

# Schizophrenia and Social Cognition: A Review of Concepts and Treatment Options

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## Abstract

Social cognition is a neuropsychological domain of the human psyche, in charge of processing the information about ourselves and the people that surrounds us. This includes recognition of faces and emotions, facial expression, experience sharing, reactions, and inferring people's mental processes. Schizophrenia is the most severe condition in the psychotic disease range, presenting with both positive and negative symptoms. Social cognition is affected in schizophrenic patients, impairing their ability to function properly in society. Recent research has been done in the areas of emotion and face recognition in schizophrenics, with the aim of improving treatment options through various neuropsychiatric approaches. In the medical field, oxytocin has been discovered to be a key molecule in mediating human social performance, and its use is being studied for improving social cognition in schizophrenia. We offer a review and update on the main concepts of social cognition and its disturbances caused by schizophrenia, along with the treatment options available and the direction in which future research is heading.

**Keywords:** Cognition; Schizophrenia; Social behavior; Neuropsychiatry; Emotions; Theory of mind

## Introduction

In recent years, there has been an increased interest in the medical and psychological field on social cognition, which is a term involving the psychological means needed to process, encode, store and regulate the information about other individuals and oneself [1-3]. Experience sharing, face and emotional recognition, getting insight about people's thoughts from their expressions, and emotional reactions are among some of the components of social cognition [2,4,5]. It is now considered a neuropsychological domain, along with processing speed, attention, memory, learning, reasoning and problem solving, and is related to many different brain areas and complex pathways [6-10].

Schizophrenia is one of the most recognized psychiatric conditions, and it can severely incapacitate social functioning of the affected individual [11,12]. Schizophrenic symptoms are divided in two groups:

positive and negative (Table 1). Most of the clinical research conducted is directed toward positive symptoms of schizophrenia. However, the negative symptoms are the ones most directly involved with social impairment [10,13,14]. It is now known that social cognition is affected in schizophrenic patients, and recent research has provided more insight into which areas become more compromised [11,12,15]. Experimental models have shown that psychotic subjects seek social withdrawal, which is associated with altered neural pathways and receptors [5,9,16,17]. Patients with schizophrenia often find themselves being unable to recognize facial expressions or misunderstanding comments, even having trouble assessing whether someone is addressing them or not, and they progressively become socially isolated [2,18,19]. As such, social impairment has a stronger impact on quality of life than non-social impairment [2,20]. In this review, we aim to provide an update on the main social cognitive deficits presented by schizophrenic patients, and the most recent research being done on this field (Table 1).

Positive symptoms	Negative symptoms
Hallucinations [auditory, visual, etc.]	Anhedonia
Delusions	Lack of drive
Altered speech	Reduced motivation
Loose associations	Reduced expression of emotion
Odd, eccentric or agitated behavior	Diminished social capabilities

**Table 1:** Summary of positive and negative symptoms in schizophrenia [2].

## Social cognitive impairment in schizophrenia

Individuals with schizophrenia start manifesting social impairment early on their disease history, when it is still regarded as a psychotic disorder and not as a chronic established condition [21,22]. Negative psychotic symptoms and social interaction anxiety reduce social functioning, which becomes worse as the psychosis gets more severe [14,21,23]. It is still unclear if people at high risk for schizophrenia have early social cognitive impairment, but they should be closely followed to detect any sign of psychosis [24,25]. Social rewarding is also altered in these patients when compared to healthy subjects, reacting differently and activating different brain areas of the brain when engaged in these conditions [17].

Interpersonal communication is a complex process that involves facial expression, body posture, hand movement, voice tone and even gait [2,26]. Patients with psychosis and schizophrenia with impaired social capacities have difficulty when communicating with other people, as they find it hard to recognize all these factors and integrate them into the correct message that the speaker is trying to relay [26,27]. They can get the message wrong, or misinterpret something said to them, increasing confusion and even worsening the severity of positive symptoms due to anxiety [15,18]. The inability to recognize facial affect is an important predictor of functional outcome in schizophrenia, and it hinders communication considerably [4]. It is still unclear if these social deficits are different between genders, but the neural pathways involved appear to be the same [3,4,7]. Emotion recognition from facial expression is affected both for explicit and implicit facial emotions, such as fear, happiness, anger and surprise, and this condition is associated with poorer problem-solving skills and social performance [28]. Facial emotion recognition is associated with neural activation at the bilateral fusiform gyrus, visual cortex, temporal lobes, limbic system [specially the amygdala, cingulate cortex and Para hippocampal gyrus], inferior frontal and medial prefrontal gyri, and putamen [2,8]. Schizophrenic patients perform worse when asked to identify facial expressions, as has been proven by many MRI-based studies, identifying GABAergic pathways as responsible for this deficit [2,5].

Speech is just as important for a correct communication. Components of speech include voice pitch, intonation, rhythm, emphasis and emotional tone, and they provide more information about the message being relayed, adding meaning to the words [2,26]. Emotion can also be transmitted via speech by using rhythm, or prosody, and some studies have demonstrated that schizophrenic patients also have difficulty recognizing vocal emotions [23,29]. When listening to sentences read with emotional intonation and without it, schizophrenic patients could not make a correct distinction, as healthy subjects did without problem [2,27].

The ability to make conscious decisions in daily life situations can also be affected in patients with psychosis, and this is derived from many cognitive processes working simultaneously [12,30]. When faced with social situations such as economic decision-making, socially impaired individuals have unpredictable reactions that can cause them to get into uncomfortable situations they actually did not intend to end up in [10]. However, a recent study found that, while still suffering from emotion processing abnormalities, schizophrenic patients retained a good decision-making capacity, even when the proposer changed emotions while facing patients with a decision [30].

Mentalizing [or the theory of mind], which is the ability to understand other people's thought process based on the social context,

including inferring their beliefs, emotions and intentions [1,2]. It is now well known that schizophrenic patients struggle with mentalizing when presented with a cartoon panel and being asked to infer the intentions of a character, or understanding what the beliefs of said character are [2]. In cases where mentalizing is correctly achieved by psychotic individuals, it usually requires a greater level of neural activity than healthy controls [2,31]. The temporoparietal junction, temporal pole, precuneus and medial prefrontal cortex are activated during mentalizing, and it has been suggested that excitatory impulses from the amygdala assist in achieving it [2]. Diminished gray matter volume, such as in schizophrenia, can affect this process [31].

The act of internally sharing experiences with other individuals is another condition thought to be hampered by schizophrenia [12]. Experience sharing is achieved by both motor resonance, which refers to a synchronization of movements of the actor and the observer when communicating, and affect sharing, the activation of emotion-related brain regions on the observer when faced with an emotional expression from the actor [2,26]. This confers an ability to identify oneself with the speaker, or actor, and better understand his or her motivations, thoughts and feelings [11,28]. As of now, results from studies regarding experience sharing capacity in schizophrenics are inconclusive [2]. It has been proven that these patients need continuous and strong interpersonal connections in order to pursue recovery, remarking the importance of being able to correctly identify with the speaker's emotions, through the process of experience sharing [27,32].

Immediate emotion expression does not seem to be affected by psychotic states, as recent studies have shown that patients with schizophrenia show the same core first reactions when presented with sudden emotional situations that healthy subjects do, even when negative symptoms such as anhedonia are present [2,15]. However, they seem to have a dysregulated emotion regulation process, which causes them to present an exaggerated or diminished reaction, even when that reaction is the correct one for the situation [fear, anger, happiness, etc.] [7,24]. Cognitive appraisal, which is the mean human beings use subconsciously to regulate emotions before expressing them, in order to deliver a reaction of adequate level, has been observed to be less frequently used by schizophrenic patients [2,19].

While it seems clear that schizophrenics underperform when tested for social cognition components, compared to healthy individuals, an alternate and interesting theory suggests that these patients are unmotivated then being assessed for cognitive function, and thus obviously perform worse. A recent study found a significant relationship between performance and motivation levels, and this causes researchers to ask whether a motivation is directly affecting task results in schizophrenia, or it is schizophrenia itself that is causing this drop in motivation due to impaired social abilities [10,33].

The subject of conceptual disorganization had been brought to light in recent years due to its potential relationship to social impairment in schizophrenia. This refers to a psychotic symptom characterized by loose associations, disrupted goal-directed sequencing, an illogicality [34]. It has been suggested that conceptual disorganization moderates relationships between cognitive processes, especially the control of neurocognition over social cognition [12,34]. As such, conceptual disorganization has recently become a topic of research as a possible treatment target, aiming to improve social impairment in schizophrenics [23,34].

## Treatment options

In addition to antipsychotic therapy, social rehabilitation is an essential aspect of the treatment of schizophrenia. It has been noticed that a healthy social environment and functioning is necessary to achieve recovery and symptom control in these patients, and there are many interventions being used and researched to improve social impairment treatment [20]. Social cognitive interventions are classified as targeted, comprehensive and broad-based therapies, each with a proven effect on improving social performance of individuals, but with still limited success on severe cases [35].

Targeted treatments are aimed at specific domains of social cognition, such as social perception, emotion processing, or mentalizing [35]. Of these, affect recognition therapy for improving the processing of emotions is the most widely recognized treatment, and it involves asking participants to correctly identify the emotion being shown in a picture of a face, praising the patient if a correct answer is given [2,12,35]. This method can also involve “re-teaching” a patient how to differentiate emotions, by given detailed explanations on the meaning of a particular emotion and the context in which it is used, or asking the patient to infer which emotion or thought is being presented based on a specific situation [36,37]. Social perception can be improved with memory oriented techniques that intend to present the patients with different social cues and showing them to recall these cues in everyday life, applying them to the correct scenario [35]. Theory of mind improvement has been achieved by asking patients to verbalize the most likely thoughts and motivations shown by a cartoon character in a set of vignettes [31,35].

Besides the high amount of targeted treatment options available, a group of comprehensive therapies have arisen to provide an alternative option for management. These methods are not aimed at a specific social cognitive domain, instead taking a comprehensive approach to social cognition as a whole [38]. One of such therapies prompt patients to attend a full series of office visits, where they are taught how to identify basic emotions, design strategies to avoid jumping into conclusions too fast when presented with social situations, and acquiring various social cognitive skills for application in real life scenarios, separating real facts from guesses [35,38]. Comprehensive therapies are aimed at emotion recognition, social perception, Attributional bias and mentalizing, but are applied together at the same time for a more integral management of cognitive impairment [35]. Broad-based therapies are derived from comprehensive methods, but they focus not only on social cognition but also on neurocognition, seeking to use improvements on the latter to positively affect social performance [20,35]. The effect of neurocognitive remediation on social cognition aspects has been studied by some research groups, but if an improvement occurs, it does not seem to last after long-term follow-up, indicating that there is still more research needed on this field in order to determine its usefulness for treating these patients [4,39].

Advances in management for social impairment have arisen not only in neuropsychiatry, but also in the medical field, where we have come to understand that antipsychotic treatment alone will not restore the patient to proper social functioning [40]. Oxytocin has been identified as one of the neuromodulators involved in social cognition, specifically in emotion recognition, trust behavior and empathy [9,41]. It interacts with dopamine and serotonin receptor in the nucleus Accumbens and the amygdala, reduces cortisol release, and controls anxiety when faced with social stress [41-43]. The ability to interpret facial emotions and mental states, and the time spent staring at other

people's eyes when viewing their faces are also enhanced by oxytocin [41]. Peripheral oxytocin levels have been discovered to be elevated immediately after being involved in social experiences [43]. Several studies have assessed the utility of an intranasal oxytocin injection for improving social capabilities in schizophrenia [41,44]. A single dose of the hormone administered in conjunction to social cognition learning therapies has demonstrated to be beneficial in treating altered high order cognitive domains [44]. Other molecules and hormones are undergoing research in order to determine their usefulness in treating the social impairment of schizophrenics [16,40].

## Conclusion

Social impairment in schizophrenia is a functionally devastating condition, which can be even more limiting for everyday life than the presence of positive psychotic symptoms. Most of the principal components of social cognition, including emotional awareness, face expression recognition, interpersonal communication, and the capacity to identify the mental processes of others, are affected in schizophrenics. The correct identification and management of social cognition disturbances will help with restoring normal functioning in most non severe cases, along with the already well known medical antipsychotic treatment. Several neuropsychiatric approaches exist, each oriented either to a specific component, or to the integral concept of social cognition. These strategies have the common goal of restoring the individual to normal or acceptable social functioning. New options in medical treatment are also being researched, and there is need for further research on both psychological and medical therapies directed to treating social impairment in more severe cases, as well as improving treatment options for the whole range of psychotic disorders.

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