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Neuropsychological functioning in pediatric obsessive-compulsive disorder: One size does not fit all

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ABSTRACT

Previous studies examining neuropsychological functioning in pediatric obsessive-compulsive disorder (OCD) have presented heterogeneous results. To clarify if this variability could be related to the existence of discrete cognitive profiles, we conducted a cluster analysis to identify homogeneous groups of patients with similar neuropsychological performance in a sample of 61 children and adolescents with OCD. Then, each OCD group was compared to a matched control sample (n = 40) with regard to their neuropsychological variables. Finally, demographic and clinical comparisons were conducted to investigate differences between the OCD groups. A two-cluster solution was identified. The first group (n = 52, 85%) performed comparably to controls in all neuropsychological domains ("preserved") whereas the second group (n = 9, 15%) exhibited a poorer performance than controls in non-verbal memory ($p < 0.01$) and visuospatial abilities ($p < 0.01$). Contrary to our expectations, the two OCD groups did not differ in demographic and clinical variables. These findings support the presence of at least two cognitive profiles in children and adolescents with OCD, and begin to address the relationship between these discrete groups and clinical and functional factors.

1. Introduction

Obsessive-compulsive disorder (OCD) is a psychiatric condition characterized by obsessions (intrusive unwanted thoughts, images or urges) and/or compulsions (repetitive behaviors or mental acts performed to relieve the distress caused by obsessions) (American Psychiatric Association, 2013). The disorder has a lifetime prevalence of 2.3% (Ruscio, Stein, Chiu, & Kessler, 2010) and can cause significant impairment to both affected individuals and family members (Stewart et al., 2017). Once considered to be rare in the pediatric population, it is currently known that the first symptoms of the disorder may appear during childhood or adolescence (Delorme et al., 2005). OCD has been associated with deficits in neuropsychological functioning that seem to play a role in the development of obsessive-compulsive (OC) symptoms (Nakao, Okada, & Kanba, 2014).

In contrast to the extensive literature on neuropsychology in adults with OCD (Abramovitch, Abramowitz, & Mittelman, 2013), studies in the pediatric population are scarce and have reported heterogeneous results. First, it is still unclear whether youth with OCD exhibit some degree of underperformance in neuropsychological functioning compared to controls. Although most studies in pediatric OCD have reported deficits in certain neuropsychological domains (Andres et al., 2007; Behar et al., 1984; Chang et al., 2007; Geller et al., 2017; Ornstein, Arnold, Manassis, Mendlowitz, & Schachar, 2010; Shin et al., 2008; Taner, Baker, & Oner, 2011), some others have failed to identify statistically significant differences in neuropsychological functioning between the two groups (Beers et al., 1999). More recently, Abramovitch et al. (2015) conducted a meta-analysis on pediatric OCD studies that also provided evidence of similar neuropsychological performance in youth with OCD compared to controls.

Second, data on the neuropsychological domains that may be affected in pediatric OCD are also inconclusive. On the one hand, it has been suggested that executive functions such as set shifting or cognitive flexibility may be among the most impaired areas in youth with OCD (Ornstein et al., 2010; Shin et al., 2008; Taner et al., 2011). However, other studies have not found statistically significant differences between youth with OCD and controls in neuropsychological tests assessing this domain (Beers et al., 1999; Chang et al., 2007, Geller et al.,

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2017). In addition, some investigations (though not all, see Geller et al., 2017; Ornstein et al., 2010; and Shin et al., 2008) have shown deficits in non-verbal memory (Andres et al., 2007). Visuospatial abilities are another area of controversy; whereas some studies in pediatric OCD have reported deficits in this domain (Andres et al., 2007; Behar et al., 1984; Taner et al., 2011), others have not (Beers et al., 1999; Chang et al., 2007). Finally, processing speed has recently been suggested to be the most impaired area in a study involving the largest sample children and adolescents with OCD (Geller et al., 2017). Again, this finding was reported to be consistent with adult literature (Abramovitch et al., 2013), but has not been replicated in other pediatric studies (Beers et al., 1999; Ornstein et al., 2010).

Third, there is some evidence to relate the heterogeneity of results to a large variability in neurocognitive performance within youth with OCD. In fact, Lewin, Piacentini et al. (2014) reported that only a third of a sample of 96 children and adolescents with OCD exhibited cognitive sequelae (defined by the presence of two or more neuropsychological tests with scores two standard deviations below the normative population mean). Moreover, these authors identified associations between neuropsychological performance and clinical characteristics such as the use of atypical antipsychotics or comorbidity with tic disorders. Along the same lines, McGuire et al. (2014) reported that youth with hoarding and symmetry/ordering symptoms showed greater neuropsychological impairments than patients with other OC symptom dimensions. Although these studies were well executed and included a large sample size, they did not include a control group.

In light of the possibility that variability in pediatric literature could be accounted by the existence of inter-individual differences in neuropsychological functioning, we aimed to identify subgroups of OCD patients that shared similar cognitive profiles. To this end, we conducted a cluster analysis, an approach that has never been applied to OCD in order to identify subgroups of patients based on their neuropsychological functioning. The application of cluster analysis in neuropsychology has been successfully used in other psychiatric conditions such as bipolar disorder or schizophrenia to define groups of patients with cognitive profiles that exhibit more difficulties in global functioning (Jensen, Knorr, Vinberg, Kessing, & Miskowiak, 2016; Roux et al., 2017; Sole et al., 2016) and are more refractory to treatment (Gilbert et al., 2014). Our secondary aims were: 1) to compare the cognitive profiles of the OCD clusters and a matched control group, and 2) to compare the OCD clusters in terms of demographic, clinical, and functional outcome variables. We hypothesized that: 1) different cognitive profiles would exist among youth with OCD, 2) one of the OCD clusters would perform comparably to controls, while the others would exhibit some degree of underperformance in specific neuropsychological domains (non-verbal memory, visuospatial abilities, and executive functions), and 3) distinct clinical and functional variables would be associated with each group of patients.

2. Material and methods

2.1. Participants

The sample included 101 participants between 11 and 17 years, of whom 61 were patients with OCD and 40 were non-psychiatric controls. Patients were recruited from an outpatient OCD specialty clinic affiliated with a large university hospital. To be included in the study, they had to be diagnosed with OCD by a child psychiatrist according to the Diagnostic and Statistical Manual of Mental Disorder, 4th edition (DSM-IV-TR) (American Psychiatric Association, 2000) and exhibit moderate to severe OC symptoms (defined by scores ≥ 14 on the Children Yale-Brown Obsessive-Compulsive scale, CYBOCS) (Lewin, Piacentini, et al., 2014). Exclusion criteria were comorbidity with a psychotic disorder, autism spectrum disorder, or neurological illness, as well as an intelligence quotient (IQ) below 70. As proposed by Lezak (1995), intellectual ability was estimated using the Vocabulary subtest of the Wechsler Intelligence Scale for Children, 4th edition (WISC-IV) (Wechsler, 2003) or the Wechsler Adult Intelligence Scale, 3th edition (WAIS-III) (Wechsler, 2001), depending on the patient's age. Controls were recruited through advertisements posted in primary health care centers and other community locations within the same geographical area as the patients. Prospective controls with IQ below 70 or a personal history of any psychiatric disorder were excluded. Age, gender, and estimated IQ were used to match OCD cases with controls.

The institutional research ethics committee approved all procedures in the study. Written informed consent was obtained from all parents or guardians, and assent was obtained from all children and adolescents. Researchers undertook to preserve the confidentiality of the study participants at all times and to use the information collected solely for the purposes indicated.

2.2. Psychiatric assessment

Diagnoses were established by experienced psychiatrists using the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children—Present and Lifetime Version (K-SADS-PL) (Kaufman et al., 1997), in its validated Spanish version (Ulloa et al., 2006). In the OCD group, this structured interview was administered to confirm the OCD diagnosis as well as to identify comorbidpsychiatric disorders. In the control group, psychiatric diagnoses were ruled out by means of the same structured interview.

The severity of obsessive-compulsive, depressive, and anxiety symptoms was quantified by self-reported questionnaires in all study participants. Obsessive-compulsive symptoms were assessed with the Obsessive-Compulsive Inventory—Child Version (OCI-CV) (Foa et al., 2010; Rosa-Alcazar et al., 2014), depressive symptoms with the Children's Depression Inventory (CDI) (Davanzo et al., 2004; Kovacs, 1992), and anxiety symptoms with the Screen for Childhood Anxiety Related Emotional Disorders (SCARED) (Birmaher et al., 1997; Domènech-Llaberia & Martinez, 2008). In the OCD group, the Children's Yale-Brown Obsessive-Compulsive Scale (CY-BOCS) (Scahill et al., 1997; Ulloa et al., 2004) was used to measure severity of OC symptoms. In addition, the most prominent obsession/compulsion was recorded using the CY-BOCS checklist. In accordance with the factor analysis conducted by Bloch, Landeros-Weisenberger, Rosario, Pittenger, and Leckman (2008), we classified the most prominent OC symptom into four separate dimensions: symmetry, forbidden thoughts, cleaning, and hoarding. In the OCD group, the Children's Global Assessment Scale (CGAS) (Shaffer et al., 1983) was also used to rate patients' general functioning.

All the questionnaires used in the study are considered gold standard instruments for assessment of the different clinical areas (obsessive-compulsive, depressive, and anxiety symptoms) and have shown good psychometric properties both in the original language and in the validated Spanish version.

2.3. Neuropsychological tests

Neuropsychological testing was administered by a psychologist under the supervision of two experienced neuropsychologists. At the time of evaluation, all patients were receiving cognitive-behavioral therapy and/or naturalistic pharmacological treatment following the institution's clinical protocol, which is based on internationally recognized guidelines (Geller et al., 2012; NICE guidelines, 2005).

A comprehensive neuropsychological battery with internationally validated tests was selected. In accordance with the previous literature (Abramovitch et al., 2015), neuropsychological tests were combined in the following domains:

1. *Intellectual ability* was estimated using the Vocabulary subtest of the Wechsler Intelligence Scale for Children, 4th edition (WISC-IV) or the Wechsler Adult Intelligence Scale, 3rd edition (WAIS-III),