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Temperamental Effortful Control (Self-Regulation)

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Introduction

An important dimension of temperament is effortful control, which has been defined by Rothbart as "the ability to inhibit a dominant response to perform a subdominant response" (p. 137)[1] or the “efficiency of executive attention, including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan, and to detect errors.”[1,2] Effortful control includes the abilities to voluntarily manage attention (attentional regulation) and inhibit (inhibitory control) or activate (activational control) behaviour as needed to adapt, especially when the child does not particularly want to do so. For example, the abilities to focus attention when there are distractions, to not interrupt others and sit still in church or class, and to force oneself to do an unpleasant task are aspects of effortful control. These abilities underlie the emergence of self-regulation, a major milestone in children’s development.[2,3]

Although nearly all children improve greatly in their effortful control (and hence self-regulation) across the first five years of life, there are large individual differences in effortful control. As is true for other aspects of temperament, individual differences in effortful control are believed to be due to both biological factors (hereditary and constitutional factors, such as the prenatal environment) and environmental influences (e.g., on prenatal care), and to be affected over time

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by environmental influences during early childhood. Effortful control is believed to involve executive attention abilities and to be linked to activity in the anterior cingulate gyrus (part of the brain) and prefrontal cortex.[3] Effortful control, as part of executive attention, has been shown to be involved in the voluntary control of thoughts and feelings, in resolving conflict in regard to discrepant information, correcting errors and planning new actions.[1,3,4]

Subject

The emergence of temperamentally based self-regulation and individual differences therein is important for multiple reasons. As children age, they are increasingly held responsible for their own behaviour by their socializers.[2,3] Children who are not well regulated are likely to elicit negative reactions from both peers and adults. In addition, the attentional skills involved in effortful control are likely quite important for learning.[5,6] Finally, the skills involved in effortful control have an obvious relevance to children's emerging adjustment and social competence.[7]

Problem

For the aforementioned reasons, it is important to identify both the normative pattern for the emergence of effortful control and the antecedents of individual differences in effortful control. Researchers in the developmental sciences have examined both of these issues.

Research Context

Effortful control has been studied using a variety of methods. Investigators examining effortful control typically have used parents' or other caregivers' reports of children's effortful control and behavioural measures. These behavioural measures typically include tasks that assess children's focused attention and persistence on tasks, attentional control on Stroop tests or other measures of executive attention, the ability to delay gratification (e.g., hold an M & M on their tongue), and the abilities to inhibit or activate behaviour (e.g., follow an instruction in response to one cue but not another or move faster and slower in accordance with instructions).[8] Such research has been conducted in both laboratory settings (sometimes in preschools) and in the home environment.

Key Research Questions

Important research questions are the age at which attentional and behavioural control (i.e., inhibitory and activational control) emerge in the early years of life and when they become

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relatively well developed. Investigators have also been interested in aspects of children's social interactions – especially parent-child interactions – that are associated with individual differences in effortful control. Behavioural and molecular geneticists have also attempted to identify the degree to which heredity contributes to effortful control and interacts with environmental influences when predicting self-regulation. Finally, researchers have assessed the relationships between effortful control and young children's adjustment and moral development.

Recent Research Results

Young infants exhibit very little effortful control. Attention becomes somewhat more voluntary (but still quite limited) between nine and 18 months of age[9] as infants learn to resolve conflicts (e.g. when processing information), correct errors and plan new actions.[4] Using a Stroop-like task that requires toddlers to switch attention and inhibit behaviour accordingly, Posner and Rothbart[4] reported that children showed significant improvement in performance by 30 months of age and performed with high accuracy by 36 to 38 months of age.[10,11]

Infants are very limited in the behavioural component of voluntary behavioural control (e.g., the ability to inhibit behaviour upon command), but these skills improve considerably in the third year of life.[4,8] The ability to effortfully inhibit behaviour on tasks such as "Simon Says" emerges at approximately 44 months of age and is fairly good by four years of age,[4,12] although improvements in effortful control continue into childhood.[13]

Twin studies confirm that there is a genetic basis to effortful control.[14] However, parenting has also been associated with individual differences in effortful control. In general, young children's self-regulation (including behaviours that reflect effortful control) has been positively associated with maternal support and sensitivity, and negatively related to a directive and controlling caregiving style.[15,16,17] Moreover, children's heredity and quality of their attachment interact to predict their self-regulation; children with certain *serotonin*-related *polymorphisms* are more susceptible to the low self-regulation if they have an insecure (but not secure) attachment.[18]

Finally, it is clear that effortful control is linked to optimal development, even in the first five years of life. For example, laboratory or parent-report measures of toddlers', preschoolers' and children's effortful control have been associated with lower levels of problem behaviours, concurrently and at older ages.[19,20,21] In addition, young children's effortful control has been found to correlate with, and predict over time, low levels of negative emotion,[7,19,20,22,23] conscience,[19,24,25]

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high levels of social competence,[5,7,26] andhighly committed compliance.[26,27]

Conclusions

Although effortful control has a hereditary basis, it develops rapidly in the first four years of life, with marked improvements occurring in the third year. Individual differences in effortful control, although due partly to heredity, are also associated with the quality of mother-child interactions. Warm, supportive parenting, rather than cold, directive parenting, appears to predict higher levels of effortful control. Individual differences in effortful control that emerge during the first five years of life have been linked to higher levels of adjustment, social competence, committed compliance and conscience, concurrently and in the future.

Implications

The toddler and preschool years are a time in which temperamentally based effortful control emerges rapidly and provides the basis for the emergence of self-regulation. Self-regulation is critical because it affects the quality of children's social interactions and their capacity for learning. Because adults increasingly expect children to self-regulate as they mature, adults are likely to respond negatively to children who do not develop at least normative levels of self-regulation.

Although individual differences are due partly to heredity, it is likely that socializers influence the emergence of children's effortful control; moreover, genes and the social environment interact in their effects on regulation. Because the quality of parenting is associated with higher levels of effortful control, it is important that parents and other caregivers be encouraged to interact with children in ways that foster the development of effortful control. Indeed, the relation between parenting style and a range of developmental outcomes is likely due in part to the effects of parenting on children's self-regulation.[28] Because of the relation between effortful control and healthy psychological and socio-emotional development, service-providers and policy-makers are well advised to implement procedures that promote supportive parenting and teacher-child interactions.

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