

# Cognition, social cognition and social functioning in schizophrenia

Paola Jaramillo, Inmaculada Fuentes, I.\* and Juan C. Ruiz

*University of Valencia, Spain*

*(Received December 28, 2008; Accepted January 27, 2009)*

**ABSTRACT:** The discoveries continually being made in the study of schizophrenia have shown the complexity of this serious mental disorder. Research has enabled intervention to be redirected to focus on areas of maximum impact and efficacy. Currently, studies concur that the majority of people with schizophrenia exhibit deficits in non-social cognitive functioning, in performance in social cognition tasks and clearly in social functioning. This article aims to give a concise overview of developments made in these three areas and the importance of the subsequent relations between them.

*Key words:* Schizophrenia, Cognition, Social Cognition, Social Functioning.

**RESUMEN:** La investigación en el campo de la esquizofrenia pone de manifiesto permanentemente la complejidad de este grave trastorno mental. Los estudios en la intervención en dicho trastorno se han dirigido últimamente a las áreas que muestran más impacto y más eficacia en el tratamiento. En la actualidad en la literatura se está de acuerdo en que la mayoría de personas con esquizofrenia muestran déficit en funcionamiento cognitivo no social, una ejecución deteriorada en las tareas de cognición social y consecuentemente en el funcionamiento social. Este trabajo tiene como objetivo presentar una revisión concisa de los desarrollos y avances llevados a cabo en estas tres áreas y además en la importancia de las relaciones que se presentan entre ellas.

*Palabras clave:* Esquizofrenia, Cognición, Cognición Social, Funcionamiento social

The Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) project has focussed on understanding the nature and extent of cognitive dysfunction in schizophrenia in order to facilitate the development of treatments that will hopefully improve this debilitating aspect of schizophrenia (Barch, 2005). MATRICS looks at seven cognitive domains where schizophrenic patients demonstrate deficits. These cognitive domains are: speed of processing, working memory, attention/vigilance, verbal learning and memory, visual learning and memory, reasoning and problem solving, and social cognition (Green and Nuechterlein, 2004).

In the mid nineties, the latter, social cognition, began to be a focal point of research because it was thought to be a factor that could partly explain the deterioration of social functioning in persons suffering from schizophrenia. Currently, results of various studies suggest that social cognition is a mediator variable between basic cognition or neurocognition and social functioning (Brekke, Kay, Lee and Green, 2005; Vauth, Rüsck, Wirtz and Corrigan, 2004). In this context, it is important to review, in brief, the importance of social cognition and its relationship with neurocognition and social functioning in people with schizophrenia.

\* Correspondence: I. Fuentes. Department of Personality, Evaluation and Psychological Treatments, Faculty of Psychology, Avda. Blasco Ibañez, 21. 46010 Valencia. E\_mail: [inmaculada.fuentes@uv.es](mailto:inmaculada.fuentes@uv.es)

Acknowledgements: This study has been subsidised by the Ministry of Education and Science, SEJ2006-07055

## COGNITIVE DEFICITS IN SCHIZOPHRENIA

Studies in cognitive disorders in schizophrenia have grown noticeably and many researchers have even proposed that such disorders are nodal points of the illness (Pardo, 2005). A high percentage of people with schizophrenia demonstrate some kind of cognitive deficit and, more specifically, in 40% these are considered serious. Nonetheless, it has to be pointed out that an estimated 30% of schizophrenic patients do not exhibit any significant deficit in their cognitive or neuropsychological functioning (Rund and Borg, 1999).

A review carried out by Rund (1998) analysing fifteen longitudinal studies evaluating the neuropsychology of schizophrenic patients, concluded that, from the onset of the illness, cognitive deficits are relatively stable over time, and even more stable than the symptoms of the illness itself, especially the positive ones. According to Hoff, Sakuma, Wieneke et al. (1999), they tend to be one or two standard deviations below the performance of normal people.

It is considered that attentional deficits are a specific trait. These are stable over time and independent from fluctuations in clinical state (Cornblatt and Keilp, 1994). People with schizophrenia, in comparison to normal people, show greater distraction, slower response times, reduced vigilance and problems with tasks requiring continual processing. They also exhibit problems in distinguishing important stimuli from irrelevant stimuli and in multi-tasking as well as in maintaining or changing the location of attentional resources (Balanzá, 2005). In general, these attentional deficits come to the fore when tasks are very complex, as these require a higher degree of information processing (Balanzá, 2005).

The deficit pattern for memory is quite global and includes semantic memory tasks, verbal working memory and short and long-term visual spatial memory, with episodic memory relatively intact. Patients' performance was poorer in recall than in recognition and in long-term recall as opposed to immediate (Balanzá, 2005). Deficits in learning and memory could be related to a failure to use contextual signs and in the strategic processes necessary to classify and retrieve information. This deficiency would generate failures in verbal memory.

Some studies have found that deficits in working memory in patients can typically amount to four deviations from the average performance of normal people while for long-term memory they are only typically one deviation lower than the average (Sharma and Antonova, 2003).

Various studies conclude that patients exhibit problems in executive functions and demonstrate difficulties in solving problems. These complications are evident in both the handling of concepts and hypothesis as well as in abstract reasoning and monitoring own behaviour. Additionally there are deficits in planning, insight and social judgement (Balanzá, 2005).

*SOCIAL COGNITION IN SCHIZOPHRENIA*

Social cognition refers to the set of processes and functions that allow a person

to understand and benefit from the interpersonal environment (Corrigan and Penn, 2001).

The most important areas of social cognition are: emotion processing, theory of mind, social perception, social knowledge (social schema), and attributional bias. In this review we will be concentrating on discoveries made in emotion processing in people with schizophrenia because this is one of the areas of social cognition that has been more extensively researched.

Emotional processing is a construct involving a broad range of aspects related with perception and using emotions. The findings in the area of emotional processing indicate that schizophrenics have a marked deficit in facial and vocal affect recognition (Baudouin, Martin, Tiberghien, Verlut and Frank, 2002; Borod, Martin, Alpert, Brozgold, and Welkowitz, 1993; Edwards, Jackson and Pattison, 2001; Heimberg, Gur, Erwin, Shtatsel, Gur, 1992; Mandal, Pandey and Prasad, 1998; Penn et al., 2000; Schneider et al., 1995; Walker, 1994). These deficits are not related to age, gender, level of medication or dosage of neuroleptics (Poole, Tobias and Vinogradov, 2000; Salem, Kring and Kerr, 1996; Schneider et al., 1995). In general, these deficits in facial affect recognition occur in both recognition and discrimination (Penn et al., 2001, Schneider et al., 2006).

People with schizophrenia present deficits in affect recognition when compared with non-clinical control groups and subjects with non-psychotic clinical diagnoses (Edwards et al., 2002; Mandal et al., 1998; and Morrison, Bellack and Mueser, 1988). These deficits may be due to overall low performance (Bellack, Blanchard and Mueser, 1996; Kerr and Neale, 1993; Mueser, Doonan and Penn et al., 1996; Salem et al., 1996).

Patients with chronic schizophrenia that have marked negative symptoms present more deficits in their ability to recognize facial emotions and in their social skills than less chronic patients (Mueser et al., 1996; Penn, Spaulding, Reed and Sullivan, 1996).

Penn et al. (2001) state that there is evidence that patients in the acute phase of the disorder have poorer performance in affect recognition tasks than patients in the remission phase (Gessler, Cutting, Frith and Weinman, 1989) even though these deficits seem to be fairly stable in longitudinal studies (Addington and Addington, 1998; Gaebel and Wölwer, 1992; Wölwer, Streit, Polzer and Gaebel, 1996). Scholten, Aleman, Montagne and Kahn (2005) have confirmed that women with schizophrenia have better performance in labelling negative emotions than men with schizophrenia.

Happiness is the most easily recognized facial expression followed by surprise, and the judgment of fear is less accurate than other emotions (Edwards et al., 2002). The review of Edwards et al. (2002) underscores the strong methodological limitations of the studies due to the ambiguous characteristics of the participants and the wide variety of instruments used, which makes the validation and generalization of the results difficult.

### **SOCIAL FUNCTIONING IN SCHIZOPHRENIA**

Social dysfunction is a hallmark characteristic of schizophrenia that has important implications for the development, course, and outcome of this illness (Couture, Penn and Roberts, 2006).

It is believed that decline in social functioning represents an area independent from negative and positive symptoms (Lenzenweger and Dworkin, 1996; Lenzenweger, Dworkin and Wethington, 1991; Strauss, Carpinter and Bartko, 1974). These deficits, while present in other clinical groups (bipolar disorder), are more pronounced in patients with schizophrenia (Bellack, Morrison, Wixted and Mueser, 1990) and are more evident in children and adolescents who later go on to develop the disease (Dworkin, et al., 1993; Hans, Marcus, Henson, Auerbach and Mirsky, 1992; Walker, 1994). These social deficits are frequently already present in the first phases of the disease and anti-psychotic treatments are more effective on positive symptomology than on social deterioration. Furthermore, it is the social deficits themselves that often worsen the course of the disease and probably contribute to relapse (Pinkham, Penn, Perkins and Lieberman, 2003), and these could be the most powerful predictors in patient prognosis (Mueser, Bellack, Morrison and Wixted, 1990; Tien and Eaton, 1992).

#### RELATIONSHIP BETWEEN SOCIAL FUNCTIONING AND COGNITIVE DEFICITS

Overall, research findings suggest that neurocognition explains between 20% and 60% of the variance in the functional outcomes of individuals with schizophrenia (Green, Kern, Braff and Mintz, 2000). Furthermore, there is evidence that cognition can be seen as a significant predictor in social functioning during the first years of the illness (Robinson, Woerner, McMeniman, Mendelowitz and Bilder, 2004).

Various studies have found an association between cognition and social functioning (Addington, McCleary and Munroe-Blum, 1998; Addington and Addington, 1999; Addington and Addington, 2000; Bellack, Gold and Buchanan, 1999; Green et al., 2000; McGurk and Mueser, 2003; Milev, Ho, Arndt and Andreasen, 2005), but there are, however, other studies that have not (Breier, Schreiber, Dyer and Pickar, 1991; Dickerson, Boronow, Ringel and Parente, 1996).

Research carried out by Holthausen, Wiersma, Cahn et al. (2007) found significant differences between patients with and without cognitive deficits in areas such as work and vocational functioning. It would seem that cognition is a more powerful indicator of work performance when there are cognitive deficits than when there are not.

There is also evidence that neurocognitive capacity can be related to acquisition of social skills (Green and Nuechterlein, 1999), to functioning in day-to-day activities (Dickerson et al., 1996) and to independent living.

A review by Green et al. (2000) of 39 published studies suggests that different types of cognitive deficits are associated with different areas of social functioning and that these cognitive deficits could individually determine the functional performance of people with schizophrenia. Specific cognitive deficits such as those in working memory, executive functioning, verbal memory and vigilance could be associated with poor social functioning and with problems in social skill acquisition.

In figure 1 we can see a scheme created by Green et al. (2000) illustrating the meta-analysis results summarizing some of the discoveries of various studies on the relation between cognitive variables and social functioning.

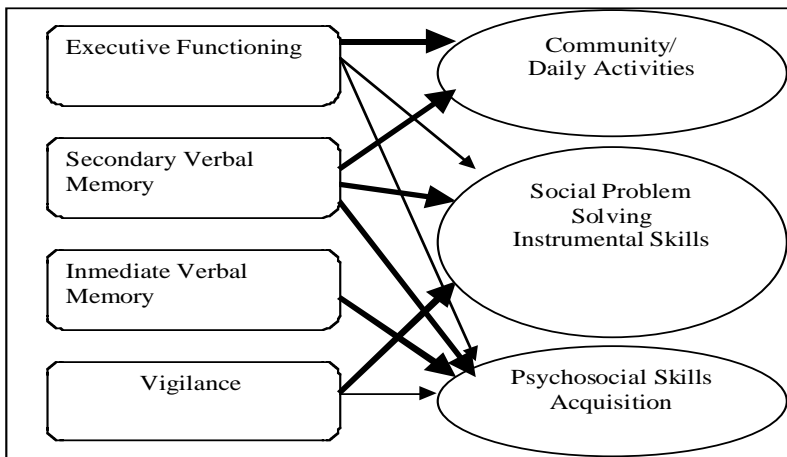


Figure 1. Relation between cognitive variables and social functioning

Certain cognitive areas such as verbal memory and vigilance have been repeatedly considered as predictors of the functional result in specific areas such as community functioning, social problem solving and social acquisition skills. Fujii and Wylie (2003) found that verbal memory explained nearly half of the variance in a community outcome measure. Deficits in working memory, in turn, demonstrate a strong correlation with occupational functioning and the capacity to lead an independent life (Sharma and Antonova, 2003).

On the other hand, deficits in executive functioning also have a significant impact on areas of occupational functioning. Rund and Borg (1999) also discovered that levels of performance in executive functioning were, a predictor not only of occupational development but also of day-to-day social functioning.

However, these discoveries in performance of executive function are diverse: on the one hand there are studies that have associated low performance with deficits in social functioning (Penadés, Boget, Catalán et al., 2003; Penn et al., 1996), and then there are other studies that do not (Addington and Addington, 1999; Dickerson et al., 1996; Fujii and Wylie, 2003). This could be due to differences in the measures used to evaluate social functioning (Cohen, Forbes, Mann and Blanchard, 2006).

#### RELATIONSHIP BETWEEN SOCIAL FUNCTIONING AND SOCIAL COGNITION IN SCHIZOPHRENIA

Growing empirical evidence is relating deterioration in social functioning with deficits in social cognition. Deficits in emotion perception and in social problem solving are common (Bellack, Morrison, and Mueser, 1989; Morrison et al., 1988) and are associated with social competence (Mueser et al., 1996; Spaulding, Weiler and Penn, 1990) and with social functioning (Sullivan, Marder, Liberman, Donahoe and Mintz, 1990).

Corrigan and Toomey (1995) compared the relationship between measures of

social and non-social cognition with the ability to resolve inter-personal problems, demonstrating that measures of social cognition bear a more consistent relation with the ability to resolve these types of problems than measures of non-social cognition. Penn et al. (1996) extended the results of Corrigan and Toomey (1995). In both studies, measures of social cognition showed a stronger relation to social behaviour than to measures of non-social cognition.

The relationship between social cognition and functional outcome depends on the specific domains of each construct examined; however, it can generally be concluded that there are clear and consistent relationships between aspects of functional outcome and social cognition (Couture, Penn and Roberts, 2006).

Some of the more relevant conclusions of the studies that relate social functioning with social cognition are centred on research in emotional processing. These suggest that the deficits in affect perception are related to social functioning (Mueser et al., 1996; Penn et al., 1996; Ihnen, Penn, Corrigan and Martin, 1998).

Kucharska-Pietura, David, Masiak and Phillips (2005) suggest that, in schizophrenia, there may be a progressive deficit in emotional processing that may not seem to be related to specific symptoms but that is responsible for the social dysfunction observed in people suffering from this disorder. They conclude that these deficits are characteristic of the disorder and will increase with the duration of the illness.

Furthermore, deficits in affect recognition and in solving problems of social cognition are associated with social competence (Mueser et al., 1996; Penn et al., 1997) and social functioning (Sullivan et al., 1990). Along these same lines, Schneider et al. (2006) determined that the deficits found in emotion recognition in schizophrenics could lead to misunderstandings in social communication and could be the underlying cause of their difficulties in social adaptation.

For Penn et al. (2001), the facial affect identification is significantly associated with social behaviour in the treatment setting among inpatients with chronic schizophrenia and modestly associated with social skills among stabilized outpatients and evidence for association between facial affect discrimination and social functioning is limited to social adjustment in the treatment setting.

#### MODELS TO EXPLAIN THE RELATIONSHIP BETWEEN COGNITION, SOCIAL COGNITION AND SOCIAL PROCESSING IN PEOPLE WITH SCHIZOPHRENIA

As we have seen, both social functioning and ability to recognise emotion depend on other basic cognitive abilities, yet the associative mechanisms between these variables are still not clear. To give an overview of these three variables, some models have been created that attempt to organise the knowledge gained by various studies and thereby enable more efficient therapeutic goals to be set. Some of these explanatory models are reproduced below in the forms created by their authors (see figures 2, 3 and 4).

The model created by Green and Neuchterlein (1999) in figure 2 is a complex one separating the components of neurocognition, social cognition and social functioning. In the abridged version of the diagram shown, the role of pharmacology, interventions

and symptomology have been omitted (Ruiz, García, and Fuentes, 2006).

The model in figure 3, created by Brekke et al. (2005), is a biopsychosocial causal model of social functioning in schizophrenia. It is used to predict both global social functioning as well as specific areas in neurocognition, social cognition, social competence and social support. (The thickness of the lines is proportional to the influence of one factor on another).

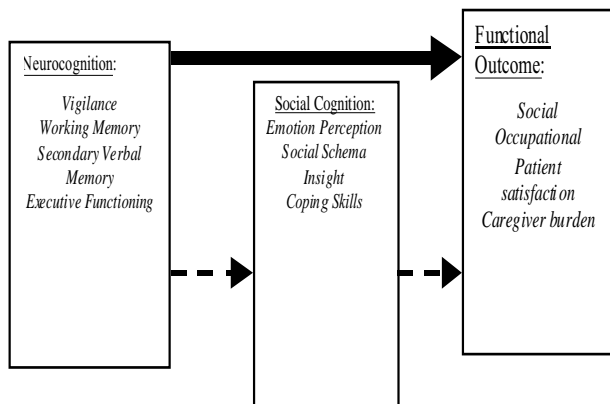


Figure 2: Model from Green and Nuechterlein (1999)

In this model, significant effects of neurocognition on global social functioning were mediating effects via the different variables studied. Social cognition showed both direct effects on global social functioning as well as mediating effects via social support and social competence. Furthermore, social cognition behaved as a mediator of the neurocognitive impact on social functioning.

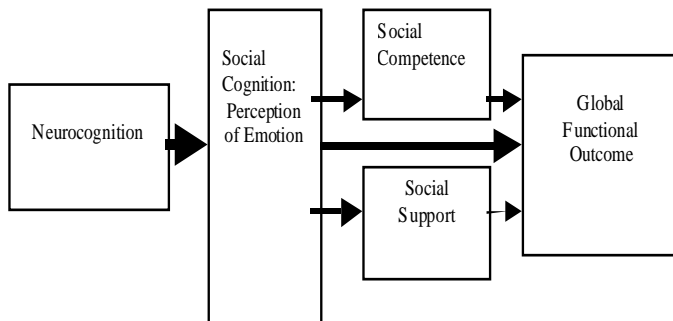


Figure 3: Model from Brekke et al. (2005)

The model from Vauth et al. (2004) shown in figure 4 shows results of the role of social and non-social cognition as determinants in social abilities related to work. Twenty-five percent of the variance in vocational functioning and social skills related to work can be explained by the combination of social and non-social cognition. After individual analysis, the variance in vocational functioning can be explained by 7% from

non-social cognition and 10% from social cognition which proves that the combination of both variables is more powerful.

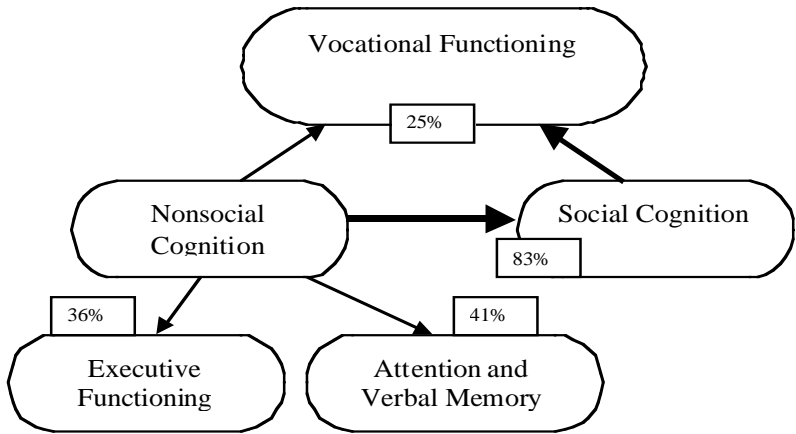


Figure 4: Model from Vauth et al. (2004)

In this study, a large proportion of social cognition (83%) was explained by non-social cognition and at the same time, social cognition was a stronger predictor on vocational functioning than non-social cognition.

All these results imply that social cognition could act as a mediating factor between the influences of neurocognitive deficits on social functioning in people with schizophrenia.

#### CONCLUSION

Research has demonstrated the relationship of emotion recognition with both cognitive functioning and social or community functioning for people diagnosed with schizophrenia.

The evaluation of social functioning, due to both the extent of this construct and the multiple evaluation techniques used, means it is difficult to explain which are the specific areas of social functioning that are influenced by deficits in emotion recognition. It is important that future research uses measures of social functioning that can allow results to be transferred from the intervention set to the real life situations of the subject.

The major results suggest that improvements in social cognition lead to improvements in daily social functioning, which makes interventions such as the ones listed below essential in the quest for improvement in this area: *Training of Affect Recognition* (TAR; Frommann, Streit and Wölwer, 2003; Wölwer et al., 2005), *Emotion Management Training* (EMT; Hodel Brenner, Merlo and Teuber, 1998); *Psychological Integrate Therapy for Schizophrenia* (IPT; Roder, Brenner, Kienzle and Fuentes 2007; *Cognitive Enhancement Therapy* (CET; Hogarty and Flesher, 1999); and *Social Cognition*



and Interaction Training (SCIT; Penn, Roberts, Munt et al., 2005).

#### REFERENCES

- Addington, J. and Addington, D. (1998). Facial affect recognition and information processing in schizophrenia and bipolar disorder. *Schizophrenia Research*, 32, 171–181.
- Addington, J. and Addington, D. (1999). Neurocognitive and social functioning in schizophrenia. *Schizophrenia Bulletin*, 25, 173-182.
- Addington, J. and Addington, D. (2000). Cognitive and social functioning in schizophrenia: a 2.5 year follow-up study. *Schizophrenia Research*, 44, 47-56.
- Addington, J., Mc Cleary, L. and Munroe-Blum, H. (1998). Relationship between cognitive and social dysfunction in schizophrenia. *Schizophrenia Research*, 34, 59-66.
- Balanzá, V. (2005) *Estudio longitudinal de la función neurocognitiva en pacientes bipolares tipo I y esquizofrénicos* (tesis doctoral). Valencia: Universitat de València.
- Barch, D. (2005). The relationships among cognition, motivation, and emotion in Schizophrenia: How much and how little we know. *Schizophrenia Bulletin*, 31, 875-881.
- Baudouin, J., Martin, F., Tiberghien, G., Verlut, I. and Frank, N. (2002). Selective attention to facial emotion and identity in schizophrenia. *Neuropsychologia*, 40, 503–511.
- Bellack, A., Blanchard, J. and Mueser, K. (1996). Cue availability and affect perception in schizophrenia. *Schizophrenia Bulletin*, 22, 535-544.
- Bellack, A., Gold, J. and Buchanan, R. (1999). Cognitive Rehabilitation for schizophrenia: Problems, prospects, and strategies. *Schizophrenia Bulletin*, 25, 257-274.
- Bellack, A., Morrison, R. and Mueser, K. (1989). Social problem solving in schizophrenia. *Schizophrenia Bulletin*, 15, 101-106.
- Bellack, A., Morrison, R., Wixted, J. and Mueser, K. (1990). An analysis of social competence in schizophrenia. *British Journal of Psychiatry*, 156, 809-818.
- Borod, J., Martin, C., Alpert, M., Brozgold, A. and Welkowitz, J. (1993). Perception of facial emotion in schizophrenia and right brain damaged patients. *Journal of Nervous and Mental Disease*, 181, 494–502.
- Breier, A., Schreiber, J., Dyer, J. and Pickar, D. (1991). National Institute of Mental Health Longitudinal Study of Chronic Schizophrenia. *Archives of General Psychiatry*, 48, 239-246.
- Brekke, J., Kay, D., Lee, K. and Green, M. (2005). Biosocial pathways to functional outcome in schizophrenia: a path analytic model. *Schizophrenia Research*, 80, 213-225.
- Cohen, A., Forbes, C., Mann, M. and Blanchard, J. (2006). Specific cognitive déficits and differential domains of social functioning impairment in schizophrenia. *Schizophrenia Research*, 81, 227-238.
- Cornblatt, B., Keilp, J. (1994). Impaired attention, genetics, and the pathophysiology of schizophrenia. *Schizophrenia Bulletin*, 20, 31-46.
- Corrigan, P. and Penn, D. (2001). *Social Cognition and Schizophrenia*. Washington, DC: American Psychological Association.
- Corrigan, P. and Toomey, R. (1995). Interpersonal problem solving and information processing déficits in schizophrenia. *Schizophrenia Bulletin*, 21, 395-403.
- Couture, S., Penn, D. and Roberts, D. (2006). The functional significance of social cognition in schizophrenia: a review. *Schizophrenia Bulletin*, 32, 44-63.

- Dickerson, F., Boronow, J., Ringel, N. and Parente, F. (1996). Neurocognitive deficits and social functioning in outpatients with schizophrenia. *Schizophrenia Research*, 21, 75-83.
- Dworkin, R., Cornblatt, B., Friedmann, R., Kaplansky, L., Lewis, J., Rinaldi, A., Shilliday, C. and Erlenmeyer-Kimling, L. (1993). Childhood precursors of affective vs. social deficits in adolescents at risk for schizophrenia. *Schizophrenia Bulletin*, 19, 563-577.
- Edwards, J., Jackson, H. and Pattison, P. (2002). Emotion Recognition via facial expression and affective prosody in schizophrenia: A methodological review. *Clinical Psychology Review*, 22, 789-832.
- Edwards, J., Pattison, P., Jackson, H. and Wales, R. (2001). Facial affect and affective prosody recognition in first episode schizophrenia. *Schizophrenia Research*, 48, 235-253.
- Frommann, N., Streit, M. and Wölwer, W. (2003) Remediation of facial affect recognition impairments in patients with schizophrenia: a new training program. *Psychiatry Research* 117, 281-284.
- Fujii, D. and Wylie, A. (2003). Neurocognition and community outcome in schizophrenia: long term predictive validity. *Schizophrenia Research*, 59, 219-223.
- Gaebel, W. and Wölwer, W. (1992). Facial expression and emotional face recognition in schizophrenia and depression. *European Archives of Psychiatry and Clinical Neuroscience*, 242, 46-52.
- Gessler, S., Cutting, J., Frith, C. and Weinman, J. (1989). Schizophrenic ability to judge facial emotion: A controlled study. *British Journal of Clinical Psychology*, 28, 19-29.
- Green, M. and Nuechterlein, K. (1999). Should schizophrenia be treated as a neurocognitive disorder?. *Schizophrenia Bulletin*, 25, 309-318.
- Green, M. and Nuechterlein, K. (2004). The MATRICS initiative: Developing a consensus cognitive battery for clinical trials. *Schizophrenia Research*, 72, 1-3.
- Green, M., Kern, R., Braff, D. and Mintz, J. (2000). Neurocognitive deficits and functional outcome in schizophrenia: are we measuring the "right stuff"? *Schizophrenia Bulletin*, 26, 119-136.
- Hans, S., Marcus, J., Henson, L., Auerbach, J. and Mirsky, A. (1992). Interpersonal behaviour of children at risk for schizophrenia. *Psychiatry*, 55, 314-335.
- Heimberg, C., Gur, R.E., Erwin, R., Shtatsel, D. and Gur, R.C. (1992). Facial emotion discrimination: III. Behavioral findings in schizophrenia. *Psychiatry Research*, 42, 253-265.
- Hodel, B., Brenner, H.D., Merlo, M.C. and Teuber, J.F. (1998). Emotional management therapy in early psychoses. *British Journal of Psychiatry*, 172 (Supl. 33), 128-133.
- Hoff, A., Sakuma, M., Wieneke, M., Horon, R., Kushner, M. and De Lisi, L. (1999). Longitudinal Neuropsychological Follow - Up Study of Patients With First-Episode Schizophrenia. *American Journal of Psychiatry*, 156, 1336-1341.
- Hogarty, G. and Flesher, S. (1999). A development theory for cognitive enhancement Therapy for schizophrenia. *Schizophrenia Bulletin*, 25, 677-692.
- Holthausen, E., Wiersma, D., Cahn, W., Kahn, R., Dingemans, Schene, A. and van den Bosch, R. (2007) Predictive value of cognition for different domains of outcome in recent-onset schizophrenia. *Psychiatry Research*, 149, 71-80.
- Ihnen, G., Penn, D., Corrigan, P. and Martin J. (1998). Social Perception and social skill in schizophrenia. *Psychiatry Research*, 80, 275-286.
- Kerr, S. and Neale, J. (1993). Emotion perception in schizophrenia: specific deficit or further evidence of generalized poor performance? *Journal of Abnormal Psychology*, 102, 312-318.
- Kucharska-Pietura, K., David, A., Masiak, M. and Phillips, M. (2005) Perception of facial and vocal affect by people with schizophrenia in early and late stages of illness. *British Journal of*

*Psychiatry*, 187, 523-528.

- Lenzenweger, M. and Dworkin, R. (1996). The dimensions of schizophrenia phenomenology: Not one or two, at least three, perhaps four. *British Journal of Psychiatry*, 168, 432-440.
- Lenzenweger, M., Dworkin, R. and Wethington, E. (1991). Examining the underlying structure of schizophrenic phenomenology: Evidence for a three process model. *Schizophrenia Bulletin*, 17, 515-524.
- Mandal, M., Pandey, R. and Prasad, A. (1998). Facial Expressions of Emotions and Schizophrenia: A Review. *Schizophrenia Bulletin*, 24, 399-412.
- McGurk, S. and Mueser, K. (2003). Cognitive functioning and employment in severe mental illness. *Journal of Nervous and Mental Disease*, 191, 789-798.
- Milev, P., Ho, B., Arndt, S. and Andreasen, N. (2005). Predictive values of neurocognition and negative symptoms on functional outcome in schizophrenia: a longitudinal first-episode study with 7-year follow-up. *American Journal of Psychiatry*, 162, 495-506.
- Morrison, R., Bellack, A. and Mueser, K. (1988). Deficits in facial-affect recognition and schizophrenia. *Schizophrenia Bulletin*, 14, 67-83.
- Mueser, K., Bellack, A., Morrison, R. and Wixted, J. (1990). Social competence in schizophrenia: premorbid adjustment, social skills, and domains of functioning. *Journal of Psychiatry Research*, 24, 51-63.
- Mueser, K., Doonan, R., Penn, D., Blanchard, J., Bellack, A., Nishith, P. and DeLeon, J. (1996). Emotion recognition and social competence in chronic schizophrenia. *Journal of Abnormal Psychology*, 105, 271-275.
- Pardo, V. (2005). Trastornos cognitivos en la esquizofrenia. Estudios cognitivos en pacientes esquizofrénicos: puesta al día. *Revista de Psiquiatría del Uruguay*, 69, 71-83.
- Penadés, R., Boget, T., Catalán, R., Bernardo, M., Gastó, C. and Salamero, M. (2003). Cognitive mechanisms, psychosocial functioning, and neurocognitive rehabilitation in schizophrenia. *Schizophrenia Research*, 63, 219-227.
- Penn, D., Combs, D. and Mohamed, S. (2001). Social Cognition and Social Functioning in Schizophrenia. En P. Corrigan and D. Penn (Eds.), *Social Cognition and Schizophrenia* (97-121). Washington, DC: American Psychological Association.
- Penn, D., Combs, D., Ritchie, M., Francis, J., Morris, S. and Townsend, M. (2000). Emotion recognition in schizophrenia: further investigation of generalized versus specific deficits models. *Journal of Abnormal Psychology*, 109, 512-516.
- Penn, D., Corrigan, P., Bentall, R., Racenstein, J. and Newman, L. (1997). Social cognition in schizophrenia. *Psychological Bulletin*, 121, 114-132.
- Penn, D., Roberts, D., Munt, E., Silverstein, E., Jones, N. and Sheitman, B. (2005). A pilot study of social cognition and interaction training (SCIT) for schizophrenia. *Schizophrenia Research* 80, 357-359.
- Penn, D., Spaulding, W., Reed, D., and Sullivan, M. (1996). The relationship of social cognition to ward behavior in chronic schizophrenia. *Schizophrenia Research*, 20, 327-335.
- Pinkham, A., Penn, D., Perkins, D. and Lieberman, J. (2003). Implications of a neural basis for social cognition for the study of schizophrenia. *American Journal of Psychiatry*, 160, 815-824.
- Poole, J., Tobias, F. and Vinogradov, S. (2000). The functional relevance of affect recognition errors in schizophrenia. *Journal of the International Neuropsychological Society*, 6, 649-658.
- Robinson, D., Woerner, M., McMeniman, M., Mendelowitz, A. and Bilder, R. (2004). Symptomatic

- and functional recovery from a first episode of schizophrenia or schizoaffective disorder. *American Journal of Psychiatry*, 161, 473-479.
- Roder, V., Brenner, H.D., Kienzle, N. and Fuentes, I. (2007). *Terapia Psicológica Integrada para la Esquizofrenia*. Granada: Alboran.
- Ruiz, J.C., García, S. and Fuentes, I. (2006). La relevancia de la cognición social en la esquizofrenia. *Apuntes de Psicología del Colegio Oficial de Psicología de Andalucía Occidental y Universidad de Sevilla*, 24, 137-155.
- Rund, B. (1998). A review of longitudinal studies of cognitive functions in schizophrenia patients. *Schizophrenia Bulletin*, 24, 425-435.
- Rund, B. and Borg, N. (1999). Cognitive deficits and cognitive training in schizophrenic patients: a review. *Acta Psychiatrica Scandinavica*, 100, 85-95.
- Salem, J., Kring, A. and Kerr, S. (1996). More evidence for generalized poor performance in facial emotion perception in schizophrenia. *Journal of Abnormal Psychology*, 105, 480-483.
- Sharma, T. and Antonova, L. (2003). Cognitive function in schizophrenia. Deficits, functional consequences and future treatment. *Psychiatric Clinics of North America*, 26, 25-40.
- Schneider, F., Gur, R.C., Gur, R.E. and Shtatsel, D. (1995). Emotional processing in schizophrenia: neurobehavioral probes in relation to psychopathology. *Schizophrenia Research*, 17, 67-75.
- Schneider, F., Gur, R.C., Koch, K., Backes, V., Amunts, K., Shah, N.J., Bilker, W., Gur, R.E. and Habel, U. (2006). Impairment in the Specificity of emotion processing in Schizophrenia. *American Journal Psychiatry*, 163, 442-447.
- Scholten, M., Aleman, A., Montagne, B. and Kahn R. (2005). Schizophrenia and processing of facial emotions: Sex matters. *Schizophrenia Research*, 78, 61-67.
- Spaulding, W., Weiler, M. and Penn, D. (1990). Symptomatology, neuropsychological impairment, social cognition, and performance in chronic schizophrenia. *Comunicación presentada en la reunión anual de la American Psychopathological Association*.
- Strauss, J., Carpenter, W. and Bartko, J. (1974). The diagnosis and understanding of schizophrenia: Part III. Speculations on the process that underlie schizophrenic signs and symptoms. *Schizophrenia Bulletin*, 1, 61-69.
- Sullivan, G., Marder, S., Liberman, R., Donahoe, C. and Mintz, J. (1990). Social skills and relapse history in outpatient schizophrenics. *Psychiatry*, 53, 340-343.
- Tien, A. and Eaton, W. (1992). Psychopathologic precursors and sociodemographic risk factors for the schizophrenia syndrome. *Archives of General Psychiatry*, 49, 37-46.
- Vauth, R., Rüschi, N., Wirtz, M. and Corrigan, P. (2004). Does social cognitive influence the relation between neurocognitive deficits and vocational functioning in schizophrenia?. *Psychiatry Research*, 128, 155-165.
- Walker, E. (1994). Developmentally moderated expressions of the neuropathology underlying schizophrenia. *Schizophrenia Bulletin*, 20, 453-480.
- Wölwer, W., Frommann, N., Halfmann, S., Piaszek, A., Streit, M. and Gaebel, W. (2005). Remediation of impairments in facial affect recognition in schizophrenia: Efficacy and specificity of a new training program. *Schizophrenia Research* 80, 295-303.
- Wölwer, W., Streit, M., Polzer, U. and Gaebel, G. (1996). Facial affect recognition in the course of schizophrenia. *European Archives of Psychiatry and Clinical Neuroscience*, 246, 165-170.