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Scrupulosity and contamination OCD are not associated with deficits in response inhibition

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ABSTRACT

Background and objectives: Prior research has indicated a number of neuropsychological deficits in patients with OCD consistent with the cortico-striato-thalamo-cortical model of the disorder. Response inhibition (RI), defined as the inability to inhibit a prepotent response, has been identified as a possible candidate endophenotype for OCD. However, the results from previous studies of RI in OCD patients have been mixed, suggesting the possibility that some OCD dimensions may be associated with deficits in RI while others may not. The present study aimed to examine RI using a Go/No-Go (GNG) task in two OCD symptom dimensions, one of which, scrupulosity, has never been subject to neuropsychological investigation.
Methods: A total of 63 individuals, consisting of scrupulous OCD (n = 26), contamination OCD (n = 18) and non-psychiatric controls (n = 19) completed study measures. Controlling for depression symptoms, no significant performance differences were found between the groups on the GNG test, indicating no deficits in RI among contamination or scrupulous OCD.
Results: Results are consistent with several prior studies of RI in OCD that found no differences as compared to non-psychiatric controls, especially on GNG tests, and with more recent suggestions that RI may not constitute a clinical significant impaired domain in OCD.
Limitations: Limitations included a primarily highly educated and Causasian sample.
Conclusions: Additional conclusions include careful consideration of the RI measures selected for future studies, as well as the need for further investigation into the neuropsychological and neurobiological nature of scrupulous OCD.

1. Introduction

Obsessive-Compulsive Disorder (OCD) is a burdensome neuropsychiatric disorder with a lifetime prevalence rate of approximately 2.3% (Ruscio, Stein, Chiu, & Kessler, 2010). Imaging studies implicate the frontal-striatal circuitry in the pathophysiology of OCD (Pauls, Abramovitch, Rauch, & Geller, 2014), supporting the prevailing cortico-striato-thalamo-cortical (CSTC) model of OCD (Saxena & Rauch, 2000). A complementary substantial body of neuropsychological research, yielding an overall moderate degree of deficits across several neuropsychological domains (Abramovitch, Abramowitz, & Mittelman, 2013; Shin, Lee, Kim, & Kwon, 2014), is characterized by highly inconsistent results (Kuelz, Hohagen, & Voderholzer, 2004). In fact, a recent meta-analysis of neuropsychological test performance in adult OCD revealed statistically significant heterogeneity across most neuropsychological domains that was unaccounted for by clinical, demographic, or factors associated with neuropsychological test administration (Abramovitch et al., 2013).

One of the most highly researched neurocognitive domains in the OCD literature is response inhibition (RI), defined as the ability to inhibit a pre-potent response (Logan, Cowan, & Davis, 1984). The ever-growing interest in RI in OCD stems primarily from imaging studies indicating the prominent role of prefrontal regions, especially the orbitofrontal cortex, in the pathophysiology of OCD (Evans, Lewis, & Iobst, 2004). In fact, RI has frequently been suggested as a candidate endophenotype for OCD (Chamberlain, Blackwell, Fineberg, Robbins, & Sahakian, 2005; Menzies et al., 2007). However, as a whole, research on RI in OCD reveals inconsistent, and heterogeneous results (Abramovitch et al., 2013; Kuelz et al., 2004).

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Indeed, review of the OCD literature across the three major test paradigms assessing RI reveals that whereas the majority of studies assessing RI using the Stop Signal Task (SST) report significantly reduced performance in OCD samples compared to controls (Chamberlain et al., 2005; Penades et al., 2007; de Wit et al., 2012), only a minority of studies assessing RI using go/no-go (GNG) tests or continuous performance tests (CPT) report differences between OCD and control samples (Abramovitch, Dar, Schweiger, & Hermesh, 2011; Ghisi, Bottesi, Sica, Sanavio, & Freeston, 2013; Penades et al., 2007; da Rocha, Alvarenga, Malloy-Diniz, & Correa, 2011). Indeed, a large number of studies report comparable number of commission errors on GNG and CPT tests among OCD individuals compared to controls (Bohne, Savage, Deckersbach, Keuthen, & Wilhelm, 2008; Krishna et al., 2011; Lee, Chiu, Chiu, Chang, & Tang, 2009; Page et al., 2009; Thomas, Gonsalvez, & Johnstone, 2014; Tolin, Villavicencio, Umbach, & Kurtz, 2011; Ursu, Stenger, Shear, Jones, & Carter, 2003; Watkins et al., 2005), despite evidence for aberrant brain activity while performing RI tasks in OCD (e.g., Page, et al., 2009).

OCD is a heterogeneous disorder that includes various particular clinical presentations including contamination, checking, hoarding, symmetry and ordering and repugnant obsessions (Abramowitz & Jacoby, 2014). It has been speculated that different OCD dimensions – that hypothetically may be associated with different neurocognitive deficiencies - may partially account for variability between neuropsychological studies described above (Abramovitch et al., 2013). Preliminary evidence suggests that some OCD dimensions may be associated with distinct neural correlates (van den Heuvel et al., 2009; Mataix-Cols et al., 2004). Subsequent preliminary neuropsychological studies reported distinct neuropsychological deficits associated with OCD symptom dimensions. For example, Hashimoto et al. (2011) examined neuropsychological correlates of symptom dimensions in a sample of 63 adults with OCD. The authors found that the aggressive/checking dimension was associated with poorer performance only on the trail making test, while the symmetry/ordering dimension was associated with poorer performance on the trail making test and logical (verbal) memory test. Interestingly, the contamination/cleaning dimension was associated with better performance on the latter two tests. Another study reported that deficits in nonverbal memory in OCD may be associated with the checking dimension, but not with contamination/washing (Cha et al., 2008).

A limited number of studies investigated the association between RI and symptom dimensions in OCD. This limited body of literature indicates that there are no performance differences on RI tasks between OCD dimensions, as measured by GNG tests (Khanna & Vijaykumar, 2000; Penades et al., 2007). In fact, OCD symptom dimensions were not found to be differentially associated with performance on other tasks of RI, such as the Stroop and the Stop Signal tasks (Hashimoto et al., 2011; Penades et al., 2007). However, one study found that the checking dimension is associated with a significantly higher number of commission errors on a GNG test than the washing dimension (Omori et al., 2007). In another study using an analogue sample, Lee, Chiu et al. (2009), Lee, Yost, and Telch (2009) compared two groups of individuals with symptoms of OCD, using a novel classification of OCD symptoms. Their model does not discriminate between symptom dimension based on content, but by dichotomizing obsessions into autogenous (e.g., sexual, aggressive) and reactive (e.g., contamination, symmetry). Although the authors did not find differences on classic GNG outcome measures, they did find that the autogenous obsessions sample had a significant larger attenuated response inhibition (ARI; Lee, Yost, et al., 2009). ARI is an outcome measure involving RI and set shifting; it is the difference in average response time during a baseline block and a subsequent block for which the target go and no-go stimuli are reversed, thus encompassing both cognitive flexibility/set shifting and RI. As a whole, it appears that small number of studies available reveal inconsistent results concerning the association between RI and OCD symptom dimension, with a trend towards no association.

The aim of the present study is to examine RI using a GNG task in two OCD symptom dimensions, one of which –scrupulosity– has never been subject to a neuropsychological investigation. Scrupulosity, a relatively under-researched dimension in OCD, encompasses obsessions and preoccupation with religious and moral concerns (Abramowitz & Jacoby, 2014). Scrupulosity is often grouped with sexual and aggressive obsessions in a single unacceptable thoughts symptom dimension; however, it is perhaps better thought of as a category of core fear rather than a discrete symptom dimension (Siev & Huppert, in press). For example, a scrupulous individual may fear potentially sinful sexual obsessions (that could be categorized in the unacceptable thoughts dimension) or may engage in excessive checking (that could be categorized in the checking and responsibility for accidental harm dimension) to ensure he performed a religious ritual precisely. Although understudied, approximately 5% of individuals in Western cultures with OCD have primary scrupulosity (Foa & Kozak, 1995; Tolin, Abramowitz, Kozak, & Foa, 2001), and the presence of scrupulosity predicts poor treatment outcome in several studies (e.g., Alonso et al., 2001; Ferrão et al., 2006; Mataix-Cols, Marks, Greist, Kobak, & Baer, 2002; Rufer, Grothusen, Maβ, Peter, & Hand, 2005). The second OCD dimension examined in the present study is contamination concerns (also referred to as 'washing' or 'cleaning'). In the context of neuropsychological investigations, this symptom dimension is of particular interest since some studies report intact neuropsychological performance compared to controls (Cha et al., 2008; Nakao et al., 2009), and others report that contamination OCD is associated with better performance on several neuropsychological tasks (Hashimoto et al., 2011; Omori et al., 2007). Individuals with contamination concerns are an appropriate comparison group for this reason. In addition, scrupulosity is assumed to be autogenous and contamination obsessions are reactive (Lee & Kwon, 2003), and Lee, Chiu et al. (2009), Lee, Yost, and Telch (2009) compared individuals with autogenous and reactive symptoms using the same task used herein. In sum, the rationale to examine RI in scrupulous individuals derives from the facts that no studies to date have examined the neuropsychology of scrupulosity; scrupulosity is purported to belong to the group of autogenous obsessions, which may be related to RI deficits; and the extant literature on RI in OCD is characterized by mixed results, which may be a function of symptom subtype.

In the present study, we examined rates of commission errors as the primary RI outcome measure, and also evaluated ARI as a secondary measure of RI and set shifting. In light of previous findings, we predicted that individuals with contamination concerns would not differ from healthy controls on measures of RI. Lee, Chiu et al. (2009), Lee, Yost, and Telch (2009) found differences on ARI but not commission errors between individuals with autogenous and reactive symptoms using an analogue sample. We therefore expected that scrupulous individuals might demonstrate greater impairment on the measure of ARI, although not commission errors.

2. Materials and methods

2.1. Participants

The study sample consisted of 67 individuals meeting inclusion criteria for one of three study groups: scrupulous OCD (n = 29), contamination OCD (n = 19) or healthy controls (n = 19). We