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Cognition and the five-factor model of the Positive and Negative Syndrome Scale in schizophrenia

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ABSTRACT

Different exploratory and confirmatory factorial analyses of the Positive and Negative Syndrome Scale (PANSS) have found a number of factors other than the original positive, negative, and general psychopathology. Based on a review of previous studies and using confirmatory factor analyses (CFA), Wallwork et al. (Schizophr Res 2012; 137: 246–250) have recently proposed a consensus five-factor structure of the PANSS. This solution includes a cognitive factor which could be a useful measure of cognition in schizophrenia. Our objectives were 1) to study the psychometric properties (factorial structure and reliability) of this consensus five-factor model of the PANSS, and 2) to study the relationship between executive performance assessed using the Wisconsin Card Sorting Test (WCST) and the proposed PANSS consensus cognitive factor (composed by items P2-N5-G11). This cross-sectional study included a final sample of 201 Spanish outpatients diagnosed with schizophrenia. For our first objective, CFA was performed and Cronbach's alphas of the five factors were calculated; for the second objective, sequential linear regression analyses were used. The results of the CFA showed acceptable fit indices (NNFI = 0.94, CFI = 0.95, RMSEA = 0.08). Cronbach's alphas of the five factors were adequate. Regression analyses showed that this five-factor model of the PANSS explained more of the WCST variance than the classical three-factor model. Moreover, higher cognitive factor scores were associated with worse WCST performance. These results supporting its factorial structure and reliability provide robustness to this consensus PANSS five-factor model, and indicate some usefulness of the cognitive factor in the clinical assessment of schizophrenic patients.

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1. Introduction

Already from the earlier descriptions of schizophrenia, cognitive deficits have been considered to be a core symptom of the disorder (Kraepelin, 1919; Bleuler, 1950). Cognitive impairments have been found not only in chronic schizophrenic patients (Reichenberg, 2010), but also in those with a first psychotic episode (Albus et al, 1996; Mohamed et al., 1999; Addington et al., 2003), patients in clinical remission (Asarnow and MacCrimmon, 1978; Nuechterlein et al., 1992), neuroleptic-naïve patients (Saykin et al., 1994; Torrey, 2002), and even in subjects at high risk for developing psychosis (Erlenmeyer-Kimling and Cornblatt, 1978; Nuechterlein, 1983; Cornblatt et al., 1992) and in healthy siblings of schizophrenic patients (Kuha et al., 2007). This cognitive deficit has considerable relevance regarding prognosis, since it has been shown to be an important predictor of functioning in schizophrenia (Green, 1996; Velligan et al., 1997; Harvey et al., 1998; Green et al, 2000; Bowie and Harvey, 2005; Bowie et al., 2006, 2008).

Among the cognitive functions that have been shown to be impaired in schizophrenic patients, executive functions may be of

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special relevance (Joyce et al., 2005). Several studies suggests there may be subgroups of patients based on cognitive performance, with some patients exhibiting specific impairments in executive functions but preserved general intellectual function (Heinrichs and Awad, 1993; Goldstein and Shermansky, 1995; Weickert et al., 2000), and others suffering general intellectual impairments from illness onset, including executive dysfunction (Kremen et al., 1998; Weickert et al., 2000; Fuller et al., 2002). It has been proposed that executive impairments may be considered to be a core deficit in schizophrenia, whatever other cognitive deficits may be present (Joyce et al., 2005). The importance of executive functions has also been noted in some studies that have highlighted their relevance regarding functional outcomes (Martínez-Arán et al., 2002; Reed et al., 2002; Rocca et al., 2009; Penadés et al., 2010), and suggested their potential use as a diagnostic criterion for schizophrenia (Keefe and Fenton, 2007; Peña et al., 2011). Thus, the neuropsychological assessment of schizophrenic patients is of great interest for clinicians. In real-life clinical practice, however, resources and time are often insufficient to carry out a complete neuropsychological evaluation.

The Positive and Negative Syndrome Scale (PANSS) is a widely used instrument for the clinical assessment of schizophrenic patients. In its original form, it was divided in three scales: positive, negative and general psychopathology (Kay et al., 1987). Later factorial analyses, however, have pointed to the existence of other components. Five-factor solutions have been the most frequently described (Kay and Sevy, 1990; Lépine, 1991; Lindstrom and von Knorring, 1993; Bell et al., 1994a; Kawasaki et al., 1994; Lindenmayer et al., 1994, 1995; Dollfus and Petit, 1995; Fredrikson et al., 1997; Marder et al., 1997; White et al., 1997; Higashima et al., 1998; Lançon et al., 2000; Lykouras et al., 2000; Mass et al., 2000; Wolthaus et al., 2000; El Yazaji et al., 2002; Drake et al., 2003; Emsley et al., 2003; Lee et al., 2003; Fresán et al., 2005; Tirupati et al., 2006; van den Oord et al., 2006; van der Gaag et al., 2006; Levine and Rabinowitz, 2007; Citrome et al., 2011), with factors commonly labeled as 'positive', 'negative', 'cognitive', 'depression' and 'excitement'.

The cognitive factor (sometimes called 'disorganization') refers to the patient's cognitive functioning, and is composed of several PANSS items that vary partially in the different factorial analyses. If this cognitive factor were proved to be valid, obtaining information on cognitive performance using the PANSS would be very valuable given the wide use of this instrument in clinical practice. In this respect, several studies to date have examined the concurrent validity of the PANSS cognitive factor in schizophrenic patients (Bell et al., 1994b; Bryson et al., 1999; Mass et al., 2000; Harvey et al., 2001; Cameron et al., 2002; Daban et al., 2002; Bozikas et al., 2004; Ehmann et al., 2004; Good et al., 2004; Hofer et al., 2007). A first study by Bell et al. (1994b) studied the validity of the cognitive factor in 147 patients diagnosed with schizophrenic or schizoaffective disorder by examining correlations between this factor and different neuropsychological tests. They found a significant negative correlation between cognitive factor scores and performance in all the neuropsychological tests. Based on their results, the authors concluded that the cognitive component of the PANSS is a valid measure of cognitive deficits in schizophrenia. Since then, other similar studies have been carried out, with some obtaining results comparable to those of Bell et al. (1994b), and other studies having less consistent findings (Hofer et al., 2007). In general correlations between the PANSS cognitive factor and neuropsychological measures have been found to be moderate, ranging between 0.20 and 0.53 (Bryson et al., 1999; Cameron et al., 2002; Daban et al., 2002; Bozikas et al., 2004; Good et al., 2004; Hofer et al., 2007).

This variability may be due to the use of different neuropsychological tasks, to the study of different cognitive functions (sometimes grouped in a general cognitive index), or to the use of general measures of cognition such as those derived from the WAIS (Wallwork et al., 2012). However, grouping different cognitive measures in a single cognitive index may mask significant correlations of specific cognitive domains if the remaining domains are not correlated or only weakly so. Consequently, it would be desirable to study the concurrent validity of the PANSS cognitive factor with each of the cognitive functions that are impaired in schizophrenia separately. On other hand, the variability in correlations between the PANSS cognitive factor and neuropsychological measures may also be due to the fact that the cognitive factors used in the different studies are not composed of the same items. Despite the general similarity of five-factor models, none of them has achieved broad consensus. In this respect, the different cognitive factors described in the literature include a number of items ranging from 3 (Kay and Sevy, 1990; Lançon et al., 2000; Mass et al., 2000) to 9 (Citrome et al., 2011). Wallwork et al. (2012) have recently proposed a new consensus model, extending previous work by Lehoux et al. (2009). They used a larger collection of PANSS five-factor models reported in the literature, and tested and refined the consensus model with confirmatory factor analysis (CFA) in an American and in a Japanese sample. The consensus cognitive factor proposed by Wallwork et al. (2012) is only made up of three PANSS items: 'Conceptual disorganization' (P2), 'Difficulty in abstract thinking' (N5), and 'Poor attention' (G11). If this proposed consensus five-factor model shows adequate psychometric properties in other samples, it would gain robustness and could encourage a more generalized use. In addition, if this cognitive factor, with only three PANSS items, could provide some information regarding the cognitive function of patients, it could be of some usefulness in clinical settings. To our knowledge, no studies have addressed this issue to date.

The present study had two objectives:

1. To study the psychometric properties (factorial structure and reliability) of the five-factor model of PANSS proposed by Wallwork et al. (2012) in a large sample of clinically stable schizophrenic patients.
2. To study the concurrent validity of the cognitive factor proposed in this five-factor model using a neuropsychological task of executive function.

2. Methods

2.1. Sample

The present cross-sectional study was carried out with 215 clinically stable outpatients aged 18 to 60 years, who were consecutively referred by their treating psychiatrists. The sample was recruited in two of the participating centers (Hospital Universitario 12 de Octubre, Madrid and Hospital Virgen de la Luz, Cuenca). All patients had been diagnosed with schizophrenia according to DSM-IV criteria (APA, 1994), using the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) (First et al., 1995). Of the initial sample, 14 patients declined participation, leaving a final sample of 201 (138 male, 63 female). All patients were on antipsychotic treatment and had been clinically stable (no hospital admissions, no changes in treatment, no significant psychopathological changes) for at least 6 months before inclusion. The scales and neuropsychological tests used are part of the usual clinical protocol, and written informed consent was obtained from all participants prior to their inclusion in the study. Two experienced neuropsychologists who were blind to PANSS ratings carried out cognitive assessments. Analysis of interrater reliability indicated an adequate degree of agreement between researchers (weighted kappa for PANSS scores: 0.69–0.78).

2.2. Instruments

2.2.1. The Positive and Negative Syndrome Scale (PANSS)

The Positive and Negative Syndrome Scale (Kay et al., 1987; Spanish validation by Peralta and Cuesta, 1994) is a 30-item scale designed to obtain a measure of positive (items P1 to P7) and negative (items N1 to N7) symptoms in schizophrenic patients, as well as a measure

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