NEUROBIOLOGY OF PSYCHOSIS. CLINICAL AND PSYCHOSOCIAL IMPLICATIONS

This is a Section of *Epidemiologia e Psichiatria Sociale*, that regularly appears 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 short articles is to provide a better understanding of the neural basis of psychopathology and clinical features of these disorders in order to raise new perspective in every-day clinical practice.

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

Emotion-Based Decision Making in schizophrenia: evidence from the Iowa Gambling Task

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The decision making can be defined as the mental process in which a "*choice is made after reflecting on the consequences of that choice*" (Bechara & Van Der Linden, 2005; Bechara *et al*., 1997). It is a complex process that involves cognitive as well as emotion-based functions. In fact human beings make fast adaptive decisions in daily life, and that is based on the skill to relate emotion to contextual stimuli in order to anticipate outcomes through activation of emotional states (Bechara *et al*., 2005). In this regard, the ventromedial prefrontal cortex (VMPFC) has been widely recognized to play a key role in the emotional decision making process. The VMPFC includes the medial part of the orbitofrontal cortex (OFC), the more ventral sectors of the medial prefrontal cortex and the anterior cingulate cortex (Bechara *et al*., 1997). In particular the OFC, within the VMPFC, is part of a neural system underpinning decision-making and reward-related behaviours which are thought to be linked to social conduct (Rolls, 2000).

The Iowa Gambling Task (IGT) is an extremely widely used neuropsychological test for investigating emotion-based decision-making skill (Bechara *et al*., 1997). This task simulates real-life decision making by testing the ability of participants to learn to sacrifice immediate rewards in spite of long-term gains. It was firstly developed to study emotional decision-making process among people with VMPFC cortex lesions, which were associated with poor decision-making skills (Bechara *et al*., 1997). The IGT is particularly sensitive to OFC function because it engages decision-making processes regarding events that have emotionally significant consequences, such as meaningful rewards and losses (Lawrence *et al*., 2008). Indeed, Premkumar *et al*. (2008) reported in healthy subjects a direct association between IGT overall learning and left OFC grey matter volumes, which was not found in patients with schizophrenia. The goal of this task is to win as large a gain as possible. The subject is required to pick 100 cards, one at a time, from four decks of cards (A-D). Each card selection results in either a reward or a fine. However, the frequency and magnitude of wins and losses associated with each deck are not revealed to the subject and must be learned through experience. Cards in

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decks A and B (disadvantageous decks) involve higher immediate gains than C and D decks (advantageous decks), but they also involve larger and more frequent losses than C and D decks (Bechara *et al*., 1997).

Table I – *Behavioural studies investigating Iowa Gambling Task performance in schizophrenia patients and healthy subjects.*

Study	Subjects (N.)	Age (Years ± S.D.)	Lenght of illness	Findings in schizophrenia
Wilder *et al*. (1998)	12 patients 30 controls	33±6 30±10	12±8	No differences between schizophrenia patients and normal controls
Cavallaro *et al*. (2003)	110 patients 56 controls	33±9 31±6	9±7	No differences between schizophrenia patients and normal controls
Ritter *et al*. (2004)	20 patients 15 controls	48±6 47±10	26±5	Patients had significantly larger differential between disadvantageous cards and lost more money than controls
Shurman *et al*. (2005)	39 patients 10 controls	33±10 32±4	Various duration of illness	Patients had earned less money than controls. Patients had a preference for decks with low frequency and high punishments
Rodrìguez-Sànchez *et al*. (2005)	80 patients 22 controls	26±7 26±6	First episode patients	No differences between schizophrenia patients and normal controls
Kester *et al*. (2006)	15 patients 25 controls	16±3 17±2	5±3	Patients had worse performances than controls
Premkumar *et al*. (2008)	75 patients 25 controls	38±9 35±12	14±10	Impairment in overall performance in patients relative to controls

IGT = Iowa Gambling Task; S.D. = Standard deviations.

Deficits in task performance have been demonstrated in a wide range of psychiatric disorders, such as obsessive-compulsive disorder (Cavedini *et al*., 2004a), substance dependence (Sevy *et al*., 2007), eating disorders (Cavedini *et al*., 2004b) and pathological gambling (Cavedini *et al*., 2002). IGT performance has been also studied in schizophrenia, with several behavioural studies reporting poorer decision making ability in adult (Ritter *et al*., 2004; Shurman *et al*., 2005; Lee *et al*., 2007; Premkumar *et al*., 2008) as well as in adolescent patients (Kester *et al*., 2006), although not in all studies (Cavallaro *et al*., 2003; Rodriguez-Sanchez *et al*., 2005; Wilder *et al*., 1998). However, it has consistently been shown that patients with schizophrenia fail, or take a longer time, to adjust their selections to advantageous decks throughout the task based on feedback from their previous choices (Ritter *et al*., 2004; Shurman *et al*., 2005). Interestingly, it has been suggested that schizophrenia patients with poor IGT performance have more somatic concerns, social isolation (Premkumar *et al*., 2008) and negative symptoms (Shurman *et al*., 2005). In conclusion, poor emotion-based decision making is well demonstrated in schizophrenia and may affect social adaptation and general functioning, symptoms considered to be core features of the illness (Bellani & Brambilla, 2008; Di Michele *et al*., 2007). Future longitudinal studies should try to better identify whether such impairment correlates with OFC/VMPFC deficits and with social adjustment, trying to explore it before and after cognitive rehabilitation.

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