

# REHABILITATION OF COGNITIVE FUNCTION IN PATIENTS WITH SEVERE MENTAL DISORDER: A PILOT STUDY USING THE COGNITIVE MODULES OF THE IPT PROGRAM

Jesús de la Higuera Romero  
*Health Service of Andalucía*

*This work studied the change in verbal memory, attention and executive functions in 20 patients with severe mental disorder as a result of applying IPT (Integrated Psychological Therapy) cognitive subprograms. The CVLT, a computerized version of the CPT and the Stroop and Hanoi Tower tests were also used in order to assess subjects' performance. FBF-3 was used to identify the training aspects most closely related to self-perception of the deficit. Clear improvements were obtained in some indices, whereas others showed resistance to the intervention. The scope and relevance of the data is discussed in the current research context.*

*Se ha estudiado el cambio en la memoria verbal, atención y función ejecutiva en 20 pacientes afectados de trastorno mental severo, como resultado de la aplicación de los subprogramas cognitivos de la Terapia Psicológica Integrada (IPT) (Roder, Brenner, Hodel, Kienzle, 1996). Se ha utilizado el TAVEC, así como versiones computerizados del CPT, STROOP y Torre de Hanoi, para evaluar los rendimientos de los sujetos en su vertiente más objetiva. Se ha incluido también el FBF-3 para dilucidar los efectos del entrenamiento sobre aspectos más vinculados a la autopercepción del déficit. Los resultados muestran mejorías claras en algunos de los índices medidos (memoria), parciales en otros (atención), mientras que algunos de ellos (funcionamiento ejecutivo y conciencia de déficit) se han mostrado inalterables tras la intervención. Se discuten el alcance y significación de estos datos en el contexto actual de la rehabilitación de funciones cognitivas en la esquizofrenia.*

The data accumulated in recent decades in the field of neurocognitive research are extending our knowledge of schizophrenic deficit and promoting the emergence of new areas and variables in relation to intervention.

It seems sufficiently well established today that, in addition to the typical and more traditionally studied alterations in schizophrenia, there is a cognitive deficit that affects different areas of subjects' mental functioning (attention, memory, executive function), markedly conditioning their ability to emit functionally useful responses in order to remain in tune with their environment. This deficit is substantial and appears, in its clearest form, shortly after the first episode (Grawe & Levander, 2001) and independently of other variables such as the degree of psychopathology or the sensitivity/reactance to stress displayed by the subject (Myin-Germeys, Krabbendam, Jolles, Delespaul & Van Os, 2002).

The weight of these cognitive limitations in explana-

tions of the variance of results has been discussed in numerous works (Velligan, Mahurin, Diamond, Hazelton & Eckert, 1997; Green, 2001), with the suggestion that they predict between 40 and 50 percent of the variance in subjects' adaptative and community functioning. Research in this area, moreover, has begun to contribute interesting data with regard to identifying specific and consistent relationships between neurocognitive abilities and functional results (Green, Kern, Braff & Mintz, 2000; Velligan, Bow-Thomas, Mahurin, Miller & Halgunseth, 2000). Furthermore, authors have stressed the modulating role of these deficits, not only within the process of acquiring skills in psychosocial rehabilitation programmes, but also in relation to the possibility of occupational-employment reinsertion (Bell & Bryson, 2001) and to subjects' social functioning (Liddle, 2000).

Although the presence of these problems is well established, and we are learning more and more about their specific nature and implications, in the field of intervention there is still an open debate on whether it is necessary to develop specific strategies for dealing with them. The most traditional view of rehabilitation, even acknowledging these disorders, has been based on the idea

---

The original Spanish version of this paper has been previously published in *Apuntes de Psicología*, 2002, Vol. 20, No 3, 387-402

.....  
Correspondence concerning this article should be addressed to Jesús de la Higuera Romero. Unidad de Rehabilitación de Área. C/ Jesús de los Milagros, nº 41. 11500 Puerto de Santa María. Cádiz. Spain. E-mail: jar@correo.cop.es

that these deficits were of a lower order than patients' functional problems, that they were difficult to approach, and that they could in any case be dealt with in a non-specific way as part of standard rehabilitation procedures (Bellack, 1992; Bellack, Gold & Buchanan, 1999).

From the perspective of clinical work itself, as pointed out previously, it also seems clear that cognitive deficit may interfere with the individual's capacity for benefiting from psychosocial treatment, especially when such intervention involves learning new skills. Thus, and in contrast to the earlier view, recent years have seen the emergence of specific procedures designed to improve altered cognitive function in patients with schizophrenia. The approaches vary widely, from the highly specific, acting on particular functions (Field, Galletly, Anderson & Walker, 1997; Medalia, Revheim & Casey, 2000; Wexler, Anderson, Fulbright & Gore, 2000; Green, Satz, Ganzell & Vaclav, 1992; Medalia, Aluma, Tryon & Merriam, 1998; Benedict, Harris, Markow, McCormick, Nuechterlein & Asarnow, 1994; Summerfelt, Alphas, Wagman, Funderburk, Hierholzer & Strauss, 1991) to the most general, conceived as therapeutic programmes with a wider scope (Wykes, Reeder, Corner, Williams & Everitt, 1999; Wykes & Van der Gaag, 2001; Hogarty & Flesher, 1999; Hogarty, 2000). *Integrated Psychological Therapy* (Roder, Brenner, Hodel & Kienzle, 1994; Roder, Zorn, Muller & Brenner, 2001; Vallina, Lemos, Roder, García, Otero, Alonso & Gutiérrez, 2001; Roder, Brenner, Muller, Lachler, Zorn, Reisch, Bosch, Bridler, Christen, Jaspen, Schmidl & Schwemmer, 2002) belongs to the latter type of technique.

The present study represents a first integrated approach within a wider and more general project we are currently developing, and which revolves around two objectives: on the one hand, the assessment of the technique's therapeutic potential; on the other, its differential utility (and possible adaptations) for responding effectively to the profiles of users currently under our attention. The data presented here refer to the first assessment point after the cognitive subprograms. Our aim is to clarify whether the three initial subprograms of the technique do indeed succeed in improving subjects' cognitive performance, which is the explicit aim of their design.

## METHOD

### *Sample*

The data we offer represent only a part of the total sample of subjects currently using the IPT protocol at our

centre. We used a definitive number of 20 subjects. The diagnostic profile, based on the CIE-10 (WHO, 1992) criteria, is as follows: six subjects with a diagnosis of paranoid schizophrenic disorder (30%), five with residual schizophrenic disorder (25%), two with catatonic schizophrenic disorder (10%), two with simple schizophrenia (10%), two with bipolar disorders (10%), one with delusional ideas (5%) and one with a schizoid disorder (5%).

Mean age of the group was 34.9 years (range 26-45), and mean time since diagnosis was 12.32 years (range 2-20). The sample was made up almost totally of males (N=19), with low educational profile (85% with only basic primary education).

### *Instruments*

All participants were assessed with a specific protocol that includes the following tests and assessment areas:

1. *Sevilla Neuropsychological Battery (BNS)* (León-Carrión, 1999). This is a computerized assessment instrument that permits the rating of three cognitive functions:
  - *Attention*: by means of a continuous performance test (CPT) with two assessment formats: simple attention and conditional attention.
  - *Executive function*: by means of the *Hanoi Tower test*.
  - *Neurocognitive interference*: with the *Stroop test*.
2. *California Verbal Learning Test (CVLT)* (Spanish Version-TAVEC) (Benedet & Alexandre, 1998): for obtaining different indices referring to verbal memory.
3. *Frankfurt Psychopathological Inventory (FBF-3)*, (Spanish version) (Jimeno Bulnes, Jimeno Valdés & Vargas Aragón, 1996): evaluates subjective awareness of the deficit.

The assessment point was set at 4 months after the start of the process, after completion of the first 3 subprograms of the technique, which are precisely those most explicitly aimed at improvement of the cognitive function. Data collection was carried out by assessors trained in the application of the tests, and who were not connected with the therapeutic process.

### *Procedure*

Participants were administered the IPT treatment program. This is a group intervention program, of a cognitive-behavioural orientation, consisting of five modules (cognitive differentiation, social perception, verbal com-

munication, social skills and problem-solving). The subprograms are designed with the general objective of improving the cognitive dysfunctions and social and behavioural deficits characteristic of psychotic patients. The therapeutic procedure is organized hierarchically, so that the first subprograms are directed towards basic cognitive skills; as the procedure advances, the objective becomes the improvement of more functional responses, such as the capacity for social relationships or the solution of everyday problems.

In our case, the process of applying the technique followed the standard sequence. The groups had an average of 6 patients and functioned with a closed structure. There were two sessions per week, whose duration varied depending on the subprogram in question (they generally lasted between 45 min and 1 hour 15 min). Total duration of the group is estimated at 9-12 months, with some flexibility depending on the pace of learning. The therapeutic team is made up of two people, one who adopts the role of therapist and another who works as co-therapist. These people are responsible for guiding the group from beginning to end. A part of the sessions is structured for working on recall content.

## RESULTS

In order to reveal the extent of the changes we carried out a comparison of means between the pre- and post-intervention conditions using the Student t-test. The SPSS 10.0 package for Windows was used for the statistical analysis.

In the analysis of the results by functions, and focusing first of all on the variable memory, the initial finding emerging from the patients' performance on the TAVEC in the pre-intervention condition is the presence of a considerable mnemonic deficit: their performance was two or three standard deviations below the mean. In line with the findings of other authors (Paulsen, Heaton, Sadek, Perry, Delis, Braff, Kuck, Zisook & Jeste, 1995; Kareken, Moberg & Gur, 1996), our patients also showed high rates of intrusion and perseverative errors, poor use of recall strategies and a high percentage of false positives in the recognition test.

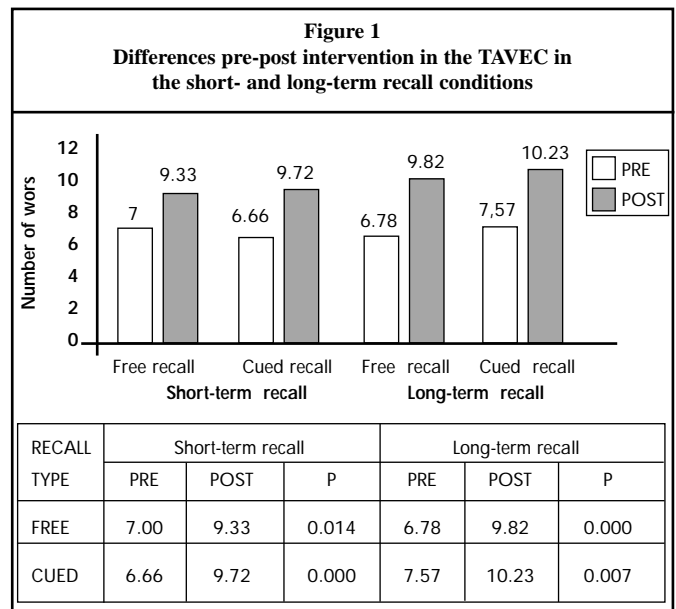
The data collected after the intervention reveal a significant improvement in a large part of the indices assessed in the test. Even so, patients' performance, though more normalized, continues to be below what would be expected in a normal population.

Total word recall (see Table 1) was significantly higher after treatment ( $p < 0.004$ ), and immediate recall also

improved ( $p < 0.018$ ); most important of all is the memory improvement shown after the learning trials. The indices referring to short- and long-term recall also changed in a positive way, in both the free recall and cued recall conditions.

In the analysis of the factors that can be considered as mnemonic interferences, it should be pointed out that intrusions decreased in both recall conditions. Patients' performance in the recall test was better, with significant gains in the discrimination indices and a decrease in the rate of false positives.

As regards attentional performance (see Table 2) in the test of simple attention, it can be seen that all the indices measured (number of stimuli identified, number of stimuli omitted, number of errors) show a tendency to improvement, but in this case the changes between the pre- and post-test assessment conditions in no case reach



**Table 1**  
Memory test performance in the pre- and post-intervention conditions

Recall indices	Pre- mean	Post- mean	Signif.
Total recall	35.78	44.16	0.004*
Immediate recall trial 1	5	6.22	0.047*
Immediate recall trial	58.47	10.77	0.018*
Free recall short term	7	9.33	0.014*
Free recall long term	6	9.82	0.000*
Cued recall short term	6.6	9.72	0.000*
Cued recall long term	7.57	10.23	0.007*
Intrusions free recall	7	2.76	0.000*
Intrusions cued recall	12.12	1.64	0.003*
False positives	2.82	0.94	0.003*

the minimum level of significance ( $p < 0.107$ ;  $p < 0.107$ ;  $p < 0.088$ ). In the conditional attention situation the data show a similar pattern, with no significant differences; patients' general performances are even slightly poorer. As was the case with memory, we find that participants' performances, in both conditions of the test, fall well

below what would be expected from a normal population.

Of the indices assessed in the executive function test (see Table 3), both total time employed in carrying out the test and mean response time fell significantly from the pre to the post condition ( $p < 0.002$ ;  $p < 0.001$ ). Nevertheless, a detailed analysis of the rest of the indices involved in the test reveals that, for example, in relation to type of movements made, the standard pattern indicating learning and control over response – that is, decrease in incorrect movements, increase in correct movements and decrease in total movements – was not fulfilled in this case. Participants displayed what could be called a more uninhibited pattern of response, in which all the indices increased to an equal extent. Consequently, errors did not decrease, and remained at levels similar to those of the pre-intervention condition.

With regard to the results of the Stroop test in the word-recognition condition (Stroop content), it can be seen (Table 4) that some of the parameters measured display the line expected after the intervention. There are significant decreases in mean response time ( $p < 0.002$ ) and total response time ( $p < 0.002$ ) for the test. Also, there is a tendency towards an increase in the number and percentage of correct responses, together with a parallel decrease in the number of errors. Statistical significance is not attained, however, in any of these parameters ( $p < 0.093$ ). The results in the colour recognition condition (Stroop colour) are poorer. The most notable result, in principle, is the higher level of interference it appears to generate in the patients. In this latter case no significant differences are found in any of the indices between the pre- and post-intervention conditions.

Scores in the factorial dimensions of the FBF-3 also fail to show significant differences between the pre and post conditions. This suggests that, despite the objective gains in some of the areas of cognitive functioning assessed, these did not have much impact with regard to the patients' own perception, which remained stable with regard to their deficits and limitations despite the training.

## DISCUSSION

The first point we wish to stress concerns the methodological limitations of this work. The study was closely linked to the clinical field itself, and had the drawback of weak control over the variables (no control group, sex bias in the sample, small number of participants, etc.). In view of this, any conclusions drawn should be treated with caution.

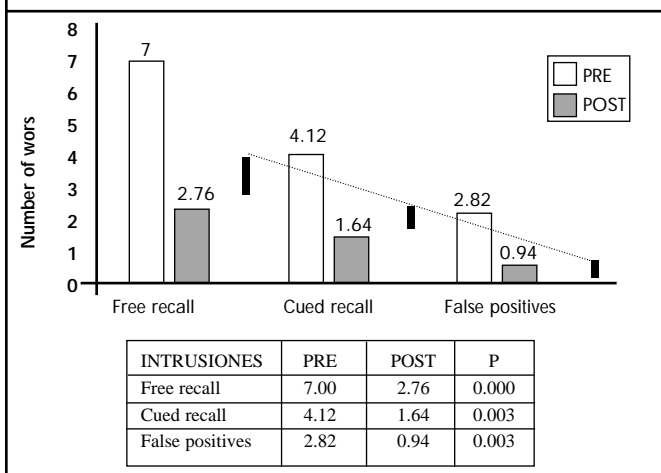
**Table 2**  
Performance in the attention test in the pre- and post-intervention conditions

Attention indices	Pre- mean	Post- mean	Signif.
<b>SIMPLE ATTN:</b>			
Identified stimuli	41.29	46.58	0.107
Omitted stimuli1	8.70	3.41	0.107
Incorrect responses	3.94	21.23	0.088
<b>CONDITIONAL ATTN:</b>			
Identified stimuli	43.37	43.75	0.776
Omitted stimuli	6.6	6.2	0.776
Incorrect responses	6.5	8.6	0.456

**Table 3**  
Performance in the executive function test in the pre- and post-intervention conditions

Indices	Pre- mean	Post- mean	Signif.
Total time (sec)	811.65	470.08	0.002*
Mean time (sec)	13.35	8.51	0.001*
Total movements	67.82	74.47	0.700
Correct movements	36.58	38.58	0.681
Incorrect movements	32.23	35.88	0.734
Type 1 error	2.76	3.1	0.767
Type 2 error	17.58	19.64	0.835
Type 3 error	10.88	13.05	0.591

**Figure 2**  
Differences between level of intrusions and rates of false positives in the TAVEC pre- and post-intervention



Nevertheless, a first analysis of the data obtained allows us to make two observations. The first is related to the scope and magnitude of the patients' cognitive deficit, which was extremely clear from their performance in practically all the tests of cognitive function used. The second observation refers to the technique itself: our data suggest that the effect of the first IPT subprograms on patients' cognitive functioning is limited to a few functions, such as memory, and is not generalizable to the rest. The results of other, more controlled studies are in a similar line (Spaulding, Reed, Sullivan, Richardson & Weiler, 1999). We cannot draw any conclusions about the potential cognitive gain at the end of the procedure, as it is possible that the cognitive improvement derives not exclusively from the *cognitive programs* of IPT, but appears as a side effect of applying the subsequent programs of social skills and problem-solving.

It is important to emphasize the achievements in the tests of verbal memory. First of all because this is one of the cognitive functions most consistently referred to in current work on cognition and functioning, as a predictor of success in acquisition (Silverstein, Hitzel & Schenkel, 1998; Spaulding, Fleming, Reed, Sullivan, Storzbach & Lam, 1999; Smith, Hull, Romanelli, Fertuck & Weiss, 1999). Secondly, because of the relevance of the gains and functional improvement in memory displayed by patients after the intervention. It would seem that the training provides them with better cognitive disposition for learning in the memory task.

In contrast to the improvements in memory, neither attentional performance nor executive functioning appeared to be significantly modified. Certain considerations can be made about this. The first of these, and in relation to attention, is to stress that previous studies have shown the difficulty of modifying these deficits. Some authors argue that we are dealing with typical markers closely linked to the psychobiological vulnerability of the subject, and that this makes their modification extremely challenging (Benedict, Harris, Markow, McCormick, Nuechterlein & Asarnow, 1994; Field, Galletly, Anderson & Walker, 1997; Sislow, Schonauer & Arolt, 2001). However, this argument should be treated with caution, since other studies have indeed found improvements in attentional performance (Medalia, Aluma, Tryon & Merriam, 1998), and some of them (Kern, Green & Goldstein, 1995) have even reported changes in subjects' performance in the *Span of Apprehension Test*, a measure of early visual processing that is also claimed to be a marker of subjects' vulnerability. A common characteristic of

these last-named works has been that of designing the training for intensive work on the function. This specificity is not a characteristic feature of IPT.

Executive functioning is a variable frequently identified as presenting a deficit in schizophrenia. However, even today, it is not sufficiently clear how potentially sensitive it is to treatments aimed at its rehabilitation. Thus, although some studies have shown the possibility of inducing changes in patients' performances in typical tests of this function such as the *WCST* (Summerfelt, Alphs, Wagman, Funderburk, Hierholzer & Strauss, 1991; Green, Satz, Ganzell & Vaclav, 1992), they can be considered initial approaches that are somewhat artificial, since, in a good deal of them, the methodology was reduced to training the subject in the response components appropriate for improving performance in the test. Thus, the data are scarcely generalizable, and have quite limited scope in the clinical field. Recently, there have been reports of the possibility of modifying this function (Delahunty & Morice, 1996; Wykes, Reeder, Corner, Williams & Everitt, 1999; Wykes & Van der Gaag, 2001) with more comprehensive programs aimed at working on cognitive flexibility, working memory and skills of planning and control. Although these studies have not found a direct relation between neurocognitive variables and other external variables such social functioning, the data suggest a consistent modification of the function, thus opening up a promising future for research.

There is a need for more empirical research, both on the altered cognitive function itself and on the weight and role of these deficits in the construction of symptoms and trademarks of the illness. It would also be interesting to delimit the subjective meaning of cognitive disorders and to identify the role of self-perception of these deficits in the subject's functioning and personal

Table 4  
Performance in the neurocognitive interference test in the pre- and post-intervention conditions

Indices	Pre- mean	Post- mean	Signif.
STROOP COLOUR:			
Total time (sec)	50.71	47.78	0.596
Mean time (sec)	2.52	2.38	0.605
Correct responses	17.78	18.35	0.651
Incorrect responses	2.21	1.64	0.651
STROOP CONTENT:			
Total time (sec)	42.92	29.84	0.002*
Mean time (sec)	2.14	1.49	0.002*
Correct responses	15.69	18.69	0.093
Incorrect responses	4.30	1.64	0.093

coping ability. Initial data reported by our team suggest consistent relationships between subjective awareness of deficits and coping strategies used by the patient (De la Higuera, Linares & Ariza, 2002). In our case, cognitive training does not appear to have generated changes in the way subjects view their cognitive deficits. It remains to be verified whether this perception has failed to improve because the training has actually fallen short of achieving changes in the function of sufficient substance and personal meaning for the subjects, or whether we are looking at a response that depends on other factors. Whatever the objective cognitive improvement, in this regard it may perhaps be unreasonable to expect a direct and linear effect of cognitive gain at the subjective level, since quite possibly, in the course of the illness, the cognitive deficits have become part of the stable views of oneself that may act as elements relatively independent of a more objective performance. Future work will need to determine whether complementing strategies for rehabilitating cognitive function with others of an individual and psychotherapeutic nature aimed at restructuring distorted views of the self might give more scope and consistency to results in this area.

Having discussed the data, and by way of a final reflection, we should like to raise and throw open some questions on the rehabilitation of cognitive functions in schizophrenia.

The first of these questions refers to the very viability of therapeutic procedures aimed at their modification. In this regard, some authors (Bebbington, Kuipers, Garety, Geddes, Martindale, Orbach & Morgan, 2002; Lublin, 2001; Haynes, 2000) suggest that, although we are talking about techniques with considerable apparent validity, their use has little empirical support at the present time. It is no less true, however, that there continue to appear in the experimental literature reports of positive results (Medalia, Revheim & Casey, 2000; Wexler, Anderson, Fulbright & Gore, 2000; Kurtz, Moberg & Gur, 2001; Van der Gaag, Kern, Van den Bosch & Liberman, 2002). Moreover, the new ideas on cerebral neuroplasticity (Robertson, 1999, 2000) and current techniques of neuroimaging are opening up new perspectives in the field, with more and more studies linking the results of training with changes in patients' brain function (Wykes, Brammer, Mellers, Bray, Reeder, Williams & Corner 2002; Wykes, 1998). What does seem to emerge from the different studies is that the gradient of change tends to be greater when exercises are designed to act specifically on the function (in the style

of rehabilitation of organico-cerebral cognitive damage). In any case, the results found in the different research projects are not uniform, and nor are such important factors as the specific methodology employed, the duration and intensity of the treatment or the assessment procedures for the results variable. In this context, the possibility of delimiting, in principle, individual potential for change takes on particular relevance. Thus, assessment methodologies revolving around the concept of learning dispositions (Wield, 1999; Wield & Wienobst, 1999) may be relevant for defining patient profiles that are more or less susceptible to intervention. Even so, it is still unclear whether this more restitutive view of cognitive function is truly relevant with regard to functional meaning and the maintenance of adaptive results, which are essential if this type of intervention is to become part of the therapeutic arsenal of rehabilitation techniques.

The second open question refers to the fact of how to incorporate the experimental data accumulated on different deficits into intervention programs. In our work, for example, IPT produces changes in patients' short- and medium-term verbal memory, but performance remains below what would be considered normal; moreover, two indices that we consider important, level of perseverative errors and use of recall strategies, were unaltered after the treatment. The fault in the use of *cluster strategies* has been found by other authors (Kareken, Moberg & Gur, 1996; Gold, Randolph, Carpenter, Goldberg & Weinberger, 1992), and has been attributed to deterioration in the central executive of working memory. Likewise, the level of perseverative errors suggests the presence of difficulties in central monitoring of action and mental control. These working memory deficits may be at the root of the poor organization and use of recall strategies in patients with schizophrenia. In our sample they were not modified, and this, in line with the observations in the first question, leaves it open to debate as to whether their modification would be possible by means of more specific rehabilitatory actions.

The third and final question we should like to consider concerns identifying the interventions that should be given priority, and above all, how to integrate the more molecular functions with the molar functions, and how to work on both the cognitive abilities and the dispositions for thought of the patient (Baron 1994). The role of structured practice is of great importance in the rehabilitation of cognitive capacity. Nevertheless, if the ultimate objective is generalization, other variables that may be

acting as mediators between subjects' cognitive deficit and their external response should also be taken into account. The new theoretical developments on the social cognition construct (Corrigan & Penn, 2001), together with the accumulated ideas and data on metacognitive functions associated with the ability to symbolize and infer intentions in oneself and in others – what has come to be called *theory of mind* – (Frith & Corcoran, 1996; Mazza, De Riso, Surian, Roncone & Casacchia, 2001; Pickup & Frith, 2001), undoubtedly constitute variables of great interest in relation to the final therapeutic result. The relationships between molecular cognitive deficits and metacognitive disorders have still to be defined, as have the ways of integrating the latter into structured therapeutic programs. Intervention techniques such as CET (*Cognitive Enhancement Therapy*) (Hogarty & Flesher, 1999; Hogarty, 2000), developed on the basis of these concepts, open up new and promising avenues towards integration.

It would seem clear that we are dealing with a complex field in which, despite the accumulation of experimental data, there is still a lack of coherent overall perspectives, which shape and give meaning to a *gestalt* that, even today, appears fragmented and incomplete. Many questions remain unanswered, and any therapeutic procedure articulated within this area will be influenced and, to some extent, limited by this theoretical and experimental vagueness. In this context, IPT represents a comprehensive, ambitious and innovative program; given its flexibility and wide-ranging approach, it is capable of acting on both the cognitive deficits present on schizophrenia and problems more closely related to patients' interpersonal functioning; it is highly structured and uses a group framework – an extremely useful therapeutic tool in work with psychotic patients. Few of the therapeutic programs currently available are so readily applicable to clinical practice. Nevertheless, its field of activity is in a state of continuous movement and innovation, making it necessary for the procedure to remain open to the possibility of incorporating new knowledge and developments.

## REFERENCES

Baron, J. (1994). *Thinking and Deciding*. New York: Cambridge University Press.

Bell, M.D. & Bryson, G. (2001). Work rehabilitation in schizophrenia: does cognitive impairment limit improvement? *Schizophrenia Bulletin*, 27, 269-279.

Bellack, A.S. (1992). Cognitive rehabilitation for schi-

zophrenia: is it possible? Is it necessary? *Schizophrenia Bulletin*, 18, 43-50.

Bellack, A.S., Gold, J.M. & Buchanan, R.W. (1999). Cognitive rehabilitation for schizophrenia: problems, prospects, and strategies. *Schizophrenia Bulletin*, 25, 257-74.

Benedet, M. & Alenjandre, M. (1998). *Test de Aprendizaje Verbal España-Complutense*. Madrid: TEA Ediciones.

Benedict, R., Harris, A., Markow, T., McCormick, J., Nuechterlein, K. & Asarnow, R. (1994). Effects of attention training on information processing in schizophrenia. *Schizophrenia Bulletin*, 20, 537-546.

Bryson, G., Whelahan, H.A. & Bell, M. (2001). Memory and executive function impairments in deficit syndrome schizophrenia. *Psychiatry Research*, 102, 29-37.

Corrigan, P. & Penn, D. (2001). *Social Cognition and Schizophrenia*. Washington DC: American Psychological Association.

Delahunty, A. & Morice R. (1996). Rehabilitation of frontal- executive impairments in schizophrenia. *Australian and New Zeland Journal of Psychiatry*, 30, 760-767.

De la Higuera, J., Linares, T. & Ariza, F. (2002). Conciencia subjetiva de deficit y estrategias de afrontamiento en la esquizofrenia: un estudio descriptivo. *XVIII Jornadas de la Asociación Española de Neuropsiquiatría*.

Elvevag, B., Weickert, T., Wechsler, M., Coppola, R., Weinberger, D.R. & Goldberg, T.E. (2002). An investigation of the integrity of semantic boundaries in schizophrenia. *Schizophrenia Research*, 53, 187-198.

Field, C.D., Galletly, C., Anderson, D. & Walker, P. (1997). Computer-aided cognitive rehabilitation: possible application to the attentional deficit of schizophrenia, a report of negative results. *Perceptual and Motor Skill*, 85, 995-1002.

Frith, C.D. & Corcoran, R. (1996). Exploring "theory of mind" in people with schizophrenia. *Psychological Medicine*, 26, 521-530.

Gold, J.M., Randolph, C., Carpenter, C.J., Goldberg, T.E. & Weinberger, D.R. (1992). Forms of memory failure in schizophrenia. *Journal of Abnormal Psychology*, 101, 487-494.

Grawe, R.W. & Levander, S. (2001). Neuropsychological impairments in patients with schizophrenia: stability and prediction of outcome. *Acta Psychiatrica Scandinavica*, 408, 60-64.

- Green, M.F. (1996). What are the functional consequences of neurocognitive deficit in schizophrenia? *American Journal of Psychiatry*, 153, 321-330.
- Green, M.F. (2001). *Schizophrenia revealed: from neurons to social interactions*. New York: Norton.
- Green, M.F., Kern, R.S., Braff, D.L. & Mintz, J. (2000). Neurocognitive deficit and functional outcome in schizophrenia: Are we measuring the "right stuff"? *Schizophrenia Bulletin*, 26, 119-136.
- Green, M.F. & Nuechterlein, D.H. (1999). Should schizophrenia be treated as a neurocognitive disorders? *Schizophrenia Bulletin*, 25, 309-318.
- Green, M.F., Satz, P., Ganzell, S & Vaclav, J.F. (1992). Wisconsin card sorting test performance in schizophrenia: Remediation of a stubborn deficit. *American Journal of Psychiatry*, 149, 62-67.
- Haynes, R.I. & McGrath, J.J. (2000). Cognitive rehabilitation for people with schizophrenia and related conditions. *Cochrane Systematic Review*.
- Hogarty, G.E. & Flesher, S. (1999). Practice principles of cognitive enhancement therapy for schizophrenia. *Schizophrenia Bulletin*, 25, 693-708.
- Hogarty, G.E. & Flesher, S. (1999). Developmental theory for a cognitive enhancement therapy of schizophrenia. *Schizophrenia Bulletin*, 25, 667-692.
- Hogarty, G.E. (2000). Cognitive rehabilitation of schizophrenia. *Harvard Mental Health Letter*.
- Jimeno Bulnes, N., Jimeno Valdés, A. & Vargas Aragón, M. (1996). *El síndrome psicótico y el inventario psicopatológico de Frankfurt. Conceptos y resultados*. Barcelona: Springer-Verlag Ibérica.
- Kareken, D.A., Moberg, P.J. & Gur, R.C. (1996) Proactive inhibition and semantic organization: relationship with verbal memory in patients with schizophrenia. *Journal of the International Neuropsychological Society*, 2, 486-493.
- Kern, R.S., Green, M.F. & Goldstein, M.F. (1995). Modification of performance on the span of apprehension, a putative marker of vulnerability to schizophrenia. *Journal of Abnormal Psychology*, 104, 385-389.
- Kurtz, M.M., Moberg, P.J., Gur, R.C. & Gur, R.E. (2001). Approaches to cognitive remediation of neuropsychological deficit in schizophrenia: A review and meta-analysis. *Neuropsychological Review*, 11, 197-210.
- León- Carrión, L. (1999). *Bateria Neuropsicológica Sevilla*. Madrid: TEA.
- Liddle, P.F. (2000). Cognitive impairment in schizophrenia: its impact on social functioning. *Acta Psychiatrica Scandinavica*, 400, 11-16.
- Lublin, H. (2001). Cognitive dysfunction in schizophrenia. *Acta Psychiatrica Scandinavica*, 408, 5-9.
- Mazza, M., De Risio, A., Surian L., Roncone, R. & Casacchia, M. (2001). Selective impairments of theory of mind in people with schizophrenia. *Schizophrenia Research*, 47, 209-308.
- Medalia, A., Aluma, M., Tryon, W. & Merriam, A. (1998). Effectiveness of attention training in schizophrenia. *Schizophrenia Bulletin*, 24, 147-152.
- Medalia, A., Revheim, N. & Casey, M. (2000). Remediation of memory disorders in schizophrenia. *Psychological Medicine*, 30, 1451-1459.
- Myin- Germeys, I., Krabbendam, L., Jolles, J., Delespaul, P.A. & Van Os, J. (2002). Are cognitive impairments associated with sensitivity to stress in schizophrenia? An experience sampling study. *American Journal of Psychiatry*, 159, 443-449.
- Paulsen, J.S. Heaton, R.H., Sadek, J.R., Perry, W., Delis, D.C., Braff, D., Kuck, J., Zisook, S. & Jeste, D.V. (1995). The nature of learning and memory impairment in schizophrenia. *Journal of the International Neuropsychological Society*, 1, 88-89.
- Penades, R., Boget, T., Lomena, F., Bernardo, M., Mateos, J.J., Laterza, C., Pavia, J. & Salamero, M. (2000). Brain perfusion and neuropsychological changes in schizophrenic patients after cognitive rehabilitation. *Psychiatry Research*, 98, 127-132.
- Perlstein, W.M., Carter, C.S., Noll, D.C. & Cohen, J.D. (2001). Relation of prefrontal cortex dysfunction to working memory and symptoms in schizophrenia. *American Journal of Psychiatry*, 158, 1105-1113.
- Pickup, G.J. & Frith, C.D. (2001). Theory of mind impairments in schizophrenia: Symptomatology, severity and specificity. *Psychological Medicine*, 31, 207-220.
- Pilling, S., Bebbington, P., Kuipers, E., Garety, P., Geddes, J., Martindale, B., Orbach, G & Morgan, C. (2002). Psychological treatments in schizophrenia: II. Meta- analyses of randomized controlled trials of social skills training and cognitive remediation. *Psychological Medicine*, 32, 783-791.
- Robertson, I.H. (1999). Setting goals for cognitive rehabilitation. *Current Opinion in Neurology*, 12, 703-708.
- Robertson, I.H. (2000). Compensations for brain deficit: "Every cloud...". *British Journal of Psychiatry*, 176, 412-413.



- Roder, V., Brenner, H., Hodel, B. & Kienzle, N. (1994). *Terapia integrada de la esquizofrenia*. Barcelona: Ariel Psicología, 1996.
- Roder, V., Brenner, H.D., Muller, D., Lachler, M., Zorn, P., Reisch, T., Bosch, J., Bridler, R., Christen, C., Jaspén, E., Schmidl, F. & Schwemmer, V. (2002). Development of specific social skills training programmes for schizophrenia patients: results of a multicentre study. *Acta Psychiatrica Scandinavica*, 105, 363-371.
- Roder, V., Zorn, P., Muller, D. & Brenner, H.D. (2001). Improving recreational, residential and vocational outcomes for patients with schizophrenia. *Psychiatric Services*, 52, 1439-1441.
- Rund, B.R. & Borg, N.E. (1999). Cognitive deficit and cognitive training in schizophrenic patients: A review. *Acta Psychiatrica Scandinavica*, 100, 85-95.
- Silverstein, S.M., Hitzel, H. & Schenkel, L. (1998). Identifying and addressing cognitive barriers to rehabilitation readiness. *Psychiatric Services*, 49, 34-36.
- Smith, T., Hull, J., Romanelli, S., Fertuck, E. & Weiss, K. (1999). Symptoms and neurocognition as rate limiters in skills training for psychotic patients. *American Journal of Psychiatry*, 156, 1817-1818.
- Spaulding, W., Fleming, S.K., Reed, D., Sullivan, M., Storzach, D. & Lam, M. (1999). Cognitive functioning in schizophrenia: implications for psychiatric rehabilitation. *Schizophrenia Bulletin*, 25, 275-289.
- Summerfelt, A., Alphs, L., Wagman, A., Funderburk, F., Hierholzer, R. & Strauss, M. (1991). Reduction of perseverative errors in patients with schizophrenia using monetary feedback. *Journal of Abnormal Psychology*, 100, 613-616.
- Suslow, T., Schonauer, K. & Arolt, V. (2001). Attention training in the cognitive rehabilitation of schizophrenic patients: A review of efficacy studies. *Acta Psychiatrica Scandinavica*, 103, 15-23.
- Tracy, J.I., Mattson, R., King, C., Bundick, T., Celenza, M.A. and Glosser, G. (2001). A comparison of memory for verbal and non verbal material in schizophrenia. *Schizophrenia Research*, 50, 199-211.
- Vallina, O., Lemos, S., Roder, V., García, A., Otero, A., Alonso, M. & Gutiérrez, A. (2001). Rehab rounds: An integrated psychological treatment program for schizophrenia. *Psychiatric Services*, 52, 1165-1167.
- Van der Gaag, M., Kern, R.S., Van den Bosch, R.J. & Liberman, R.P. (2002). A controlled trial of cognitive remediation in schizophrenia. *Schizophrenia Bulletin*, 28, 167-176.
- Velligan, D.I., Bow-Thomas, C.C., Miller, A.L. & Halgunseth, L.C. (2000). Do specific neurocognitive deficit predict specific domains of community function in schizophrenia? *Journal of Nervous and Mental Disease*, 188, 518-524.
- Velligan, D.L., Mahurin, R.K., Diamond, P.L., Hazelton, B.C. & Eckert, S.L. (1997). The functional significance of symptomatology and cognitive function in schizophrenia. *Schizophrenia Research*, 25, 21-31.
- Wexler, B.E., Anderson, M., Fulbright, R.K. & Gore, J.C. (2000). Preliminary evidence of improved verbal working memory performance and normalization of task-related frontal lobe activation in schizophrenia following cognitive exercises. *American Journal of Psychiatry*, 157, 1694-1697.
- Wield, K.H. & Wienobst, J. (1999). Interindividual differences in cognitive remediation research with schizophrenic patients: indicators of rehabilitation potential? *International Journal of Rehabilitation Research*, 22, 55-59.
- Wield, K.H. (1999). Rehab rounds: cognitive modifiability as a measure of readiness for rehabilitation. *Psychiatric Services*, 50, 1411-1419.
- Wykes, T. (1998). What are we changing with neurocognitive rehabilitation? Illustrations from two single cases of changes in neuropsychological performance and brain systems as measured by SPECT. *Schizophrenia Research*, 34, 77-86.
- Wykes, T. (2000). Cognitive rehabilitation and remediation in schizophrenia. En T. Sharma and P. Harvey (Eds.), *Cognition in Schizophrenia. Impairments, importance and treatment strategies* (pp. 332-351) New York: Oxford University Press.
- Wykes, T., Brammer, M., Mellers, J., Bray, P., Reeder, C., Williams, C., & Corner, J. (2002). Effects on the brain of a psychological treatment: cognitive remediation therapy: functional magnetic resonance imaging in schizophrenia. *British Journal of Psychiatry*, 181, 144-152.
- Wykes, T., Reeder, C., Corner, J., Williams, C. & Everitt, B. (1999). The effects of neurocognitive remediation on executive processing in patients with schizophrenia. *Schizophrenia Bulletin*, 25, 291-307.
- Wykes, T. & Van der Gaag, M. (2001). Is time to develop a new cognitive therapy for psychosis? Cognitive remediation therapy. *Clinical Psychological Review*, 21, 1227-1238.