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Applied Implications of Understanding the Natural Development of Effortful Control

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Abstract

Effortful control (EC) is an important target for many interventions intended to facilitate positive psychosocial outcomes. The first wave of these efforts have emphasized adult-to-child instruction and individualized practice at target skills. Future tests of these ideas will be facilitated by efforts to critically evaluate and improve the construct validity of EC measures. New avenues for these applied approaches will also grow out of a more complete understanding of the processes that govern EC development. Specifically, I argue that the natural development of EC includes important roles for contextual and peer relationship factors that have yet to be capitalized on in efforts to increase EC in children.

Introduction

A defining component of psychological maturation we associate with aging and the accumulation of experience is that people become capable of more complex and effective management of their behavioral options. Early in life, youngsters are not adept at flexibly deploying their (relatively limited) inventory of skills. Behavioral selection is often driven by simple, non-strategic processes such as which responses were recently rewarded, even when the child has alternatives within their behavioral repertoire and there are consequences for infelicitous choices. With age, our ability to tailor responses to different contexts and time frames (present, immediate future, and long-term goals) deepens. Meta-skills for reflecting on how well we optimize these choices take root and overlearned regulatory routines provide support for many other key psychological processes.

The complexity of these skills and breadth of their reach are reflected in the many scientific domains that address them, and the proliferation of constructs and terminology used (Nigg, 2017). Because I deal here with the development of these skills and applied efforts to facilitate that development for other ends, I use the term effortful control (EC). EC is used in the temperament literature to label the behavioral manifestations of trait individual differences in top-down self-regulation presumed to emerge from processes of executive attention and working memory (Nigg, 2017). It includes early developing, lower-level elements of executive functioning (EF; Diamond, 2013), but it excludes higher level EF and particularly when measured in psychometric approaches, emphasizes the behavioral outputs and psychosocial correlates of these processes. In personality science, EC is seen as a developmental precursor to a conceptually and phenotypically broader dimension of conscientiousness (Eisenberg, Duckworth, Spinrad, & Valiente, 2014) that incorporates

additional aspects of self-regulation, such as planning, as well as elements of conscience development.

Evidence that those with higher EC enjoy benefits across many domains of functioning (e.g., Blair & Razza, 2007; Moffitt et al., 2011; Olsen et al., 2005) has ignited interest in the possibility of manipulating EC skills to promote positive outcomes. Programs involving practice, modeling, and reinforcement for specific EC skills have been tested, often targeted to people facing developmental challenges such as formal schooling and successful aging. These efforts are built on the following assumptions: (1) if EC skills cause positive outcomes, manipulating EC will result in changes in these outcomes; (2) EC skills reside *within* the person, so EC can be increased through learning opportunities directed to the targeted persons; and (3) because EC measures exhibit the largest mean-level changes during periods of major neurobiological maturation (early childhood and adolescence through young adulthood; Zelazo & Carlson, 2012; Casey, Jones, & Somerville, 2011), changes in the brain are the locus of changes in EC. Effects of these programs vary from negligible to small, depending upon the population, program, and outcome examined (Diamond, Barnett, Thomas, & Munro, 2007; Raver et al., 2011; Rueda, Rothbart, McCandliss, Saccomanno, & Posner, 2005; Rueda, Checa, & Combita, 2012; Lampit, Hallock, & Valenzuela, 2014; Frieze, Frankenbach, Job, & Loschelder, 2016). The small magnitude of their effects may be due to the relatively modest contribution of any one process to complex distal outcomes, or we may simply not be harnessing the causal processes most critical to the development of EC.

Below, I argue that thinking differently about the conceptualization and measurement of EC, as well as considering aspects of its natural development, may help us to craft and test different, potentially more beneficial applied strategies.

EC measures are not equivalent to the psychological processes targeted by EC training

The aim of some applied efforts to improve EC is to produce gains on the downstream behavioral outputs EC is presumed to cause (e.g., to help children become more patient, rule-governed, etc.). Collecting salient markers of those outputs are one means of validating an EC training protocol, but the causal link between these outputs and EC processes is often not as clear as presumed. For example, in the well-known “marshmallow task” that challenges children’s ability to postpone an immediate food reward in favor of a larger delayed reward (Mischel, Ebbesen, & Zeiss, 1972), two children may wait for the same length of time but use very different strategies for doing so, a difference obscured if we treat wait time as equivalent to their level of EC. Wait time may also be influenced by other traits and peculiarities (e.g., preference for the specific snack). Imperfect connections between observable EC behaviors and constituent processes are consistent with evidence that training one EC skill does not yield generalized improvement on other EC measures (Melby-Lervag & Hulme, 2013; Sala & Gobet, 2017). Measures of EC can be straightforward, but that does not mean there is a straight line between the measure and the processes of interest. There are limited data on how common EC measures fare in terms of sensitivity to even short-term

manipulations of EC processes. To improve applied efforts, we need more work clarifying the construct validity of EC measures, including their sensitivity to change, discriminant validity, and measurement invariance across childhood developmental periods.

EC involves transactions between person and environment that should be understood in efforts to change EC

The observation that mean level changes in EC are largest during early childhood and adolescence, periods of dense neurobiological change, has fueled an expectation that EC changes arise from neurological maturation. However, there is not yet strong evidence for tight connections between manipulations of EC skills and individual differences in neurobiological markers (Pontifex et al., 2013; Espinet, Anderson, & Zelazo, 2013; Rueda et al., 2012). We may have overlooked a key piece of the equation – the affordances and boundaries set by the environments in which neurobiological maturation and EC development co-occur. EC processes are engaged when someone is motivated to monitor, evaluate, or adapt their behavior in concert with internal (e.g., goals) and *external* (e.g., expectations, contingencies) conditions. In a culture that values harnessing individual desires and powers to attain a self-defined goal, EC may develop differently than in one that prioritizes responsivity to the authority and rules of elders. Recent data comparing children from two such cultures (Lamm, Keller, Teiser, Gudi, et al., 2017) showed that Cameroonian Nso 4-year-olds outperformed German peers on the classic “marshmallow” task and moreover, that good performance among the Nso youngsters was predicted by different behavioral strategies than was previously found in Western samples.

Socioeconomic status is a broad umbrella for important affordances and constraints of a child’s environment, and SES indices correlate positively with EC measures (Blair & Raver, 2012). Under the view that EC resides within the person, these associations are sometimes interpreted as reflecting a skills deficit in disadvantaged children. However, children with less reliable access to resources may optimize their EC skills to fit those contexts by, for example, choosing immediate rewards over larger but uncertain ones, a strategy that in their experience may yield better outcomes (Sturge-Apple et al., 2016). This observational evidence is reinforced by an experimental study (Kidd, Palmeri, & Alsin, 2013) in which reliability of the experimenter in the marshmallow task was manipulated (in one condition, the experimenter made good on their promises and in the other, they did not). Children in the reliable condition waited four times as long as those in the unreliable condition.

These lines of evidence suggest it is premature to interpret individual differences in performance on EC measures as providing evidence only of *internal* EC capacity, and point to the importance of understanding the how the behavioral manifestation of EC is shaped by environmental contexts that provide different learning experiences and consequences for developing EC skills. Individually delivered interventions in which children receive standardized training in EC skills are one route for facilitating EC development. A different and potentially more flexible route would involve changes to children’s contexts. These could leverage information about how EC development manifests differently in response to

different environmental contexts and potentially be designed to be more sensitive to the values at play in children's environments.

Environmental contexts that change EC are not solely 'instructional'

Early in life, behavioral regulation relies heavily on external supports, principally caregiving adults. Shouldering more of the burden by self-regulation is often seen as a hallmark of successful development (Kopp, 1982), and failures to do so as troublesome. EC is a predictor of children's responsivity to their parents' interactions and parents of low EC children are observed to be less sensitive and make more attempts to control their child's behavior (Wilson & Durbin, 2012). Low EC is also viewed as problematic by non-parents; it correlates with negatively valenced child characteristics in teacher reports (e.g., Clark et al., 2017) and ratings by experimenters who interact with children (Vroman, Lo, & Durbin, 2014). This may have self-fulfilling consequences for subsequent EC development. If adults are more directive and controlling, low EC children will have fewer opportunities to independently reflect, practice, and make decisions (and thus, less natural practice internalizing EC skills).

The solution to fostering EC may not lie in more adult-to-child learning transactions, changes to qualities of parent-child interactions, or massed practice of skills. Much of the natural development of EC is likely both unplanned and routine, occurring organically as children interact with a complex world that challenges them to extend their behavioral repertoire and its flexibility if they wish to accomplish their goals. Children may acquire EC skills through interaction with people who are not 'experts' in EC, and in interactions that are not instructional. One overlooked locus for changing children's EC is within their peer interactions. Children in preschool classrooms with a greater proportion of free choice (versus teacher-lead) activities show larger gains in children's inhibitory control (Goble & Pianta, 2017). Peer interactions during free choice provide rich opportunities in which behavioral flexibility is rewarded and child-driven activities may heighten motivation for behavior change in ways that adult-driven ones do not.

We took observational measures of children's traits and peer interactions over an entire school year in two preschool classrooms (Neal, Durbin, Gornik, & Lo, 2017). The sample's mean level of EC increased over the school year, but EC development varied across children. Longitudinal social network analysis showed the makeup of children's social networks influenced change in EC. Children who developed friendships with peers who were above average in EC were more likely to themselves increase in EC, compared to those whose friends were below average in EC, even though children did not tend to develop friendships with children similar to them on EC.

Why are friendship networks important in addition to opportunities for peer interactions and how did friends' EC influence one another? Likely not by explicit instruction in EC by peers. Perhaps high EC children modeled playful, rule-abiding, attentive behavior that was emulated by friends (Bandura, 1977). Habitual engagement in high EC behaviors like one's friends may be a bottom-up route to increasing EC, as opposed to more top-down growth requiring reflection or other strategic skills (Marcovitch & Zelazo, 2009). Alternatively,

children high in EC may have engaged (and thus involved their friends) in different kinds of play, which may have facilitated growth in EC. High EC children may have received different treatment by teachers that spread to their interaction partners and thus influenced their EC in the classroom. Understanding which of these mechanisms are at play could inform different avenues for facilitating EC growth in the classroom setting.

Importantly, the environmental influence of friends' EC we observed more readily supports inferences about causal processes across relationship partners, unlike in studies demonstrating correlations between parenting behaviors and child EC, which could be accounted for by genetic influences. However, they may share some mechanisms of influence. Parent-child relationship factors, specifically mutually responsive orientation (positive, cooperative, and responsive bonds between partners), are important correlates of EC development (Kochanska & Kim, 2014). In close relationships, behavioral norms and values communicated by the relationship partner are valued and prized, making partners more open to influence by those partners and emulation of their behaviors. Peer friendships may co-opt the same attachment systems that enable youngsters to develop 'committed compliance' with parental expectations. Matching your behavior to that of your friends may be reinforcing if it strengthens the bond between partners. Thus, manipulation of behavioral norms in peer groups, especially stable peer groups in which friendships form, may be a more sustainable form of influencing child EC than having children practice EC skills and receive reinforcement by adults for doing so. Providing children with opportunities to interact with and potentially form friendships with high EC children (either peers high on the trait or older children with greater EC development) may provide for sustained mechanisms for influencing EC development.

The tendency for EC to increase in the context of close relationship processes is consistent with evidence later in the lifespan on another period in which increases in EC are normative. Self-reported Conscientiousness (of which EC is a developmental precursor) exhibits large mean-level change across late adolescence through emerging adulthood (e.g., Donnellan et al., 2007; Robins, Fraley, Roberts, & Trzesniewski, 2000) and individual differences in these changes are tied to the experience of key norm-setting contexts, including establishing close relationships and entering the workforce (Lodi-Smith & Roberts, 2007). One study of adult partners found evidence that partners' level of conscientiousness influence one another, partly because of emulation of the partner's activities (Solomon & Jackson, 2014). The natural environment is richly constructed with avenues for supporting EC development via natural consequences and routine experiences that support the development of component skills within the contextualized environments in which they are needed for success. A deeper understanding of the processes involved in this natural development will generate new ideas about strategies for facilitating EC and for understanding its role in psychosocial adjustment.

Summary

As the contours of the natural development of EC are clarified, there are opportunities to harness these developmental phenomena to test mechanistic models of the internal processes and external conditions that help to shape EC, and the reasons why it has such wide-reaching influences on outcomes across the lifespan. Understanding these processes will be critical

for crafting applied strategies to facilitate EC development and may suggest new avenues for training and intervention that can be implemented within the contextual settings most critical to EC development.

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