legal action for compensation but you may have to pay for it. Regardless of this, if you wish to complain, or have any concerns about any aspect of the way you have been approached or treated during the course of this study, the normal National Health Service complaints mechanisms will be available to you. NHS Direct can advise on NHS complaints. Call 0845 4647.

If you have any other concerns or questions, you can contact Dr Richard Drake at the University of Manchester on 0161 306 7944. You can also talk to the NHS Patient Advice & Liaison Service on 0800 015 1462 or E-mail PALS@manchester.nhs.uk.
THEORY OF MIND AND PERCEPTION OF EMOTION AS PREDICTIVE FACTORS OF SOCIAL FUNCTIONING IN PSYCHOSIS
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The University of Manchester
2013

Abstract

The relationship of social cognition with social functioning in schizophrenia has been well documented. Specifically, theory of mind and emotion perception impairments, that are common in people with schizophrenia, have been found to be good predictors of poor social functioning, which is one of the major disturbances of schizophrenia.

The aim of the present study is to investigate the relationship between those two types of social cognition and social functioning. We hypothesized that both ToM and PoE would be positively associated with social functioning and that those two types of social cognition would be independent predictors of social functioning for people with a diagnosis schizophrenia.

The Hinting Task and the Eyes Test were used as measures of social cognition. The Face Emotion Recognition Task was used to measure emotion perception. The SOFAS and RFS were used to measure social functioning. 43 rehabilitation patients with schizophrenia completed these measures of social cognition and social functioning and their symptomatology and social anxiety were also assessed. Their demographic characteristics were collected.

Both types of social cognition were significantly related with social functioning when Pearson’s correlation was used. Multiple regression analyses showed that ToM and emotion perception were not independent predictors of social functioning. Multiple regression analysis indicated that the variables that better predicted social functioning were negative symptoms and ToM as measured by the Hinting Task.