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Assessing effortful control in typical and atypical development: Are questionnaires and neuropsychological measures interchangeable? A latent-variable analysis

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ABSTRACT

Objective: Effortful control (EC), the self-regulation component of temperament, is traditionally measured using questionnaires. Through the years, several neuropsychological measures originating from the cognitive psychology and the executive function (EF) literature have been introduced in the domain of temperament research to tap EC. Although this is not particularly surprising, given the conceptual overlap between EC and EF, it remains unclear whether EC questionnaires and neuropsychological EF tasks can really be used interchangeably when measuring EC. The current study addressed two important aspects in evaluating the interchangeability of both types of measures, that is: (a) do they measure the same construct? and (b) do they give the same results when comparing clinical populations?

Method: Three EC questionnaires, two inhibitory control tasks, and two attentional control tasks were administered in 148 typically developing children, 30 children with attention-deficit/hyperactivity disorder (ADHD), and 31 children with autism spectrum disorder (ASD). All children were between 10 and 15 years of age and had a full scale IQ of 80 or higher.

Results: Confirmatory factor analyses revealed that the questionnaires and EF tasks do not capture the same underlying latent variable(s). Groups could not be differentiated from each other based on their performance on EF tasks, whereas significant group differences were found for all EC-reports.

Conclusions: Overall, our findings show more differences than commonalities between the EC questionnaires and EF tasks and, consequently, suggest that both types of measures should not be used interchangeably.

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1. Introduction

The construct of effortful control (EC) has received a substantial amount of attention in child development research in the course of the past decade (Bijttebier & Roeyers, 2009). EC refers to the self-regulation component of temperament and is defined as "the ability to inhibit a dominant response in order to perform a subdominant response" (Rothbart & Bates, 1998, p. 137). EC involves both an attentional aspect (i.e., the ability to focus or shift attention when needed) and a behavioral aspect (i.e., the ability to inhibit or activate behavior in accordance with situational demands) (Rothbart, 1989). EC levels have been linked not only to the positive emotional, social, and cognitive development in children (e.g., Eisenberg, Smith, Sadovsky, & Spinrad, 2004), but also to the onset and/or maintenance of both internalizing and externalizing problems (e.g., Muris & Ollendick, 2005), as well as to developmental disorders such as attention-deficit/hyperactivity disorder (ADHD; e.g., Martel & Nigg, 2006; Samyn, Roeyers, & Bijttebier, 2011) and autism spectrum disorders (ASD; e.g., Konstantareas & Stewart, 2006; Samyn et al., 2011). In general, within the domain of temperament research, EC is considered a key component in development and it is assumed that a vulnerability to develop psychopathology is largely associated with a temperament characterized by, among other things, low levels of EC (e.g., Lonigan & Phillips, 2001).

EC is traditionally measured using questionnaires (e.g., Derryberry & Reed, 2002; Ellis & Rothbart, 2001; Lonigan & Phillips, 2001) or, in young children, by means of Kochanska's multitask battery (e.g., Walk a Line, Turtle's House, Telephone Poles, Circle, Star, and Lowering Voice; Kochanska & Knaack, 2003). However, through the years, several researchers have introduced neuropsychological measures (e.g., Go/No-Go, Stroop) originating from the domain of cognitive psychology and the executive function (EF) literature to tap EC (e.g., Lengua, Honorado, & Bush, 2007; for a review, see Zhou, Chen, & Main, 2012). This is not particularly surprising, given the conceptual overlap between EC and EF. Both constructs show considerable similarities in terms of definition and core components (e.g., a focus on inhibition and identifying executive attention as an underlying process; for an extensive review, see Zhou et al., 2012). However, up till now, it remains unclear whether EC questionnaires and neuropsychological EF tasks can really be used interchangeably when measuring EC. To date, most studies have focused on either EC or EF and studies focusing on both within a single sample are limited. The few studies that did include questionnaires as well as EF tasks at best show small to moderate correlations between both (e.g., Blair & Razza, 2007; Verstraeten, Vasey, Claes, & Bijttebier, 2010). Overall, findings are inconclusive and call for additional research. Also, the practice of interchanging these measures hampers the interpretation of and comparison between results of different EC studies (e.g., when comparing different populations on their ability to effortfully control their attention and/or behavior). Therefore, the main aim of our study was to investigate the extent to which EC questionnaires and a selection of neuropsychological EF measures considered to assess inhibitory control, attention focusing, and attention shifting are interchangeable when measuring EC. In the present study we addressed two important aspects in evaluating the interchangeability of measures, that is: (a) do they measure the same construct? and (b) do they give the same results, for example when comparing clinical populations? First, a necessary (although not sufficient) condition for measures to be interchangeable is that they tap the same (or very similar) construct(s) (Fine, 1992). In order to evaluate this, we used latent-variable analyses. Applying a latent-variable approach (as opposed to a correlational approach) has several advantages. In a nutshell, this technique statistically extracts the common variance among multiple measures chosen to tap the same underlying construct while excluding the variance attributable to idiosyncratic task requirements and measurement error (Friedman & Miyake, 2004). For the purpose of the current study, two models were analyzed. First, a model was investigated in which the different EC total scores and the relevant variables of the neuropsychological EF tasks all load on the same underlying latent factor and thus are presumed to be best characterized as a unitary factor (see Fig. 1 for the hypothesized model). Although this model is in accordance with the practice that both types of measures are used interchangeably to investigate EC, there are some reasons to assume that a single factor approach may not be the best solution. For example, the relatively small correlations between both types of measures (e.g., for a review, see Zhou et al., 2012) and the lack of

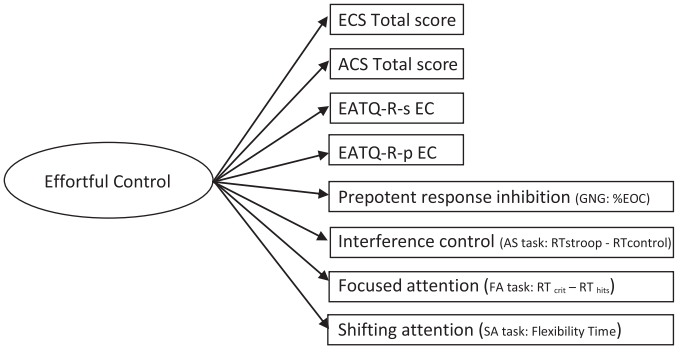

Fig. 1. Hypothesized model linking the EC scales and performance on neuropsychological EF measures to the underlying latent variable EC. GNG = Go/No-Go; AS = animal stroop; FA = focused attention; SA = shifting attention.

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