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Response inhibition to emotional faces in childhood obsessive-compulsive disorder

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ABSTRACT

Background and objectives: Evidence regarding the role of response inhibition in obsessive-compulsive disorder (OCD) is inconsistent. Most prior research has examined response inhibition to emotionally neutral stimuli or task demands. Given that OCD is characterised by distress due to unpleasant and undesirable thoughts/images and compulsive behaviours, this study examined response inhibition to emotional stimuli in children with OCD compared to healthy controls.
Methods: Children with OCD ($N=12$) and controls ($N=15$) completed an emotional Go/No Go task in which they responded on some trials (i.e., Go trials) when neutral faces were presented amongst angry or happy faces to which children were instructed to avoid responding (i.e., No Go trials) or when angry and happy faces were presented as Go trials and children were instructed to avoid responding to neutral faces.
Results: Children with OCD made more false presses on No Go trials than healthy controls, regardless of emotional expression. This was not due to a speed-accuracy trade-off. There were no significant group differences on Go trials.
Limitations: The sample size was small and the emotional Go/No Go task did not include a neutral condition.
Conclusions: Results are discussed in terms of response inhibition deficits in childhood OCD.

1. Introduction

Childhood obsessive-compulsive disorder (OCD) is a chronic and disabling neuropsychiatric condition with lifetime prevalence estimates between 1% and 3% (Flament et al., 1988; Reinherz, Giaconia, Lefkowitz, Pakiz, & Froast, 1993; Valleni-Basile et al., 1994; Zohar, 1999). This disorder has a severely negative impact on all aspects of a child's functioning including family relationships, school performance and social life (Piacentini, Bergman, Keller, & McCracken, 2003). Indeed, adults with a history of childhood OCD are less likely to be married/living with a partner, more prone to experience social/peer difficulties, isolation, unemployment, and to endure greater difficulties sustaining a job (Stewart et al., 2004). The prevalence and significant impairment caused by childhood OCD highlight the need to advance our understanding of the underlying mechanisms and determinants of these disorders.

OCD is clinically characterised by two symptom dimensions: obsessions, which are unwanted, intrusive, recurrent and unpleasant thoughts that cause distress and are often concerned with contamination, checking or symmetry; and/or undesirable compulsions, which are repetitive behaviours carried out in relation to obsessions, including washing, household safety checking and object rearrangement (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), American Psychiatric Association (APA), 2013). A growing body of neuropsychological research has emerged examining whether OCD is associated with cognitive impairments, and in particular, whether perseverative thoughts and behaviours which are symptomatic of the disorder may be due to deficits in inhibitory control of responses (Chamberlain, Blackwell, Fineberg, Robbins, & Sahakian, 2005).

Inhibition refers to one's ability to suppress either irrelevant or interfering stimuli or behaviours (Garavan, Ross, & Stein, 1999). Several forms and measures of response inhibition have been studied including the Stroop task, the Stop-Signal Task and the Go/No Go task (Schachar et al., 2007). For example, in the Go/No Go task, participants respond to any letter (Go trials) but the letter 'X' to which they withhold a response (No Go trials) (e.g., Durston, Thomas, Worden, Yang, & Casey, 2002; Durston et al., 2002). The research on inhibition in adults with OCD is extensive. Whereas a number of studies have found that adults with OCD have dificulties withholding responses, resulting in increased commission errors

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(e.g., Bannon, Gonsalvez, Croft, & Boyce, 2006, 2002; Chamberlain, Fineberg, Blackwell, Robbins, & Sahakian, 2006; Enright & Beech, 1993; Hartston & Swerdlow, 1999; Kuelz, Hohagen, & Voderholzer, 2004; Penades et al., 2007), others have noted no differences in performance on these tests between adults with OCD compared to controls (Boone, Ananth, Philpott, Kaur, & Djenderjian, 1991; Rao, Reddy, Kumar, Kandavel, & Chandrashekar, 2008; Maltby, Tolin, Worhunsky, O'Keefe, & Kiehl, 2005; Bohne, Savage, Deckersbach, Keuthen, & Wilhelm, 2008; Page et al. 2009; see Abramovitch, Abramowitz, & Mittelman, 2013 for a review), while still others have indicated dificulties only when introducing additional cognitive demands such as reversing the Go/No-Go rules (Watkins et al., 2005). Such mixed results have contributed to the small effect size found for response inhibition deficits in OCD across studies indexing response inhibition in terms of commission errors ($d=-.33$) (Abramovitch et al., 2013).

The literature on response inhibition in paediatric OCD lags behind research with adults, yet the published studies to date suggest similar inconsistencies. Rosenberg et al. (1997) examined a range of cognitive functions in paediatric OCD, including the ability to suppress reflexive responses to external cues (e.g., a target light), volitionally execute delayed responses and anticipate predictable events. Results showed that children with OCD demonstrated more response suppression failures compared to controls. By contrast, two imaging studies reported no difference between children with OCD and controls in performance on switching and stop tasks (Rubia et al., 2010; Woolley et al., 2008). A similar discrepancy was found between studies examining performance on the Stroop test, where two studies reported impaired inhibitory performance on this task (Andres et al., 2007; Isik, Erdogan, & Oner, 2011), while others did not (Beers et al., 1999; Woolley et al., 2008; Ornstein, Arnold, Manassis, Mendlowitz, & Schachar, 2010; Chang, McCracken, & Piacentini, 2007). Moreover, statistical correction in one of these studies eliminated the group effects found on the Stroop task (Andres et al., 2007). Finally, from scanning studies (Gruner et al., 2012), higher functional anisotropy in the left dorsal cingulum bundle in children with OCD was correlated with better performance on two measures of response inhibition/cognitive control, even though children with OCD did not differ from healthy controls in behavioural performance on the Stroop task. Thus, functional abnormalities may serve a compensatory mechanism, allowing children with OCD to perform equivalently with controls when confronted with conflicting task requirements.

A notable feature of almost all studies of response inhibition conducted to date with both adults and children with OCD it that they have employed emotionally neutral stimuli and tasks primarily taken from standardized neuropsychological test batteries. Yet OCD by definition is characterised by distress and impairment triggered by unpleasant and undesirable obsessional thoughts and compulsive behaviours (APA, 2013). Thus, studies that utilise emotional stimuli might extend upon previous research by determining whether or not response inhibition is a general neuropsychological deficit in paediatric OCD or deteriorates in response to emotionally negative stimuli.

In a Go/No-Go task that used punishments or rewards to promote response activation or inhibition, Morein-Zamir et al. (2013) found that adults with OCD made more errors of commission on punishment trials than healthy controls. However, using a novel priming-based inhibitory task with threat and neutral words, Bannon. Gonsalvez, and Croft (2008) found that adults with OCD showed poorer inhibition for both neutral and threat words compared to controls and adults with panic disorder. Two studies with (non-OCD) anxious children have utilised an emotional Go/No Go task to assess response inhibition to emotional face stimuli and found that anxious youths were slower to respond to neutral face Go trials when angry face No Go trials were embedded amongst them (Ladouceur et al., 2006; Waters & Valvoi, 2009). These findings suggest that the aversive context created by angry faces interfered with the task of responding to neutral faces. However, there were no differences between anxious children and controls on the No Go trials, suggesting that (non-OCD) anxiety disorders are not associated with difficulties in withholding responses to emotional stimuli.

To the authors' knowledge, there have been no studies published to date on response inhibition to emotional stimuli in children with OCD. However, if children with OCD have difficulty inhibiting responses (e.g., such as compulsive behaviours) following distressing thoughts and/or images for example (APA, 2013), then given that angry faces possess strong evolutionary threat value and good ecological validity (Waters, Mogg, Bradley & Pine, 2008), one hypothesis is that children with OCD will make more false presses (i.e., more commission errors) on angry face No Go trials compared to happy and neutral face No Go trials. On the other hand, the other anxiety disorders, as opposed to OCD, are known to be associated with enhanced responses to threat and feared stimuli as evidenced by differences in neural circuitry implicating the amygdala and related areas in imaging studies (see Waters, Farrell, & Schilpzand, 2013 for a review). However, in the absence of studies on inhibitory responding to emotional stimuli in paediatric OCD, it is unclear if this distinction also applies to response inhibition deficits which form one of a number of executive functions associated with frontal–striatal circuitry (Graybiel & Rauch, 2000; see Waters et al., 2013).

Therefore, the present study examined whether paediatric OCD is associated with response inhibition deficits on emotional No Go trials compared to healthy control children. We hypothesised that children with OCD would make more errors of commission (i.e., more false presses) when angry face No-Go trials compared to happy face No-Go trials appeared amongst neutral Go trials. However, this would not be due to a speed-accuracy trade-off and as such, OCD children would not differ from healthy controls on reaction-time on false press trials. Moreover, if difficulties are specific to response inhibition and not response facilitation deficits to emotional stimuli, then children with OCD and controls were not expected to differ in reaction-time on angry versus happy Go trials, or in errors of commission to neutral face No-Go trials.

2. Method

2.1. Participants

Participants included 27 children between 9 and 12 years of age; 12 children with a principal (i.e., most severe) diagnosis of OCD (6 girls; *M* Age=9.2 years, SD=1.2) and 15 healthy control children (8 girls; *M* Age=10.05; SD=1.1). Children were excluded if they had psychosis or an organic mental disorder or IQ suspected to be below 70, based on parent responses to screening items administered during an initial telephone screen. Children recruited for the control group were excluded if they met criteria for psychiatric diagnoses including anxiety disorders, depressive disorders, externalising disorders or developmental disorders. Children recruited for the OCD group were excluded if their likely diagnosis was a disorder other than OCD based on screening items administered during an initial telephone screen. Based on these criteria, all 12 consecutive referrals of children with OCD were retained in the final sample. For control children, the final 15 children were recruited from a sample of 22 children whose mother returned consent forms. Four children were excluded due to the presence of clinically significant anxiety and were referred elsewhere. A further two withdrew due to ongoing conflicting commitments and one child was excluded due to high rates of error responses on the emotional Go/No-Go task (> 50% of trials).

The OCD sample had moderate-high OCD severity based on the Children's Yale-Brown Obsessive-Compulsive Scale (CY-BOCS) (*M*=20.18; SD=8.25) and the Clinician Severity Rating (CSR) for their principal OCD diagnosis derived from the Anxiety Disorders Interview Schedule for DSM-IV Parent Version (ADIS-IV-C/P) (*M*=5.91; SD=1.3). Eighty-three per cent of the OCD group had at least one comorbid diagnosis of either generalised anxiety disorder (*n*=7), social phobia (*n*=3), or specific phobia (*n*=2). One third of the children with OCD (*n*=4) were stabilised on a Serotonergic medication (SSRI) at the time of assessment.