

## Best Practices in the Development of Effortful Control in Early Childhood

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### **Topic**

[Aggression](#)

### **Introduction**

Effortful control (EC) is a dimension of temperament related to the self-regulation of emotional reactivity and behaviour.<sup>1</sup> EC allows increased control over action and adjustment to situational demands in a flexible and willful manner. The concept includes aspects related to attention, including the ability to voluntarily move, focus and sustain attention as needed, and behavioural regulation, which includes both inhibitory control of action (not eating a candy) as well as activation control (eating a fruit instead). From very early in life, children greatly differ in their EC abilities. During infancy caregivers provide much of control over children behaviour and it is not until the end of the first year of life that early forms of self-regulation start to develop. Subsequently, the capacity for effortful control increases markedly in the preschool years and may continue to develop into adulthood.<sup>2</sup> However, despite the progressive development due to maturation, EC appears to show within-subject stability from toddlerhood through preschool and into early school age years.<sup>3</sup>

### **Subject**

Given its role in emotion regulation and adjustment, EC is considered an important contributor to the socio-emotional development of the child.<sup>4</sup> When experiencing negative emotions it is useful to use attention in order to shift thoughts away from the source of distress. It can also be helpful to use inhibitory control to stop aggressive impulses or mask the expression of negative emotion when needed. Finally, it can also be good to use activation control to take actions that may ameliorate the situation. The same range of abilities may help in a variety of situations in which regulation is required. Many of these situations in children's lives happen at school, and it has been shown that EC is an important predictor of academic achievement and social adjustment at school.<sup>5-7</sup>

Individual differences in EC are related to aspects of cognition such as theory of mind (i.e., knowing that people's behaviour is guided by their mental state, which includes beliefs, desires and knowledge). There is also evidence showing that EC plays an important role in the development of conscience, which involves the interplay between

experiencing moral emotions (i.e., guilt/shame or discomfort following transgressions) and behaving morally, in a way that is compatible with rules and social norms.<sup>8</sup> Besides, children who are high in EC appear to be more able to display empathy toward other's emotional states and pro-social behaviour.<sup>4</sup> EC is thought to provide the attentional flexibility required to link emotional reactions (both positive and negative) in oneself and others with internalized social norms and action in everyday situations.

### **Problems**

Poor regulatory abilities often place the child at risk of developing pathologies such as disruptive behaviour problems or ADHD.<sup>9</sup> In relation to behaviour problems, it is important to distinguish between reactive aggression (emotionally-driven conduct problems) and proactive aggression (unprovoked, unemotional aggression that is used for personal gain or to influence and coerce others). EC shows a consistent negative correlation with behaviour problems based on reactive aggression but not so much on proactive aggression.<sup>10</sup> Across cultures, it has been shown that children who show high levels of emotional reactivity, either in a surge-approaching (e.g., impulsivity, sensation and reward-seeking) or a negative (e.g., anger and frustration) mode or both, often show externalizing behaviour problems when having poor EC abilities.<sup>4</sup> Conversely, children with covert proactive behaviour problems such as stealing do not always exhibit self-regulation difficulties. Aspects of the home environment are also important in the development of behaviour problems. In fact, a direct relationship between positive parenting (warmth/positive expressivity) and low levels of externalizing behaviour problems has been established. Nevertheless, this relationship appears to be mediated by children's EC,<sup>11</sup> meaning that positive parenting is facilitated when children show more regulated behaviour.

### **Research Context**

EC is often measured with parents, teachers or with self-reported questionnaires. These are made up of questions about children's reactions to everyday situations on the variety of dimensions included in the definition of EC (focusing and shifting attention, inhibitory control and activation control). It can also be measured with tasks designed to elicit temperament-related reactions (i.e., receiving an undesired gift) in the laboratory, or by means of direct observations in naturalistic settings. In addition, given the conceptual link between EC and attention, experimental tasks often used to measure attentional control are also utilized to measure individual differences in self-regulatory abilities.<sup>12</sup> Such tasks usually require resolving conflict between stimuli and/or responses. One example of this type of task is the Flanker task. In this task, a target stimulus is surrounded by irrelevant stimulation that can either match or conflict with the response required by the target. When distracting stimulation conflict with the correct response, the time to respond is delayed with respect to when the distracting information matches the target response (there is no conflict). This delay in reaction time can be used as an index of efficiency of attentional control (larger delays indicate poorer control of the distracting stimulation). Performance of conflict tasks in the laboratory have been empirically linked to aspects of children's EC in naturalistic settings. Children who are relatively less affected by conflict receive higher parental ratings of EC and higher scores on laboratory measures of inhibitory control.<sup>12</sup> Moreover, using experimental tasks is particularly effective when it

comes to understanding the brain basis underlying children's control skills, because the child can perform those tasks while neural activation is registered with brain imaging techniques. It has been shown that a brain network including the *anterior cingulate cortex (ACC)* and lateral *prefrontal cortex* areas, mostly modulated by the neurotransmitter *dopamine*, subserves the function of regulating thoughts, emotions and responses.<sup>13</sup> Patterns of activation of these brain structures are related to the efficiency of resolving conflict<sup>14</sup> and variations in the size and structure of the ACC have been related to the EC score obtained in temperament questionnaires.<sup>15</sup>

### Key Research Questions

Key research questions that are currently addressed in relation to EC are about the genetic and experiential factors that may influence individual differences in EC and its development. One important question is whether the regulatory abilities central to EC are subject to intervention, and if so, what are the educational practices, whether provided at home or at school, more likely to potentiate children's EC.

### Recent Research Results

From early models, temperament has been thought to have a constitutional basis.<sup>1</sup> Recent evidence is showing that polymorphic variation in dopamine-related genes is associated to individual differences in EC and attentional control.<sup>16</sup> However, the relevance of the biological endowment for EC does not mean that this ability cannot be influenced by experience. Computer-based training programs targeting attention focusing and control has proven to enhance efficiency of the brain attention system in young children as well as reasoning capacities.<sup>14</sup> It has also been shown that classroom curricula that emphasize regulation and executive functions skills, such as Tools of the Mind,<sup>17</sup> improves children's cognitive control.<sup>18</sup> But home environment is also important. Aspects of parent-child relationships such as attachment security, early positive mutuality, warmth, responsiveness and discipline have been shown to play a role on the development of regulatory abilities. Recent evidence suggests that autonomy support (i.e., offering children age-appropriate problem-solving strategies and providing opportunities to use them) is the strongest predictor of children performance on cognitive control tasks.<sup>19</sup> In children who are more likely to display externalizing behaviour problems, it has been shown that the use of gentle discipline (i.e., giving commands and prohibitive statements in a positive tone) by parents results in the development of greater EC, whereas the use of reasoning explanations and redirections in neutral tone is associated to poorer EC later on.<sup>20</sup> In line with this, other studies have shown that positive parental control can buffer the risk of developing externalizing behavioural problems in children low in EC.<sup>21</sup> A similar result is also found for teacher-child relationships. Supportive teaching appears to safeguard the risk of academic failure in children who are low in EC.<sup>22</sup>

### Research Gaps

Since the entire human genome sequencing a decade ago, lots of research efforts have been devoted to understanding genetics of behaviour and cognition. Variations in a number of genes have been associated with particular developmental pathologies (i.e., VNTR-type 7-repeats *polymorphism* of the *DRD4 gene* is associated with increased risk for developing ADHD).<sup>23</sup> However, it would be worthwhile to explore whether genetic variation interacts with experience to determine patterns of behaviour and cognitive

efficacy. Related to this question, recent research suggests that particular polymorphisms, often those linked to risk for pathology, make the individual more susceptible to be influenced by parenting and other experiences.<sup>24-26</sup> For example, children carrying the 7-repeat variation of the DRD4 appear to benefit more from interventions directed to prevent behaviour problems than those carrying other variations of the gene.<sup>24</sup> Nonetheless, further research is needed on how and to what extent EC skills may be influenced by the interplay between constitution and experience.

### Conclusions

Effortful control is a dynamic temperamental dimension determined by a multiplicity of factors including both constitutional dispositions as well as experience. It captures individual differences in the voluntary and effortful regulation of thoughts, emotions and responses. Individual differences in EC are important for a broad range of behaviours that significantly influence children's social adjustment and their success in school. There are strong increases in this function during early childhood followed by a more progressive development during late childhood and adolescence, as brain processes related to executive control become progressively more refined and efficient. Efficiency of systems of self-regulation is partially determined by the genetic endowment of the individual and is also affected by environmental factors such as parenting and education. Susceptibility to experience provides an opportunity to promote EC by means of appropriate educational interventions. Determining the interventions and experiences most likely to foster EC may serve the purpose of helping children to become successful and happily-adjusted members of society.

### Implications for Parents, Services and Policy

Effortful control is a quality that is key to socialization. Children need to develop self-control to resist temptations, stay focused despite distractions, persist to complete tasks even when the reward may take time to arrive, and avoid acting in a way that they might regret, giving considered responses rather than impulsive ones. Evidence shows that improving EC will promote children's adjustment to society and pro-social attitudes, and will help to prevent the development of regulation-related disorders and conduct problems.<sup>4,8</sup> An important challenge for parents and educators is to provide children with the type of learning experiences that will help them to succeed in this endeavour.<sup>27</sup> Parental attitudes involving secure and affectionate responsiveness toward the child together with discipline and autonomy support appear to promote the development of EC.<sup>11,19-22,25</sup> Also, emerging scientific evidence shows that particular educational experiences support the acquisition of regulatory skills.<sup>14,18</sup> This type of studies provides an opportunity to turn research findings into curricular improvement.

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