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Inhibitory control and emotion regulation in preschool children

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Abstract

This research investigated the relation between individual differences in inhibitory control and emotion regulation. Preschool children ($N = 53$) ages 4–6 ($M = 5$; 0) were assessed on brief batteries of inhibitory control of prepotent responses and emotion regulation. Individual differences in inhibitory control were significantly correlated with children's ability to regulate their emotions. This relation held up even after controlling for age and verbal ability, and persisted for both Emotion Understanding and "online" control of emotional expressions that were negative (Disappointing Gift) or positive (Secret Keeping). Parent report of children's self-control and emotion regulation corroborated the behavioral results. These findings suggest that executive control of attention, action, and emotion are skills that develop in concert in the preschool period. However, there was also evidence of a quadratic relation in which emotion regulation was optimal at intermediate levels of inhibition, highlighting the interplay of both cognitive control and temperament in socio-emotional functioning.

Keywords: Inhibitory control; Executive function; Emotion regulation; Temperament; Preschool

1. Introduction

The ability to control potentially interfering thought processes and actions develops rapidly in the preschool period. Children of age 3 years have difficulty on tasks that require inhibitory control of attention and motor responses, such as suppressing a dominant response in accordance with rules. By 5 years of age they are much more proficient at these tasks (for a summary see Carlson, 2005). At the same time, children improve in the ability to regulate the experience of emotions by monitoring their expressive behavior. Saarni (1984) found that young children made an attempt to inhibit negative expressions upon receiving an undesirable gift, but they had trouble neutralizing

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their expressions. Older children were more likely to attempt to feign positive expressions of emotion, although there were individual differences in these skills at all ages. Explaining individual differences in emotion regulation that appear early in childhood is an important undertaking because older children who have difficulty managing emotions (e.g., anger) are at risk for developing behavioral disorders (Cole, Michel, & Teti, 1994; Dodge & Garber, 1991). Both the control of attention and action in relatively unemotional "cool" contexts and the control of emotional expressions in affectively charged "hot" contexts appear to have key requirements in common: prevention of an impulsive response and carrying out an opposite act. Furthermore, deficits in attention and emotion regulation tend to co-occur in certain atypical and at-risk populations, such as children with Attention Deficit/Hyperactivity Disorder (Barkley, 1997). Surprisingly, however, little research has examined the relation between children's regulation of action and emotion. Zelazo and Müller (2002) described potentially separate and shared neuroanatominal pathways for executive function in cool and hot task paradigms, but the question remains as to whether inhibitory control of prepotent responses and online emotion regulation in a social context are overlapping or independent skills at the level of individual differences. The aim of the present study was to assess the relation between individual differences in the deliberate control over actions and emotional expressions in typically developing preschool children.

1.1. Executive function

Executive function (EF), defined as the conscious control of thought and action needed for future-oriented and purposeful behavior (Welsh, Pennington, & Groisser, 1991; Zelazo, Carter, Reznick, & Frye, 1997), involves a diverse set of cognitive processes, including planning, working memory, set-shifting, error detection and correction, and the inhibitory control of prepotent responses (e.g., Roberts, Robbins, & Weiskrantz, 1998; Stuss & Benson, 1986). EF is required for goal-directed behaviors to solve novel problems, particularly those calling for the inhibition of automatic or established thoughts and responses (e.g., Casey, Tottenham, & Fossella, 2002; Roberts & Pennington, 1996). Inhibitory control (IC), then, refers to *the ability to inhibit or suppress salient thought processes or actions that are not relevant to the goal or task at hand* (Rothbart & Posner, 1985). Note that flexible employment of inhibitory control in problem-solving situations may involve not only the suppression of a dominant (but incorrect) response, but also the activation of a subdominant (but adaptive) response, or alternation between initiating and inhibiting a prepotent response according to setting conditions. For example, in the Bear/Dragon task (a simplified version of Simons Says), children are told to perform all actions commanded by a "nice" bear puppet but to suppress all actions commanded by a "naughty" dragon puppet, in an alternating fashion. Young 3-year-olds have difficulty inhibiting their actions in this task despite understanding the rule, whereas older 3-year-olds and most 4-year-olds can do so selectively (Reed, Pien, & Rothbart, 1984). This example illustrates one of many similar EF tasks showing marked improvement between ages 3 and 6, when children become much better at resolving conflict of attention and/or motor responses, waiting for a reward, and staying on-task in the face of tempting distractions (Carlson, 2005; Kochanska, Murray, & Harlan, 2000).

Diverse problem-solving scenarios are likely to require flexible suppression and selection of information in working memory and ensuing responses. Indeed, inhibitory control is thought to contribute to individual differences and/or developmental changes in a wide array of cognitive abilities including attention, memory, reading comprehension, and theory of mind (e.g., Carlson, Mandell, & Williams, 2004; Dempster, 1992; Harnishfeger & Bjorklund, 1993; Posner & Rothbart, 2000). EF in general is strongly associated with prefrontal cortex (PFC), which has an extremely