NEUROBIOLOGY OF PSYCHOSIS. CLINICAL AND PSYCHOSOCIAL IMPLICATIONS

This is a new Section of *Epidemiologia e Psichiatria Sociale*, called *Neurobiology of Psychosis, Clinical and Psychosocial Implications*, that will regularly appear in each issue of this Journal to describe relevant neuroscience topics. In particular, studies investigating the relationship between neurobiology and psychosocial psychiatry in major psychoses will be debated. The aim of these articles is to provide a better understanding of the neural basis of psychopathology and clinical features of these disorders in order to raise new perspectives in every-day clinical practice.

Paolo Brambilla, *Section Editor* and Michele Tansella, *Editor* EPS

Social cognition, schizophrenia and brain imaging

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Social cognition refers to the whole "mental operation underlying social interactions, which includes the human ability to perceive the intentions and disposition of others" (Brothers, 1990). Although social cognition has differently been defined, most of the researchers suggest that it is composed by the following domains: (a) emotional processing, (b) theory of mind (the ability to infer the intentions and beliefs of others), (c) social perception (which expresses the person's ability to ascertain social cues from behaviour provided in a social context, including emotional cues), (d) social context, (e) social knowledge (the awareness of the roles, rules and goals that characterize social situations and guides social interactions), and (e) attributional bias (how one explains the causes for positive and negative outcome of events) (Green *et al.*, 2005; Salovey *et al.*, 1997; Toomey *et al.*, 1997). All these dimensions would together support the complex behaviours necessary for social interactions. A neural network involving prefrontal cortex (PFC) areas (i.e. orbitofrontal cortex, ventrolateral, dorsolateral and dorsomedial PFC), cingulate, fusiform gyrus, amygdala, and superior temporal sulcus participate in supporting social cognition in humans (Burns, 2006; Grady *et al.*, 2002). In this regard, individuals with PFC damage have impaired social behaviour and functioning, despite the retention of intact cognitive skills. This would lead to misinterpretation of social situations, especially when the damage is located in the orbitofrontal/ventromedial PFC region (Shamay-Tsoory *et al.*, 2007).

Impairment in social functioning is also a core feature of schizophrenia (Spauwen *et al.*, 2006; Pinkham *et al.*, 2003). Burns (2006) argued that the patient's sense of detachment and disembodiment from "social self" and "social world" is the essential disturbance of schizophrenia. Altered social cognition is in fact present throughout the course of the illness, worsens with chronicity, is often resistant to antipsychotic treatment, and may represent a risk factor for the disease (Killackey *et al.*, 2007; Pinkham *et al.*, 2003; Addington *et al.*, 2000). Moreover, since social cognition partially sustains functioning, it is considered an intervention target (Green *et al.*, in press) and some studies have shown that cognitive training may improve social outcome measures in schizophrenia (Combs *et al.*, 2007; Jabben *et al.*, 2007; Wolwer *et al.*, 2005). Indeed, there is growing evidence that social cog-

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nition is related to various domains of functional outcomes in schizophrenia, such as social problem solving, social behaviour and community functioning (Couture *et al.*, 2006). For instance, it has been found that disorganization as well as negative symptoms correlate with poorer social functioning (Norman *et al.*, 1999; Sergi *et al.*, 2007). Therefore, it is of great interest to understand the neurobiological basis of social cognition impairment in schizophrenia (Green *et al.*, in press) which has been explored, to our best knowledge, by few imaging studies (see Table I and Brunet-Gouet & Decety, 2006, for an extensive review). In particular, Chemerinski *et al.* (2002) found an inverse correlation between ventral frontal cortex size and social dysfunction (the worse the social functioning the smaller the volumes). Also, reduced medial PFC and anterior cingulate gray matter concentrations have been reported to associate with poor emotion perception (Fujiwara *et al.*, 2007; Yamada *et al.*, 2007). Finally, hypoactivation in middle/inferior frontal gyrus during mental state attribution was observed in subjects with schizophrenia (Russel *et al.*, 2006).

Table I. – *Magnetic resonance imaging (MRI) studies exploring the neural basis of social cognition in schizophrenia.*

Study	Subjects	Age (years)	Lengh of illness (years)	Social cognition evaluation	Findings
Russel *et al.*, 2000	5 chronic male patients 7 healthy controls	36±9 40±11	13±7	Mental State Attribution task (Baron-Cohen's eyes task)	Hypoactivation in the left middle/ inferior frontal gyrus during task performance
Chemerinski *et al.*, 2002	45 chronic patients 45 healthy controls	30.0±8.9 30.5±8.5	6.9±8.1	Premorbid Adjustement Scale Scale for the Assessment of Negative Symptoms	Ventral frontal cortex volumes inversely correlated with social cognition abilities
Lee *et al.*, 2006	13 chronic patients with acute episode 13 healthy controls	31.7±7.3 30.5±8.8	9.8±5.4	Social Cognition task (Farrow's test)	Deficit of activation in left medial prefrontal cortex partially ameliorated after recovery (being directly associated with improved social functioning)
Yamada *et al.*, 2007	20 chronic patients 20 healthy controls	38.8±7.2 39.1±7.1	11.6±8.7	Benton Facial Recognition Test Perception of Affect Task	Association between decreased gray matter density of medial prefrontal cortex and and emotion attribution impairments
Fujiwara *et al.*, 2007	26 chronic patients 20 healthy controls	37.1±7.1 37.8±7.4	10.1±7.9	Perception of Affect Task	Relationships between reduced volumes of anterior cingulate and social cognition deficits

In conclusion, deficits of social cognition have consistently been described in schizophrenia by neuropsychological studies, possibly representing a vulnerability marker for the disease (Pinkham *et al.*, 2003; Couture *et al.*, 2006). Interestingly, imaging studies suggest that structural and functional alterations are present in patients suffering from schizophrenia (Russel *et al.*, 2000), with partial normalization after recovery from an acute episode (Lee *et al.*, 2006). Impairment of specific PFC areas (i.e. medial and ventral regions), probably along with altered connections with other cortical (i.e. anterior cingulate) and subcortical (i.e. amygdala) structures, may sustain impaired social cognition in schizophrenia (Brunet-Gouet & Decety, 2006; Lee *et al.*, 2004). The fMRI study of social cognition neural network may become a useful tool to detect prognosis and outcome targets of treatment and rehabilitation interventions in schizophrenia (Lee *et al.*, 2006). However, imaging studies recruiting first-episode patients are expected to better differentiate the neural mechanism underlying social and emotional misattributions in the context of social cognition and to further explore the neurotransmission pathways sustaining such impairments.

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