

Efficacy of the Social Cognition Training Program in a Sample of Outpatients with Schizophrenia

David Gil-Sanz¹, Mar Fernández-Modamio¹, Rosario Bengochea-Seco¹,
Marta Arrieta-Rodríguez¹, Gabriela Pérez-Fuentes²

Abstract

Objective: Social cognition is recognized to be a deficit in individuals suffering from schizophrenia. Numerous studies have explored the relationship between social cognition and social functioning in outpatients with schizophrenia through the use of different social cognition training programs. This study examines the efficacy of the Social Cognition Training Program (PECS in Spanish) in adults with a diagnosis of schizophrenia. **Methods:** Data were derived from a sample of 44 non-hospitalized adult patients who presented with a *DSM-IV-TR* Axis I diagnosis of schizophrenia and 39 healthy controls. The 44 patients were divided into an experimental group (n=20) and a control task group (n=24) that received cognitive training. Healthy controls did not receive any treatment. Sociodemographic and clinical variables correlates were computed. The 2-way ANOVA was conducted to examine differences between groups in pre- and post-treatment measures. Intragroup differences were explored using the paired-samples t-test. **Results:** At the end of the training, patients in the experimental group showed a higher performance compared to patients in the control task group in the Hinting Task Test and in the emotion recognition of sadness, anger, fear, and disgust. **Conclusions:** The PECS proved to be effective in the improvement of some areas of theory of mind and emotion recognition in outpatients with schizophrenia. The PECS is one of the first programs developed in Spanish to train social cognition, and the data obtained support the importance of expanding the social cognition programs to non-English language samples.

Key Words: Schizophrenia, Social Cognition Training, Emotion Perception, Theory of Mind, Attributional Style

Introduction

Social cognition is defined as “the processes and functions that allow a person to understand, act on, and benefit from the interpersonal world” (1). Despite the lack of agreement on which domains comprise social cognition, the vast majority of schizophrenia research has focused on the

following domains: emotional processing, theory of mind, social perception, social knowledge, and attributional style and bias (2). Emotional processing refers to the abilities needed to identify and manage emotions, both emotions in oneself as well as one’s relationship with others. Theory of mind is defined as the ability to infer other people’s mental states, such as their intentions or beliefs. Social perception constitutes the ability to assess social rules, social roles, and the social context. Social knowledge, also known as social scheme, is closely related to social perception; it implies the knowledge of the actions, norms, roles, and objectives that characterize a specific social situation, and that allows the individual to know how to act in that specific situation. Lastly, attributional style and bias refers to how the causes for positive or negative results are explained and how the meaning of the events is based on such explanation (2).

¹Centro de Rehabilitación Psicosocial Padre Menni, Santander, Spain

²New York State Psychiatric Institute, New York, NY. Department of Psychiatry, College of Physicians and Surgeons, Columbia University, New York, NY.

Address for correspondence: David Gil-Sanz, Centro de Rehabilitación Psicosocial Padre Menni, C/Andrés del Río 7, bajo. 39004, Santander, Spain
Phone: 942.31.90.86; Fax: 942.31.90.89; E-mail: crpsant@mennisant.com

Submitted: July 19, 2013; Revised: October 29, 2013;

Accepted: December 20, 2013

Clinical Implications

The present study provides evidence on the efficacy of the PECS (the Social Cognition Training Program in Spanish) in non-hospitalized individuals with schizophrenia. Patients who participated in this training program showed significant improvement in the ability to infer hinting—one of the areas of theory of mind—and recognition of some emotions, two of the domains that integrate social cognition. At the end of social cognition training, patients in the experimental group demonstrated higher performance compared to patients in the control task group in the Hinting Task Test and in the emotion recognition of sadness, anger, fear, and disgust, as well as in the affect recognition test total scoring.

In summary, results about the efficacy of PECS are in line with previous studies, at least in the recognition of some emotions (sadness, anger, and fear) and the ability to infer hinting (18, 21-24), and they build on the idea that social cognition deficit can be improved, although without reaching a normal level of functioning. Furthermore, the data obtained support the importance of developing programs of social cognition training in non-English language and expand the data concerning the effectiveness of this training in cross-cultural samples.

Numerous studies have documented that patients with schizophrenia execute a deficient management of the different domains that comprise social cognition (3-5) and that these deficits are related to functional performance (5-9) even more so than neurocognitive deficits (10, 11). In a review carried out by Couture et al. (6), the authors found that the domains that were more strongly associated with social functioning were emotional processing and social perception. However, subsequent studies also found a relationship between theory of mind and communal functioning (5, 11, 12). Social cognition has also been proposed as a mediator variable between non-social cognition or neurocognition and social functioning (13-16).

This relationship between social functioning and social cognition has caused the latter to be considered an important objective of intervention, both for pharmacological as well as for psychosocial approaches. As a consequence, several different social cognition training programs have been developed during the past years, such as Social Cognition and Interaction Training (SCIT; 17), Social Cognitive Skills Training (SCST; 18), Integrated Psychological Therapy (IPT; 19), Integrated Neurocognitive Therapy (INT; 20), Social Cognition Enhancement Training (SCET; 21), and Cognitive Enhancement Therapy (CET; 22). Overall, these programs have demonstrated their efficacy in the improvement of emotional perception (17, 18, 23), theory of mind (17), and social recognition (19, 22, 24), both in hospitalized and community populations (17, 19-26).

The present study describes the application of the Social Cognition Training Program (PECS in Spanish; for more information about PECS, please contact the principal author via e-mail) in a sample of non-hospitalized patients diagnosed with schizophrenia from Cantabria, a region in northern Spain. The PECS stems from a previous program (27) composed of twenty sessions that focused on the training of emotion recognition and social perception. Results of

the pilot study showed that this program was moderately effective in improving social perception, but that there were no differences between the experimental and control groups in facial emotion recognition (27).

The aim of the present study is to assess the efficacy of the PECS to enhance theory of mind and perception of emotions. Two other objectives of the study are: 1) assess whether there is an impairment of theory of mind in patients in remission, and 2) assess whether there is a specific impairment of the perception of negative emotions in schizophrenia. To this end, we have included a group of healthy control subjects in the study. The PECS is one of the first programs developed in Spanish to train social cognition, and this study is one of the first to examine social cognition training in non-English samples. So, it can be considered a cross-cultural study assessing the effectiveness of social cognition training.

Methods

Sample

A total of 83 Caucasian adults—44 of them with a *DSM-IV-TR* Axis I diagnosis of schizophrenia made by charts review and 39 healthy controls—constitute the sample of the present study. All 44 patients diagnosed with schizophrenia were receiving treatment at a psychosocial rehabilitation center affiliated with Padre Menni Hospital Center in Santander, Spain. This treatment was the same for all patients and it consisted of social skills training, psychoeducation, and life skills training. The duration of treatment was the same as the PECS. Furthermore, the patients were receiving antipsychotic medication throughout the duration of the study. The 44 patients were randomized to an experimental group composed of 20 patients, and a control group formed by 24 patients. Group sample characteristics are shown in Table 1. All of the subjects in the study signed informed consent prior to their participation in the study. The document about

Table 1 Sociodemographic and Clinical Characteristics

	Total (n=83)	Experimental Group (n=20)	Control Task Group (n=24)	Healthy Controls (n=39)
Sex				
Male	41	8	16	17
Female	42	12	8	22
Education				
Primary	19	7	11	1
High School	39	6	8	25
University	25	7	5	13
Age (Mean±s.d.)	38.46±8.49	37.05±6.43	43.83±9.77 (t=-2.641)*	35.89±7.19 (t=0.602)
		Mean±s.d.		t
Age of onset of illness	25.59±7.20	23.72±5.92	27.04±7.88	-1.489
Years of evolution of illness	14.44±9.40	12.17±7.29	16.22±10.59	-1.385
PANSS				
Positive Syndrome		13.30±6.17	10.42±4.33	1.815
Negative Syndrome		15.60±4.89	17.21±5.25	-1.043
General Psychopathology		29.00±10.45	25.38±7.23	1.355
Total Scoring		58±17.03	52.75±11.90	-1.200
Barcelona Test				
Digits forward		6.06±1.39	5.95±0.92	0.277
Digits backward		4.28±1.27	3.71±1.01	1.542
Categorical recall		26.28±8.64	25.86±6.86	0.170
Verbal memory		11.80±3.93	10.83±4.20	.742
List learning		80.94±15.09	72.00±15.39	1.825
Visual memory		8.35±1.32	7.52±1.83	1.563
Verbal abstraction		8.61±2.93	7.67±3.01	0.989
Symbol digit coding		26.41±8.62	23.16±6.75	1.846
Block design		4.67±1.57	4.00±1.87	1.193

*p<0.05

the informed consent, and the study itself, were approved by the ethical committee of the Padre Menni Hospital Centre.

Assessment Measures

All the evaluation measures were administered by two licensed clinical psychologists with extensive experience in psychometric assessments who worked at the psychosocial rehabilitation center. Assessors were blind to the assignment of patients to experimental or control groups.

The following measures were administered prior to the intervention:

Hinting Task Test

A Spanish version (28) of the Hinting Task Test was administered (29). This tool, designed to assess the ability to infer hinting, includes ten brief stories that the evaluator can read to the subject as many times as needed to assure a correct comprehension of these. A short version of the Spanish adaptation of this scale—composed of five stories—proved to have better psychometric properties (28). The present study used this short Spanish version, with total scoring ranging from 0 to 10 points.

Emotion Recognition Test

In order to measure emotion recognition, the NimStim Face Stimulus Set was used (30). A total of eight pictures for each of the six basic emotions was selected (happiness, sadness, anger, surprise, fear, and disgust), along with eight pictures with a neutral expression. Therefore, the overall measure consisted of 56 pictures of human emotion expression, all of them of Caucasian race. Following the recommendations of the authors, only pictures with at least 80% agreement were selected (there is not an established protocol of assessment). The points for each emotion were calculated separately (from 0 to 8), as well as a total test score (from 0 to 56, sum of all the emotional pictures plus neutral pictures). Pictures were shown to the subjects one by one without time constrictions. All the subjects saw the same pictures. Further information about the NimStim Face Stimulus Set is available elsewhere (31).

Positive and Negative Syndrome Scale (PANSS)

The PANSS (32) is a semi-structured interview of 30–40 minutes duration. It consists of thirty items (symptoms), each of which is scored from 1 (absent) to 7 (extreme). It consists of three subscales: the positive (PANSS-P) with seven items, the negative (PANSS-N) with seven items, and one measuring general psychopathology (PANSS-PG) with sixteen items. A total score of all three subscales was computed as well.

Integrated Program of Neuropsychological Exploration: Barcelona Test (Programa Integrado de Exploración Neuropsicológica, Test Barcelona)

Cognitive functioning was tested, using the short version of the Test Barcelona, by J. Peña-Casanova (33). The following subscales were selected: digits forward and backward, categorical recall, verbal memory, list learning, visual memory, abstract reasoning, digit symbol coding, and block design. Further information about Test Barcelona is available elsewhere (34).

After termination of the social cognitive training, the Hinting Task and Emotion recognition tests were re-administered.

Procedure

As mentioned above, the Social Cognition Training Program (PECS) was developed from the revision and amplification of a previous program that showed relative efficacy in improving social perception, but not positive results in emotion recognition (27). The revised PECS consists of four modules that focus on the training of emotion recognition, theory of mind and attributional style, social perception, and personalization of contents. The first three modules in-

clude theoretical content and exercises that reinforce the reviewed theory. The program includes a total of twenty-eight sessions.

Module 1, Emotion Processing

This module is carried out in nine sessions, which focus on the facial feature recognition that constitutes each of the six basic emotions, the influence of thoughts and the external facts that appear in each emotion, as well as the reactions provoked by the emotions. There is a special emphasis on learning to cope with negative reactions and favors the appearance of positive emotions through the realization of pleasurable activities.

Module 2, Theory of Mind and Attributional Style

Ten sessions are dedicated to describe the concept of theory of mind, double meaning language comprehension, and the adequate use of information, avoiding errors such as jumping to conclusions. In addition, external and internal attributional styles are described, and linked with delusional ideas, following the symptom-managing focus of cognitive therapy.

Module 3, Social Perception

The concepts of norms and social roles are introduced here, as well as how they regulate social networks and the importance of knowing them and respecting them to improve social adaptation by others. The cultural aspect of social norms and the fact that they can change from one place to another is highlighted. The importance of the context in which the social interaction occurs is also explained, differentiating generally two contexts: the formal and the informal. This module consists of four sessions.

Module 4, Personalization

In this last module, the patients are reinforced to apply all the reviewed content to personal experiences in which social cognition failed through examples of the group members. There are ten types of situations already prepared. Five sessions are dedicated to this module.

The 20 patients of the experimental group were divided in two 10-member groups. Both groups had a 45-minute weekly session. The 24 patients of the control task group were divided in two 12-member groups. These patients received exercises of attention and memory, without any social cognition content, in sessions lasting 45 minutes and also during 28 sessions. The healthy controls did not receive any intervention.

Statistical Analysis

To measure the differences between the experimental and control groups in age, onset of illness, years of illness

Table 2 Mean Difference between Post- and Pre-Treatment Measures for the Experimental Group and Control Task Group

	Mean±s.d.		F	d
	Experimental Group	Control Task Group		
Hinting Task	1.50±2.01	0.37±1.09	8.18 [†]	0.70
Emotions				
Neutral	0.40±0.68	0.20±0.58	0.89	0.31
Happiness	0.10±0.55	0.25±0.84	1.67	-0.20
Sadness	1.05±1.23	0.25±0.94	11.2 [‡]	0.73
Anger	0.6±0.99	-0.12±1.07	5.51 [†]	0.70
Surprise	0.4±0.99	0.41±1.21	2.92	-0.01
Fear	1±1.48	-0.08±1.31	7.38 [‡]	0.77
Disgust	0.5±1.05	0.37±0.82	4.78 [*]	0.13
Total	4.05±3.80	1.29±2.82	16.2 [‡]	0.82

*p<0.05, †p<0.01, ‡p<0.001

progress, and PANSS and Barcelona Test scores, t-tests of independent mean differences were conducted. T-tests of independent means were also used to measure age differences between the experimental and the healthy control groups. To assess group differences between the experimental and both control groups in the Hinting Task and the emotion recognition tests, before and after treatment, we used a 2-way ANOVA. To evaluate intragroup differences in pre- and post-treatment measures of Hinting Task and emotion recognition tests, the paired-sampled t-test was conducted. Cohen’s d statistic was obtained to measure effect size both between the experimental and control group of patients, as well as between the pre- and post-treatment test of the experimental group.

Results

Sociodemographic and Clinical Characteristics

Sociodemographic and clinical variable differences between groups are shown in Table 1. For the PANSS only, general scale scores were included. No significant differences were obtained in any of the specific items. The mean age of the experimental group was significantly lower than the control task group; therefore, the relationship between age and the tests of theory of mind and emotion perception was assessed. Significant results were obtained only in the recognition of the emotions of surprise ($r=-0.367$, $p=0.039$) and disgust ($r=-0.353$, $p=0.048$). There were no significant differences in age between the experimental group and the healthy subjects (see Table 1).

Differences between Experimental and Control Groups in Theory of Mind and Emotion Perception

Table 2 only shows mean difference between post- and pre-treatment measures for the experimental group and control task group. There were significant differences in post-treatment measures of the Hinting Task Test and emotion recognition of sadness, anger, fear and disgust, as well as in the total scoring of emotion perception test. As described in Table 2, mean difference between post- and pre-treatment measures was greater in the experimental group than in the control task group. In the case of the control task group, the mean difference was even negative in perception of anger and fear. Although it is not included in Table 2, the mean difference in the healthy controls was between -0.025 and 0.15.

The comparison of post-treatment measures between experimental group and healthy controls showed that there were significant differences between both group in all measures, except in the recognition of neutral faces ($p=0.480$) and the emotion of happiness ($p=0.083$). Patients in the experimental group obtained a worse performance in the Hinting Task Test ($p=0.009$) and in the recognition of sadness ($p=0.0001$), anger ($p=0.001$), surprise ($p=0.003$), fear ($p=0.0001$) and disgust ($p=0.0001$).

Intragroup Differences (Table 3)

1. *experimental group*: results of the paired-sample t-test showed that patients in the experimental group improved in pre- and post-treatment administration of the Hinting Task Test as well as in the perception of neutral faces and emo-

tion recognition of sadness, anger, fear and disgust. Cohen's *d* values ranged between 0.38 and 0.86. No significant differences were observed in the emotion recognition of happiness and surprise.

2. *control task group*: there were differences between pre- and post-treatment assessments only in the recognition of emotion of disgust.

3. *healthy controls*: significant differences were not observed in this group.

Only the comparisons between experimental group and control task group are described in Table 3.

Discussion

The present study provides evidence on the efficacy of the PECS in non-hospitalized individuals with schizophrenia. Patients who participated in this training program showed significant improvement in the ability to infer hinting—one of the areas of theory of mind—and recognition of some emotions, two of the domains that integrate social cognition. At the end of social cognition training, patients in the experimental group demonstrated higher performance compared to patients in the control task group in the Hinting Task Test and in the emotion recognition of sad-

Table 3 Intragroup Comparison in Hinting Task and Affect Recognition Tests, and Cohen's *d* Value in Experimental Group Measures

Experimental Group				
	Assessment Pre	Assessment Post	t	d
	Mean±s.d.			
Hinting Task	7.45±2.21	8.95±1.10	-3.332 [†]	0.86
Emotions				
Neutral	7.20±1.20	7.60±0.82	-2.629*	0.38
Happiness	7.75±0.72	7.85±0.37	-0.809	0.17
Sadness	5.90±1.89	6.95±1.05	-3.804 [‡]	0.69
Anger	6.70±1.69	7.30±0.92	-2.698*	0.46
Surprise	7.10±0.97	7.50±0.76	-1.798	0.45
Fear	5.60±2.19	6.60±1.19	-3.008 [†]	0.57
Disgust	6.50±1.70	7±1.12	-2.127*	0.35
Total	46.75±6.72	50.80±3.83	-4.761 [‡]	0.74
Control Task Group				
	Assessment Pre	Assessment Post	t	d
	Mean±s.d.			
Hinting Task	7.33±2.08	7.71±2.12	-1.676	0.18
Emotions				
Neutral	7.42±0.72	7.63±0.65	-1.735	0.30
Happiness	7.21±0.98	7.46±0.88	-1.446	0.27
Sadness	4.88±1.78	5.13±1.90	-1.297	0.13
Anger	6.21±1.22	6.08±1.53	0.569	-0.09
Surprise	6.08±1.18	6.50±1.62	-1.683	0.29
Fear	4.71±1.08	4.63±1.41	0.310	-0.06
Disgust	5.21±2.32	5.58±1.89	-2.229*	0.17
Total	41.71±4.66	43±5.87	-2.224*	0.24

**p*<0.05, [†]*p*<0.01, [‡]*p*<0.001

ness, anger, fear, and disgust, as well as in the affect recognition test total scoring. However, patients in the control task group also had a better performance in recognition of disgust in the post-treatment assessment; so, data about the effectiveness of PECS in the improvement of this emotion are not conclusive. The differences between groups in the other measures do not seem to be accounted for by symptomatology nor cognitive functioning, since pre-treatment assessment showed no significant differences between both groups, neither in the PANNS nor in the Barcelona Test scores. Furthermore, these differences cannot be related to higher chronicity in the control group, as no between-group differences were observed either in age of onset or in years of illness evolution.

Some authors have argued that cognitive remediation can improve some aspects of social cognition (35), although the combination of cognitive remediation plus social cognition training is more effective (35, 36). The results of the present study do not show an enhancement of social cognitive abilities in the control task group that received cognition training, so we can not confirm the previous data. However, we did not combine cognitive remediation plus social cognitive training. The effectiveness of this combination should be assessed in future studies.

Despite the observed improvement, patients in the experimental group continue to demonstrate poorer results than the healthy control subjects in the post-treatment evaluation, except in the recognition of neutral faces and the emotion of happiness.

There is a disagreement in the existing literature regarding whether a deficit in theory of mind is considered a stable trait of schizophrenia or a state variable that improves when symptomatology reaches remission, especially the positive symptoms. Some authors support this latter explanation and maintain that a deficit in theory of mind is a state variable that is related to the presence of positive symptoms (37, 38) and symptoms of disorganization, such as illogical language or disorganized thinking (39-41), and that this variable improves when these types of symptoms remit (42-44). In fact, several studies have found that patients in the remission phase show a similar performance to that of control subjects in theory of mind tests (43, 45, 46). Contrary to this idea, some authors argue that a deficit in theory of mind constitutes a stable trait in patients with schizophrenia that can also be observed in remission phases and in the absence of positive symptomatology (47, 48).

Brüne's literature review (3) included several studies that provide sufficient data to consider that a deficit in theory of mind is independent of the acute phase of the illness. In a subsequent research study—Bora et al. (49)—found that patients who exhibited positive symptoms presented with a more severe deficit in theory of mind than those without

positive symptomatology. They also found that these patients performed significantly poorer on tests of theory of mind than control subjects without a psychiatric diagnosis (49). According to this data, these authors concluded that a deficit in theory of mind is present in the remission phase and, therefore, it represents a stable trait in schizophrenia. Results obtained in the present study would support this idea, as patients in the experimental group presented a low symptomatology profile (see Table 1) and, as mentioned above, scores on their post-treatment evaluations were significantly lower than that of healthy controls on the theory of mind test.

Regarding emotion recognition, some authors argue that patients with schizophrenia present a deficit in the recognition of any type of emotion (46, 47). However, the vast majority of research studies supports the idea of a deficit that is especially significant in the recognition of negative emotions (48-50), without finding significant differences in relation to the normal population in the recognition of positive emotions, specifically in the recognition of happiness (48, 50). Similarly, this study found no significant differences between the experimental and healthy control groups in the recognition of happy faces, both before and after the training. Therefore, our findings would provide further evidence of the idea that patients with schizophrenia do not demonstrate difficulty in the recognition of positive emotions.

In summary, results about the efficacy of PECS are in line with previous studies, at least in the recognition of some emotions (sadness, anger, and fear) and the ability to infer hinting (18, 21-24), and they build on the idea that social cognition deficit can be improved, although without reaching a normal level of functioning. Furthermore, the data obtained support the importance of developing programs of social cognition training in non-English language and expand the data concerning the effectiveness of this training in cross-cultural samples.

Our results should be interpreted in light of several limitations. First, the experimental group consisted of only twenty subjects; therefore, findings of this study should be interpreted with caution. Including a larger sample would be necessary in order to obtain more conclusive data. Second, it should be noted that the sample included non-hospitalized patients with a long chronicity and a low symptomatology profile, making, therefore, these results non-generalizable to patients with other clinical characteristics (e.g., first-psychotic episodes, inpatients, or patients with higher symptomatology).

Social cognition training in individuals with schizophrenia has been proven to be successful in the improvement of patient's social cognitive functioning, especially in the areas of emotion recognition and theory of mind, thus having a significant impact on the improvement on quality

of life of these individuals and their loved ones. We encourage future studies to include measures of social functioning in order to be able to explore the relationship between the PECS and daily functioning performance. Furthermore, studies including long-term effects observations on these cognitive improvements would be needed to fill in this gap in the existing literature.

Acknowledgments

We want to acknowledge the statistical analysis advice of the Psychiatric Research Institute, belonging to the Sisters Hospitalers.

References

- Corrigan PW, Penn DL, editors. Social cognition and schizophrenia. Washington, DC: American Psychological Association; 2001.
- Green MF, Olivier B, Crawley JN, Penn DL, Silverstein S. Social cognition in schizophrenia: recommendations from the measurement and treatment research to improve cognition in schizophrenia new approaches conference. *Schizophr Bull* 2005;31(4):882-887.
- Brune M. "Theory of mind" in schizophrenia: a review of the literature. *Schizophr Bull* 2005;31(1):21-42.
- Penn DL, Sanna LJ, Roberts DL. Social cognition in schizophrenia: an overview. *Schizophr Bull* 2008;34(3):408-411.
- Sparks A, McDonald S, Lino B, O'Donnell M, Green MJ. Social cognition, empathy and functional outcome in schizophrenia. *Schizophr Res* 2010;122(1-3):172-178.
- Couture SM, Penn DL, Roberts DL. The functional significance of social cognition in schizophrenia: a review. *Schizophr Bull* 2006;32 Suppl 1:S44-63.
- Brekke JS, Hoe M, Long J, Green MF. How neurocognition and social cognition influence functional change during community-based psychosocial rehabilitation for individuals with schizophrenia. *Schizophr Bull* 2007;33(5):1247-1256.
- Mathews JR, Barch DM. Emotion responsivity, social cognition, and functional outcome in schizophrenia. *J Abnorm Psychol* 2010;119(1):50-59.
- Horan WP, Green MF, DeGroot M, Fiske A, Helleman G, Kee K, et al. Social cognition in schizophrenia, Part 2: 12-month stability and prediction of functional outcome in first-episode patients. *Schizophr Bull* 2012;38(4):865-872.
- Harvey PD, Penn D. Social cognition: the key factor predicting social outcome in people with schizophrenia? *Psychiatry (Edgmont)* 2010;7(2):41-44.
- Fett AK, Viechtbauer W, Dominguez MD, Penn DL, van Os J, Krabbendam L. The relationship between neurocognition and social cognition with functional outcomes in schizophrenia: a meta-analysis. *Neurosci Biobehav Rev* 2011;35(3):573-588.
- Biedermann F, Frajo-Apor B, Hofer A. Theory of mind and its relevance in schizophrenia. *Curr Opin Psychiatry* 2012;25(2):71-75.
- Vauth R, Rusch N, Wirtz M, Corrigan PW. Does social cognition influence the relation between neurocognitive deficits and vocational functioning in schizophrenia? *Psychiatry Res* 2004;128(2):155-165.
- Brekke J, Kay DD, Lee KS, Green MF. Biosocial pathways to functional outcome in schizophrenia. *Schizophr Res* 2005;80(2-3):213-225.
- Sergi MJ, Rasseovsky Y, Nuechterlein KH, Green MF. Social perception as a mediator of the influence of early visual processing on functional status in schizophrenia. *Am J Psychiatry* 2006;163(3):448-454.
- McGlade N, Behan C, Hayden J, O'Donoghue T, Peel R, Hag F, et al. Mental state decoding v. mental state reasoning as a mediator between cognitive and social function in psychosis. *Br J Psychiatry* 2008;193(1):77-78.
- Penn D, Roberts DL, Munt ED, Silverstein E, Jones N, Sheitman B. A pilot study of social cognition and interaction training (SCIT) for schizophrenia. *Schizophr Res* 2005;80(2-3):357-359.
- Horan WP, Kern RS, Shokat-Fadai K, Sergi MJ, Wynn JK, Green MF. Social cognitive skills training in schizophrenia: an initial efficacy study of stabilized outpatients. *Schizophr Res* 2009;107(1):47-54.
- Garcia S, Fuentes I, Ruiz JC, Gallach E, Roder V. Application of the IPT in a Spanish sample: evaluation of the "social perception subprogramme". *International Journal of Psychology and Psychological Therapy* 2003;3:299-310.
- Müller DR, Roder V. Integrated psychological therapy and integrated neurocognitive therapy. In: Roder V, Medalia A, editors. *Neurocognition and social cognition in schizophrenia patients. Basic concepts and treatment. Key issues mental health*. Basel: Karger; 2010 (vol 177): p. 118-144.
- Kwon J. Social cognition enhancing rehabilitation program. Seoul: Hakjisa; 2003.
- Hogarty GE, Flesher S, Ulrich R, Carter M, Greenwald D, Pogue-Geile M, et al. Cognitive enhancement therapy for schizophrenia. Effects of a 2-year randomized trial on cognition and behaviour. *Arch Gen Psychiatry* 2004;61(9):866-876.
- Horan WP, Kern RS, Tripp C, Helleman G, Wynn JK, Bell M, et al. Efficacy and specificity of social cognitive skills training for outpatients with psychotic disorders. *J Psychiatr Res* 2011;45(8):1113-1122.
- Choi KH, Kwon JH. Social cognition enhancement training for schizophrenia: a preliminary randomized controlled trial. *Community Ment Health J* 2006;42(2):177-187.
- Roberts DL, Penn DL. Social cognition and interaction training (SCIT) for outpatients with schizophrenia: a preliminary study. *Psychiatry Res* 2009;166(2-3):141-147.
- Roberts DL, Penn DL, Labate D, Margolis SA, Sterne A. Transportability and feasibility of Social Cognition and Interaction Training (SCIT) in community settings. *Behav Cogn Psychother* 2010;38(1):35-47.
- Gil Sanz D, Diego Lorenzo M, Bengochea Seco R, Arrieta Rodríguez M, Lastra Martínez I, Sánchez Calleja R, et al. Efficacy of a social cognition training program for schizophrenic patients: a pilot study. *Span J Psychol* 2009;12(1):184-191.
- Gil Sanz D, Fernandez-Modamio M, Bengochea R, Arrieta M. [Adaptation of the Hinting Task theory of the mind test to Spanish]. *Spanish. Rev Psiquiatr Salud Ment* 2012;5(2):79-88.
- Corcoran R, Mercer G, Frith CD. Schizophrenia, symptomatology and social inference: investigating "theory of mind" in people with schizophrenia. *Schizophr Res* 1995;17(1):5-13.
- Tottenham N, Tanaka JW, Leon AC, McCarry T, Nurse M, Hare TA, et al. The NimStim set of facial expressions: judgments from untrained research participants. *Psychiatry Res* 2009;168(3):242-249.
- Research Network on Early Experience and Brain Development. <http://www.macbrain.org/>
- Kay SR, Fiszbein A, Opler LA. The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophr Bull* 1987;13(2):261-276.
- Pena-Casanova J, Guardia J, Bertran-Serra I, Manero RM, Jarne A. [Shortened version of the Barcelona test (I): subtests and normal profiles]. *Spanish. Neurologia* 1997;12(3):99-111.
- Test Barcelona Estación de Trabajo. <http://www.test-barcelona.com/es/>
- Lindenmayer JP, McGurk SR, Khan A, Kaushik S, Thanju A, Hoffman L, et al. Improving social cognition in schizophrenia: a pilot intervention combining computerized social cognition training with cognitive remediation. *Schizophr Bull* 2013;39(3):507-517.
- Hooker CI, Bruce L, Fisher M, Verosky SC, Miyakawa A, Vinogradov S. Neural activity during emotion recognition after combined cognitive plus social cognitive training in schizophrenia. *Schizophr Res* 2012;139(1-3):53-59.
- Harrington L, Langdon R, Siegert RJ, McClure J. Schizophrenia, theory of mind and persecutory delusions. *Cogn Neuropsychiatry* 2004;10(2):87-104.
- Marjoram D, Gardner C, Burns J, Miller P, Lawrie SM, Johnstone EC. Symptomatology and social inference: a theory of mind study of schizophrenia

- and psychotic affective disorder. *Cogn Neuropsychiatry* 2005;10(5):347-359.
39. Sarfati Y, Hardy-Bayle MC. How do people with schizophrenia explain the behaviour of others? A study of theory of mind and its relationship to thought and speech disorganization in schizophrenia. *Psychol Med* 1999;29(3):613-620.
 40. Greig TC, Bryson GJ, Bell MD. Theory of mind performance in schizophrenia: diagnostic, symptom, and neuropsychological correlates. *J Nerv Ment Dis* 2004;192(1):12-18.
 41. Abdel-Hamid M, Lehmkamper C, Sonntag C, Juckel G, Daum I, Brune M. Theory of mind in schizophrenia: the role of clinical symptomatology and neurocognition in understanding other people's thoughts and intentions. *Psychiatry Res* 2009;165(1-2):19-26.
 42. Frith CD, Corcoran R. Exploring 'theory of mind' in people with schizophrenia. *Psychol Med* 1996;26(3):521-530.
 43. Pickup GJ, Frith CD. Theory of mind impairments in schizophrenia: symptomatology, severity and specificity. *Psychol Med* 2001;31(2):207-220.
 44. Mehl S, Rief W, Lullmann E, Ziegler M, Kesting ML, Lincoln TM. Are theory of mind deficits in understanding intentions of others associated with persecutory delusions? *J Nerv Ment Dis* 2010;198(7):516-519.
 45. Drury VM, Robinson EJ, Birchwood M. 'Theory of mind' skills during an acute episode of psychosis and following recovery. *Psychol Med* 1998;28(5):1101-1112.
 46. Pousa E, Duno R, Brebion G, David AS, Ruiz AI, Obiols JE. Theory of mind deficits in chronic schizophrenia: evidence for state dependence. *Psychiatry Res* 2008;158(1):1-10.
 47. Sprong M, Schothorst P, Vos E, Hox J, van Engeland H. Theory of mind in schizophrenia: meta-analysis. *Br J Psychiatry* 2007;191:5-13.
 48. Duño R, Pousa E, Miguelez M, Ruiz A, Langohr K, Tobena A. [Poor premorbid adjustment linked to deterioration in theory of mind skills: a study in stabilised schizophrenic patients]. Spanish. *Rev Neurol* 2008;47(5):242-246.
 49. Bora E, Gokcen S, Kayahan B, Veznedaroglu B. Deficits of social-cognitive and social-perceptual aspects of theory of mind in remitted patients with schizophrenia: effect of residual symptoms. *J Nerv Ment Dis* 2008;196(2):95-99.
 50. Johnston PJ, Katsikitis M, Carr VJ. A generalised deficit can account for problems in facial emotion recognition in schizophrenia. *Biol Psychol* 2001;58(3):203-227.
 51. Johnston PJ, Stojanov W, Devir H, Schall U. Functional MRI of facial emotion recognition deficits in schizophrenia and their electrophysiological correlates. *Eur J Neurosci* 2005;22(5):1221-1232.
 52. Kohler CG, Turner TH, Bilker WB, Brensinger CM, Siegel SJ, Kanes SJ, et al. Facial emotion recognition in schizophrenia: intensity effects and error pattern. *Am J Psychiatry* 2003;160(10):1768-1774.
 53. Comparelli A, Corigliano V, De Carolis A, Mancinelli I, Trovini G, Ottavi G, et al. Emotion recognition impairment is present early and is stable throughout the course of schizophrenia. *Schizophr Res* 2013;143(1):65-69.
-
- 