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## ORIGINAL ARTICLE

# Executive dysfunction in schizophrenia and its association with mentalizing abilities<sup>☆</sup>



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### KEYWORDS

Schizophrenia;  
Executive function;  
Theory of mind;  
Neuropsychological tests;  
Discriminant analysis

### Abstract

**Introduction:** Patients with schizophrenia have been found impaired in important aspects of their basic and social cognition. Our aim in this study is to explore the relationship between executive function (EF) and theory of mind (ToM) deficiencies in patients that suffer the illness. **Materials and methods:** Twenty-two Spanish-speaking inpatients and 22 healthy controls matched in age, sex, education, language dominance, and premorbid IQ were assessed in EF and ToM abilities. The former were assessed using 10 tasks that covered 5 cognitive dimensions and the latter using 3 different tasks. Correlation analyses were used to explore the level of association between executive and mentalizing abilities. A series of discriminant function analyses were carried out to examine the relative contribution of each executive and mentalizing task to discriminate between patients and controls.

**Results:** Patients showed impairments in both, executive and ToM abilities. The correlation analyses showed a virtual absence of association between EF and ToM abilities within the group of patients, and an almost opposite pattern within the healthy group. ToM performance was more accurate than executive performance to discriminate patients from controls.

**Conclusions:** Although EFs and ToM deficits come into view together in schizophrenia, they appear to belong to different and relatively independent cognitive domains.

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**PALABRAS CLAVE**

Esquizofrenia;  
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 Análisis discriminante

## La función ejecutiva en la esquizofrenia y su asociación con las habilidades cognitivas sociales (mentalistas)

**Resumen**

**Introducción:** En la esquizofrenia se han encontrado alteraciones en aspectos importantes de la cognición básica y social. El objetivo de este estudio es explorar la relación entre deficiencias en función ejecutiva (FE) y en teoría de la mente (TM) en pacientes que sufren esta enfermedad. **Materiales y métodos:** Veintidós pacientes de habla hispana y 22 controles emparejados a los primeros en edad, sexo, educación, lengua dominante y CI premórbido fueron evaluados en FE y capacidad de TM. Para evaluar las FEs se utilizaron 10 tareas que abarcan 5 dimensiones cognitivas, mientras que para evaluar la TM se han utilizado 3 tareas distintas. Para explorar el grado de asociación entre habilidades ejecutivas y mentalistas se han empleado técnicas de análisis correlacional. A través del análisis discriminante se ha examinado la contribución relativa de cada tarea ejecutiva y mentalista a la hora de discriminar entre pacientes y controles.

**Resultados:** Los pacientes presentaron alteraciones tanto en su capacidad ejecutiva como mentalista. El análisis de correlación mostró una ausencia de asociación entre FEs y habilidades de TM dentro del grupo de pacientes, mientras que el patrón fue más bien opuesto en el grupo control. El rendimiento en TM fue más preciso que el rendimiento ejecutivo para predecir a qué grupo pertenecían los participantes.

**Conclusiones:** Aunque los déficits en FE y en TM aparecen conjuntamente en la esquizofrenia, ambos pertenecen a dominios cognitivos distintos y relativamente independientes.

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**Introduction**

Schizophrenia is conceptualized as a neurobiological disorder that entails a severe and persistent functional impairment. The NIMH-Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS)<sup>1</sup> has identified several separable domains of cognitive impairment in people affected by the illness. Those domains can be grouped under the umbrella of neurocognition (non-social) or social cognition. Since non-social and social cognition appear systematically impaired in schizophrenia they are considered core features of the illness as well as highly relevant to its functional outcome.

The neurocognitive functioning in schizophrenia is characterized by severe impairments in a wide range of cognitive processes, especially, the ones considered purely neuropsychological, such as attention, memory, and other executive functions (EFs). EFs were defined by Lezak<sup>2</sup> as the mental abilities needed to perform an effective, creative and socially accepted behavior. Other authors<sup>3</sup> place EFs as encompassing a range of cognitive processes as anticipation, goal selection, planning, behavior's choice, self-regulation, self-control and cognitive feedback. The main purpose of these processes is to orchestrate the function of other systems in the performance of complex tasks, as comprehension, learning and reasoning. Very recently, Banich<sup>4</sup> has proposed a model that attempts to integrate the levels of neurobiology, psychology, and computation to provide a better comprehension of this set of abilities. The investigation of EFs in schizophrenia has been rather heterogeneous and many studies inform of impairments in multiple executive domains.<sup>5-7</sup>

From the field of social cognition, ToM is considered the natural capacity that allows us to decode or understand our own mental states or the ones of other people.<sup>8</sup> As a matter of fact, the neuropsychological studies of ToM have found this capacity consistently impaired in people suffering from schizophrenia.<sup>9-12</sup> The co-occurrence between anomalies in basic cognitive functions and ToM abilities has been treated in an important number of studies. The systematic review carried out by Pickup<sup>13</sup> revealed that in all cases patients were impaired in their executive and mentalizing domains, and two thirds of the studies showed correlations between some executive and some ToM task. This author points out that in the eight studies that used multivariate statistics, ToM performance continued predicting the schizophrenia group once EF was controlled for. The evidence examined leads Pickup to conclude that ToM impairment in schizophrenia reflects the dysfunction of a domain-specific cognitive system rather than a domain-general executive impairment.

One of the problems in previous studies that somehow deal with the co-occurrence of executive and mentalizing impairments is not taking into account the multifaceted nature of the EF concept. To account for it, we aimed to analyze the relationship between schizophrenic's anomalies in EFs and ToM, by using a combination of tasks in each of these domains. On the one hand, we have chosen a set of reasonably easy tasks that are regularly administered to patients with schizophrenia but that at the same time are reliable estimators of the most important dimensions of EF, such as attention, working memory, reasoning, cognitive flexibility, and verbal fluency. On the other hand, we have selected a set of non-verbal and verbal ToM tasks in order to have an improved and more accurate estimation of mentalizing impairment in schizophrenia, all of them

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