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Intellectual capacity measurement in schizophrenia

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Introduction. The measurement of the intellectual capacity (IC) in schizophrenic patients has been found to be of clinical relevance. A user-friendly tool such as the Cattell's intelligence test might facilitate this measurement in daily clinical practice.

Method. In this study, we measured the intelligence quotient (IQ) using Cattell's test in 35 schizophrenic patients before and after treatment with risperidone.

Results. At baseline, the sample showed an average intelligence of 78.3 points (standard desviation [SD]: 14.3), in the low-medium range. After 1 year on risperidone, the IQ significantly improved (mean: 84.8; SD: 17.0; p = 0.028). This IQ elevation was positively correlated with the improvement in the psychotic symptoms rated with the PANSS.

Conclusions. Cattell's intelligence test could be a valid instrument to measure cognitive performance in schizophrenic patients. Antipsychotic therapy with risperidone could be effective to improve cognitive functioning in these subjects.

Key words:
Schizophrenia. Cognitive impairment. Cattell's test. Risperidone.

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Medición de la capacidad intelectual en pacientes esquizofrénicos

Introducción. La medición del cociente intelectual (CI) del paciente esquizofrénico resulta relevante para la intervención clínica con estos enfermos. Poder disponer de un instrumento de manejo sencillo como el test de inteligencia de Cattell permitiría realizar esta medición en la práctica clínica habitual.

Método. En este estudio se presentan los hallazgos de la medición del nivel de CI en un grupo de 35 pacientes esquizofrénicos utilizando el test de Cattell antes y después del tratamiento con risperidona.

Resultados. Al inicio del estudio se observó una inteligencia media de 78,3 puntos (desviación estándar [DE]: 14,3), que puede considerarse en el rango medio-bajo. Tras 1 año de tratamiento con risperidona se produjo una mejoría estadísticamente significativa del CI (media: 84,8; DE: 17,0; p = 0,028). Esta elevación en el CI se correlacionó positivamente con la mejoría de la sintomatología psicótica medida mediante la PANSS.

Conclusiones. El test de inteligencia de Cattell podría ser un instrumento válido para medir el rendimiento cognitivo de los pacientes esquizofrénicos. El tratamiento antipsicótico con risperidona podría ser efectivo para mejorar la función cognitiva en estos enfermos.

Palabras clave:
Esquizofrenia. Déficit cognitivo. Test de Cattell. Risperidona.

INTRODUCTION

Several studies show that patients diagnosed of schizophrenia have a lower intelligence quotient (IQ) than healthy paired populations[1-5]. There is no general consensus when defining if this decreased intelligence capacity precedes schizophrenia or not and if it progresses or not with the evolution of the disease[4-11].

Decrease of cognitive capacity in schizophrenic patients seems to be more important in localized cognitive functions in the frontal lobe: basically attention, learning, certain types of memory and executive functions[12-14]. However, the scales conventionally used to evaluate IQ (WAIS, Raven test) have not been shown to be very sensitive in the evaluation of patients with frontal function deterioration[15].

Evaluation and measurement of cognitive deficits in schizophrenic patients is leading to increasingly greater interest. This interest is, first, on basic research of the characteristics of schizophrenic disease (specificity, onset, evolution, and correlation with the remaining psychopathology) and second this being a decisive indicator of functional prognosis (quality of life, reintegration in the community, academic/work insertion).

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In 1999, after making an extensive review of the articles published on the impact of cognitive deficit in the functioning of the schizophrenic patient, Green found that cognitive disorders predicted global functioning of patients better than positive and negative symptoms[16].

The difficulty that the clinicians have is because the evaluation methods of these cognitive deficits entail using standardized neuropsychological tests that take up much time for their applications and often need to be administered by professionals trained in their management. Recently, an attempt is being made to develop new reliable, short and easy-to-administer cognitive evaluation instruments that could be used in the daily clinical practice. In recent years, new short neuropsychological tests have been under development for the cognitive evaluation specifically of schizophrenic patients, such as the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)[17], Brief Assessment of Cognition in Schizophrenia (BACS)[18] and Brief Cognitive Assessment (BCA).19 At present, our department is participating in a validation study of a new evaluation scale of cognitive deterioration of psychotic and affective disorders that is easy to apply because it is short and simple, the Screen for Cognitive Impairment in Psychiatry (SCIP)[20].

It has been hypothesized that the different cognitive functions that would be measured with these tests are related with certain basic cognitive domains, such as episodic memory and language and that they are also interrelated through the «g» factor of intelligence. Fuster[21] stressed that the evaluation of the «g» factor of intelligence with the Spearman test[22] is the most sensitive test to detect a frontal lobe function alteration.

Spearman defined an intelligence factor, or the «g» factors, that seems to adequately represent the cognitive functions usually located in the frontal lobe[22-25]. Some instruments such as the Cattell test and Raven's Progressive Matrices scale have been demonstrated to be useful in the evaluation of Spearman's «g» factor and thus of cognitive deterioration in patients with frontal lobe lesions[25-30].

Different studies have confirmed that cognitive deficits of the schizophrenic may improve after treatment with atypical antipsychotics.

Between January 2001 and December 2002, we conducted a study to determine the intellectual functioning of schizophrenic patients using an easy to apply test such as the Cattell Culture Fair[28], that basically measures Spearman's «g» factor. Furthermore, it aimed to check if the IQ value obtained by said test could be improved by the effect of antipsychotic treatment with risperidone.

The antipsychotic chosen was risperidone, a benzisoxazole derivative that blocks serotoninergic 5-HT2 and dopaminergic D2 receptors[31,32] that has demonstrated a potent antipsychotic efficacy, improving both positive and negative symptoms of schizophrenia. The changes in the latter ones may be reflected in an improvement of cognitive functions and in the intelligence test results[33-41]. Furthermore, a low incidence of extrapyramidal symptoms has also been described with risperidone compared with conventional antipsychotics[42-46], as well as low sedative action due to its scarce or null anticholinergic action. The efficacy of risperidone on positive, negative and cognitive symptoms and its good tolerability profile could favor better cognitive functioning in schizophrenic patients.

This present study aimed to: *a)* evaluate the intellectual level of a group of patients with schizophrenia diagnosis, using the Cattel Culture Fair test, and *b)* evaluate the effectiveness of antipsychotic treatment with risperidone at middle term in the cognitive function of the schizophrenic.

METHODOLOGY

Bioethics

All the patients gave their consent before beginning their participation in the study. The research was designed and conducted according to the bioethical postulates of the Declaration of Helsinki[47].

Patient screening

The study population included 35 patients. Inclusion criteria were: *a)* age from 18 to 65 years; *b)* diagnosis of schizophrenic disorder according to DSM-IV criteria (codes: 295.30, 295.10, 295.20, 295.90, 295.60), and *c)* clinical indication of a change of antipsychotic because limited or null clinical response and/or bad tolerability to previous antipsychotic treatment was observed. Association of another antipsychotic drug to risperidone was not permitted.

Schizophrenic patients who were pregnant or in child bearing potential age who did not use contraceptive measures, patients who were breastfeeding, who scored less than 27 on the Mini-Mental State Exam[48], and patients with neurological diseases or other serious concomitant diseases that could interfere with the research parameters were excluded.

Study design

This is a prospective, observational, open label study conducted in the out-patient clinic of the Psychiatry Department of the Hospital General Universitario of Guadalajara.

The study period was 1 year, with a total of 6 evaluation visits (baseline, month 1, month 3, month 6, month 9 and month 12).

The instruments used were the Cattell «g» factor test, scale 2,49 PANSS scale[50], clinical global impression scale (CGI), and UKU scale to evaluate side effects of the treatment[51].

All the patients received treatment with risperidone, at a dose in the range of 3-6 mg/day and then, according to the clinical research psychiatrist's judgment, the dose was adjusted in the range of 3-9 mg/day based on the clinical response of the patients. The use of other concomitant antipsychotics was not authorized for a period greater than two weeks although prescription of other non-antipsychotic psychodrugs was permitted.

Measurements

Sociodemographic aspects, type of schizophrenic disorder and its course, previous antipsychotic treatment, measurement of intelligence quotient at the beginning of the study and its evolution during the year, severity of the psychopathology according to the PANSS scale and description of the adverse reactions are described for the sample studied.

Statistical analysis

A database was created in Access 97 for the statistical processing of the data, with internal coherence rules and ranges in order to obtain a database with the fewest errors possible. The statistical analysis was performed using the SPSS program, v. 11.0.

An analysis of the variance was performed according to statistical tests for non-parametric tests, Friedman's test and Wilcoxon's test to analyze the evolution of the seriousness of the disorder as well as the variations of the intellectual level during the study (on scale 2 of the Cattell «g» factor test and on the PANSS and CGI scales).

All the statistical tests were interpreted with a significance level of 5% and 80% power.

RESULTS

Although a total of 35 patients were enrolled, only 32 were evaluable, 3 of them being excluded because they did not fulfill the enrolment criteria of the sample (age, concomitant treatment with another antipsychotic agent and score on the Mini-Mental State Exam (MSE < 27). A total of 22 patients out of 32 evaluable ones completed the study (1 withdrew in the month 3 visit, 3 did so in the 6 month visit and 6 in the month 9 visit.

Mean age of the sample was 34.6 years. The majority were males (81.3 %), unemployed (75 %), with a middle study level (primary, 30 %, and secondary, 46.7 %), and 62 % lived with their parents. It can be considered that more than half of the patients had a deficient functioning level, with limited independence capacity, that means great dependence on their family nucleus and absence of work activity or of another type of activity.

The most frequent subtype of schizophrenic disorder was paranoid (68.8%). Mean evolution time of the schizophrenic disease was 13.1 years (SD: 10.2) (table 1).

Consumption of current or past toxic agents was the following: nicotine, 59.4 %; alcohol, 14.3 %; methadone, 40.6 %; cocaine, 43.8 %; amphetamines, 43 %; opiates, 43.8 %; barbiturates, 40.6 %, and cannabis, 46.9 % .

Mean score on the MSE was 32.8 (SD: 2). Previous antipsychotic treatments are shown in table 3.

The main reason why risperidone was initiated (76.9 % of the patients) was due to poor response to the previous treatment. The final mean dose of risperidone was 6 mg/day. Ten patients (31.3 %) did not receive any psychological treatment or social support. Six received cognitive-behavior psychotherapy (18.8 %), 3 group therapy (9.4 %), 10 psychoeducative support (31.3 %), and 1 in the day hospital (3.1 %).

Fourteen patients (43.8 %) were treated with some non-antipsychotic concomitant psychopharmacological medication (anxiolytics and hypnotics 31.3 % and antidepressants 21.9 %). In the baseline visit, 15 (46.9 %) were receiving antiparkinsonian treatment while only 7 (21.8 %) required this at the end of the study.

The mean value on the Cattell test increased significantly (Friedman test; p = 0.028), which went from a mean IQ: 78.3

Table 1 Characteristics of schizophrenic disorder

	Total	%
Type of schizophrenia		
Paranoid	22	68.8
Disorganized	2	6.3
Catatonic	1	3.1
Undifferentiated	3	9.4
Residual	4	12.5
Evolution		
Continuous	10	31.2
Episodic without residual symptoms	3	9.4
Episodic with residual symptoms	15	46.9
Less than 1 year from onset of the first psychotic symptoms	4	12.5

(SD: 14.3) in the baseline visit to a mean IQ: 84.8 (SD: 17) in the final visit (fig. 1).

In our study population, a predominance of negative symptoms over positive ones was observed. At the end of the follow-up, there was a statistically significant decrease (Friedman's test; $p<0.001$) in the global PANSS scale scores and on the positive, negative and general psychopathology subscales, it being found that the score obtained in all the visits was lower in regards to the baseline visit in the total scale and its subscales (Wilcoxon test; $p<0.05$) (figs. 2 and 3).

The decrease in the mean of the CGI scale in all the visits regarding baseline was statistically significant (Friedman's test; $p<0.001$).

Adverse reactions considered relevant were only recorded in three patients (9.4%). These were dizziness, hot flushes and palpitations.

Extrapyramidal symptoms were evaluated in the study patients with the UKU scale. A descending tendency of the extrapyramidal symptoms was observed during the study, going from a mean of 3 points (SD: 3.8) in the baseline visit to 0.5 (SD: 1.3) at 12 months of treatment (Friedman's test; $p<0.001$).

CONCLUSIONS

Although the study sample is small, some tendencies can be found in these preliminary data. The evaluable sample was mostly formed by young schizophrenic patients (mean age 34.6 years; SD: 9.3), with a majority of males (81.3%), mean disease evolution of 13 years. At the onset of the study, they had schizophrenic psychopathology with a total mean PANSS of 82.5 points (SD: 25.5), negative symptoms (23.1 points) predominating over the positive ones (17.5 points). The majority of the patients had one course of episodic disorder (56.3%) or continuous disorder (31.2%) without admissions in the year prior to the onset of the study. The majority were single and lived with their parents (62%) and were not working (75%). Thus, it can be considered that this is a group of chronic schizophrenic patients with a relatively low sociolaboral functioning level.

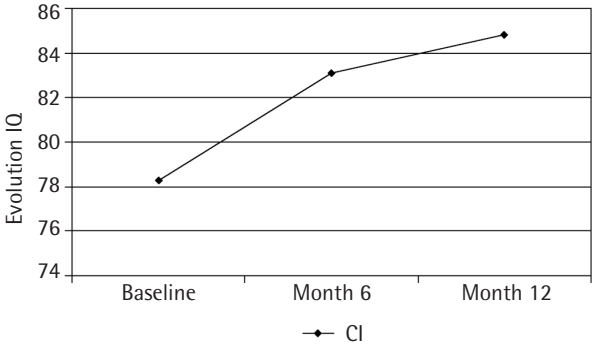

Figure 1 *Evolution of Catell test (IQ).*

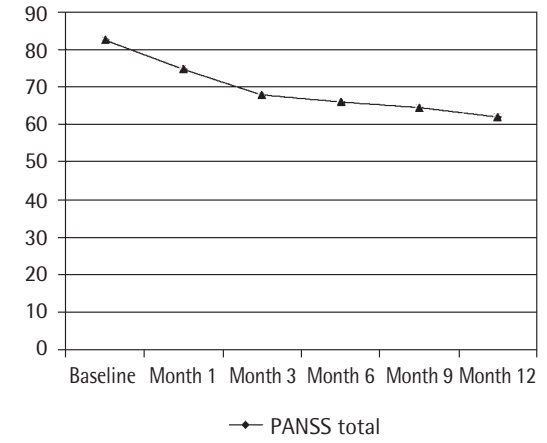

Figure 2 *Evolution of total score on PANSS scale.*

The intellectual level at the onset of the study measured with the Cattell test can be considered middle-low, with a mean IQ of 78.3 points (SD: 14.3). At the end of the study, the intelligence functioning measured by the same test had improved to an IQ of 84.4 points (SD: 17.0). This change which has statistical significance ($p<0.05$) was associated to improvement in the schizophrenic psychopathology measured by the PANSS scale, that means improvement in both the negative and positive subscale. We can infer that this improvement in IQ over 1 year means improvement in the cogni-

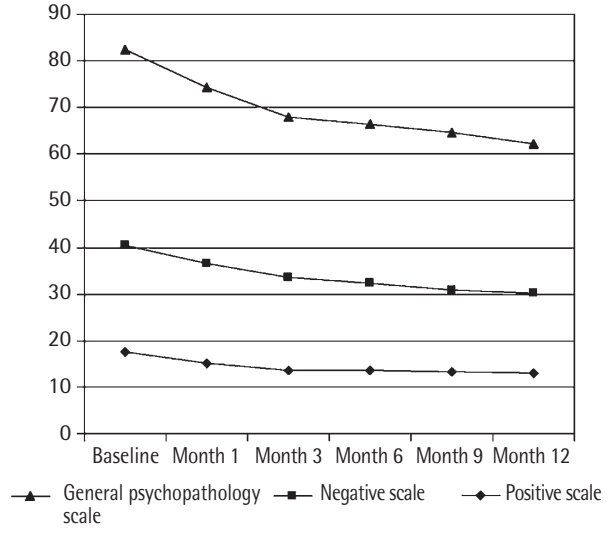

Figure 3 Evolution of PANSS scale subscales.

tive functioning of the schizophrenic and that the Cattell test can be used in the usual clinical practice, because it is simple and short, to obtain an approach to the degree of cognitive deficit of the schizophrenic and to determine their evolution with the treatment. There are no previous studies in which this test has been used to evaluate cognitive deficit in schizophrenia. The WAIS had been used, above all some subtests, as a measurement of cognitive functioning in the schizophrenic subject[52], even with global scores[53], where it was observed, as in the present study, that there was a generalized mean deterioration through the global, verbal and manipulative IQ. It was also observed that the manipulative scores are lower than the verbal ones.

The response of the patients to risperidone was effective, presenting improvement of the positive and negative psychotic symptoms that was observed through the scores obtained on the PA scale during the successive follow-up visits. The study results also indicate that treatment with risperidone improved the patient's intelligence level. Treatment tolerability was good. Only three adverse reactions were collected, there being no significant extrapyramidal effects in any case.

The present study shows that the Cattell test may be valid to know the cognitive functioning level of the schizophrenic patient and may also serve to detect a change since, at least in this study, it seems to be sensitive to improvement of the said cognitive function. It can also be concluded that treatment with risperidone may be effective to improve cognitive function in patients with schizophrenia.

Some important limitations in this study must be mentioned. The small sample size could limit the external validity of the findings. Furthermore, the improvement in IQ during the one year follow-up could be due to the elimination of the interference effect of the correctors and conventional antipsychotics on the cognitive function. Studies with larger series are required to confirm the results presented. It is also necessary to investigate if the improvement in the IQ with the treatment of the schizophrenic disease is correlated with a better level of objective psychosocial functioning in the school and work areas.

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