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Affective and neuropsychological correlates of children's rituals and compulsive-like behaviors: Continuities and discontinuities with obsessive–compulsive disorder

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Abstract

This study explored the relations among ritualistic and compulsive-like behavior, fears, and neuropsychological performance in typically developing children between the ages of four and eight years. Forty-two children were administered a battery of neuropsychological tasks assessing response inhibition and set-shifting. Two parent-report questionnaires assessed the intensity of children's fears and compulsive-like behaviors (''just right'' perceptions and repetitive behaviors). For younger children ($\leqslant$72 months), set-shifting and response inhibition accounted for significant variance in their ritualistic, compulsive-like behaviors. For older children (>72 months), a combination of neuropsychological (response inhibition) and affective (animal fears and social anxiety) factors predicted compulsive-like behaviors. These findings suggest that common neuropsychological mechanisms underlie compulsive, ritualistic behavior exhibited in normal development and in obsessive–compulsive disorder.

Keywords: Children; Rituals; Compulsive-like behavior; Fears; Anxiety; Obsessive–compulsive disorder; OCD; Executive function

1. Introduction

Routines, rituals and habits represent defining features of human behavior and individual adaptation, and yet, in other contexts, similar behaviors signify severe disturbance. In this paper, we continue our exploration of the normative aspects of rituals and other compulsive-like behaviors in children, drawing parallels between the phenomenology of children's rituals and those found in obsessive–compulsive disorder (OCD). We also go beyond phenomenological description and explore the cognitive and neuropsychological aspects of normative compulsive-like behaviors. We conclude by presenting a brain–behavior model that encompasses both adaptive and maladaptive variants of compulsive, ritualistic behavior.

Ritualistic and repetitive behaviors are prevalent throughout the lifespan but are particularly salient in early childhood (Evans et al., 1997; Leonard, Goldberger, Rapoport, Cheslow, & Swedo, 1990). Beginning around two or three years of age, children exhibit marked compulsive behavior that includes strong preferences for wholeness and symmetry in the environment, circumscribed and ritualized behaviors, rigidity of likes and dislikes, and heightened sensitivity to minute details (Gesell, 1928; Gesell, Ames, & Ilg, 1974). Children may focus their attention on minute objects such as flecks of dust or small imperfections in clothes. Likewise, they may order and arrange objects in precise, circumscribed ways or insist that a parent read the same book over and over in a particular manner (Evans et al., 1997; Leonard et al., 1990). Typically waning by age eight, compulsive-like activity reflects a common and normative part of the child's behavioral repertoire (Evans et al., 1997; Zohar & Felz, 2001).

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Although many theorists have recognized that children's rituals and compulsions are a normal part of development, little is known about the etiology or function of children's compulsive-like behaviors. Like clinically significant compulsive behaviors, normative childhood rituals seem to involve emotion regulation and anxiety reduction (Evans, Gray, & Leckman, 1999). Some compulsive-like behaviors may be more likely to occur at times of transition, such as bedtime and mealtime, or when transitions are accompanied by normative fears or anxieties, such as fears of the dark (Garber, Garber, & Spizman, 1993; Werner, 1948). Rituals are frequently enacted for the purpose of warding off dreaded events or harm to the self or others, especially parents (Marks, 1987). Indeed, compulsive-like behaviors in children are positively correlated with fears and phobias (Evans et al., 1999; Zohar & Felz, 2001). That children's compulsive behaviors may be associated with fear and anxiety is consistent with the anxiety reduction model of OCD, which has reaped great success in the treatment of OCD (e.g., Foa & Kozak, 1986).

Another approach to understanding both normal and pathological compulsive behaviors emphasizes their cognitive and neuropsychological underpinnings. OCD has been linked to deficits in executive function (Aronowitz et al., 1994; Otto, 1992; Schultz, Evans, & Wolff, 1999; Tallis, 1997). Executive function (EF) refers to a broad range of higher-order cognitive processes that coordinate information processing and behavioral control, including planning, goal-directed behavior, impulse control, working memory, sustained attention and effort, and cognitive flexibility (Heyder, Suchan, & Daum, 2004; Keil & Kaszniak, 2002). Two EF abilities that have received considerable attention in OCD research are set-shifting and response inhibition.

Set-shifting refers to the ability to learn and respond to a sorting rule, and to subsequently adapt when the rule is changed. Although some research suggests that individuals with OCD make significantly more perseverative errors than normal controls on set-shifting tasks (Aronowitz et al., 1994; Harvey, 1986; Head, Bolton, & Hymas, 1989; Hymas, Lees, Bolton, Epps, & Head, 1991; Lucey, Burness, Costa, Gacinovic, & Pilowsky, 1997), other studies have failed to observe differences in set-shifting performance between normal controls and individuals with OCD (Abbruzzese, Bellodi, Ferri, & Scarone, 1995; Boone, Ananth, Philpott, Kaur, & Djenderedjian, 1991; Christensen, Kim, Dysken, & Hoover, 1992; Zielinski, Taylor, & Juzwin, 1991). In contrast to the relatively variable findings with regard to set-shifting in OCD (see Schultz et al., 1999), more consistent findings have been reported for deficits in response inhibition. Response inhibition refers to the ability to engage a behavioral response under one condition, while inhibiting a previously reinforced or prepotent response (Casbon, Curtain, Lang, & Patrick, 2003). Individuals with OCD make more errors of commission than normal controls in "go/no-go" paradigms that require inhibitory control (Abbruzzese, Ferri, & Scarone, 1995; Bannon, Gonsalvez, Croft, & Boyce, 2002; Cavedini, Ferri, Scarone, & Bellodi, 1998; Tien, Pearlson, Machlin, Bylsma, & Hoehn-Saric, 1992). The severity of OC symptoms has also been shown to positively correlate with response-suppression failures (Rosenberg, Dick, O'Hearn, & Sweeney, 1997).

Like clinically-relevant compulsions, normative ritualistic, compulsive-like behaviors may be associated with neuropsychological task performance. Evans, Lewis, and Iobst (2004) report that highly ritualistic and perfectionistic children performed more poorly on set-shifting and response inhibition tasks than children who exhibited fewer compulsive behaviors. Both ritualistic behaviors and executive control (such as set-shifting and response inhibition) undergo developmental changes, particularly during three and six years of age (Carver, Livesey, & Charles, 2001; Diamond & Taylor, 1996; Jones, Rothbart, & Posner, 2003; Livesey & Morgan, 1991; Zelazo, Craik, & Booth, 2004; Zelazo, Frye, & Rapus, 1996). These gains translate into behavior that is increasingly deliberate and self-regulated over the course of childhood. Critical changes in EF are thus concurrent with periods of normative ritualistic activity and have been attributed to changes within the frontal lobes, particularly prefrontal cortical areas (Casey et al., 1995, Casey, Giedd, & Thomas, 2000; Diamond & Taylor, 1996; Dowsett & Livesey, 2000; Kopp, 1982).

Data linking neuropsychological findings to specific brain loci are abundant in the OCD literature. First, neuroimaging studies indicate that response inhibition (and associated error-monitoring) is governed by the orbitofrontal cortex (OFC) and the anterior cingulate cortex. Further, these cortical areas are richly connected (and partly comprise) the limbic system and the striatum—regions that are associated with emotional control as well as habit formation and the gating of intentional actions (Casey et al., 2000; Insel & Winslow, 1992). In contrast, set-shifting abilities are largely attributed to the dorsolateral prefrontal cortex (DLPFC) and are generally considered less directly linked to the limbic and striatal systems (Berman et al., 1995; Filley, Young, Reardon, & Wilkening, 1999; Milner, 1963; Rezai et al., 1993). While some neuroimaging studies have revealed abnormalities in the DLPFC (e.g., Adler et al., 2000), the preponderance of evidence suggests that the pathogenesis of OCD involves a disruption of neural mechanisms in the OFC-limbic-striatal circuit (for a review see Schultz et al., 1999). Though the present study did not include direct observation of brain function, we are intrigued by the maturational and pathogenic links between compulsive behaviors, inhibitory control and its neural substrates, and the promise that these links hold for developmental social neuroscience.

This study explored the neuropsychological and emotional underpinnings of ritualistic and compulsive behavior in typically developing young children. The overall aim of the study was to determine the nature of the relation between normative rituals, fears, and performance on EF tasks that presumably reflect frontal lobe abilities. It was