



## Effortful control, task persistence, and reading skills<sup>☆</sup>



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### ARTICLE INFO

#### Keywords:

Effortful control  
Task persistence  
Self-regulation  
Reading skills  
Bifactor model

### ABSTRACT

The present study aimed to explore the shared and unique variance of children's effortful control and task persistence as rated by mothers and language teachers, and to investigate their associations with reading skills. Overall, 732 sixth-grade children (52% boys) from 57 classes participated in the study. Bifactor models fit the data best, showing that effortful control and task persistence, as measured by widely-used questionnaires, have not only a great amount of shared variance which is explained by the common Effortful-Control factor, but also some unique variance explained by specific factors. The parent- and teacher-rated common Effortful-Control factor and unique Task-Persistence factor were both positively associated with reading skills. In contrast, the Inhibitory-Control-specific factor was negatively associated with reading skills. The results suggest that latent variables, rather than composite scores, should be used when employing questionnaires to measure these constructs.

### 1. Introduction

Regulating one's behavior is an important characteristic of learning behavior (Zimmerman, 2002). Self-regulation has been studied via effortful control (EC), which is a multifaceted construct that includes the ability to focus attention and to activate and inhibit behavior when necessary (Bridgett, Oddi, Laake, Murdock, & Bachmann, 2013). Persistence on challenging tasks has been considered an indication of attentional control and the ability to regulate emotional and behavioral impulses (Eisenberg et al., 2005; Eisenberg, Spinrad, & Eggum, 2010). Moreover, task persistence (TP; also referred to as task-focused versus task-avoidant behavior) has also been explained in motivational theories and linked to motivational beliefs and strategies (Onatsu-Arvilommi & Nurmi, 2000; Zhang, Nurmi, Kiuru, Lerkkanen, & Aunola, 2011). Repeated failures may lead to a sense of low self-efficacy (Bandura, 1997) or helplessness (Diener & Dweck, 1978), which may in turn cause students to give up on a challenging task (Bandura, 1997; Diener & Dweck, 1978). Growing empirical evidence points to a positive link between academic achievement and both EC (e.g., Blair & Razza, 2007; Véronneau, Hiatt Racer, Fosco, & Dishion, 2014; Zhou, Main, & Wang, 2010) and task-persistent learning behavior (or a negative link between academic achievement and task avoidance; e.g., Georgiou, Manolitsis, Zhang, Parrila, & Nurmi, 2013; Hirvonen, Georgiou, Lerkkanen, Aunola, & Nurmi, 2009; Jögi & Kikas, 2016; Kikas

& Mägi, 2015; Metsapelto et al., 2015). Although EC and TP have similar underlying psychological processes (e.g., attentional control), these constructs have been explored and studied independently. Knowledge about EC or TP and their specifics in each student may help teachers support students' self-regulation skills and motivation, enabling them to be more successful in their learning.

Thus far, little research has been carried out in older grades compared to younger grades (for exceptions, see Andersson & Bergman, 2011; Kikas & Mägi, 2015; Silinskas & Kikas, 2017; Véronneau et al., 2014). However, self-regulating one's learning behavior (EC and TP in school) may become especially important at the onset of adolescence in middle school, when academic expectations increase in complexity and students get less help from parents and spend more time with friends (Eccles & Roeser, 2005; Mahatmya, Lohman, Matjasko, & Farb, 2012; Steinberg & Monahan, 2007). In general, middle school is characterized by decreased academic motivation and engagement in learning (Anderman & Maehr, 1994; Mahatmya et al., 2012).

This study aimed to integrate self-regulation and motivational approaches in an effort to examine EC and TP simultaneously. We studied middle school students (Grade 6) in Estonia. Estonian students have shown good academic knowledge in international comparative surveys such as the Program for International Student Assessment PISA (e.g., in 2015, Estonia placed third in science, sixth in reading, and ninth in math; OECD, 2016). However, many students in middle school face

<sup>☆</sup> The study was supported by the Estonian Ministry of Education and Research (institutional research grant IUT 3-3) and European Social Fund Program Eduko (via Archimedes Foundation, grant 30.2-4/549).

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increased challenges. National-level tests are carried out in the end of Grade 6, and students are prepared specifically for these tests. Additionally, there is a high homework load in Estonian schools. According to the 2014 OECD report, 15-year-old students in Estonia spend more than six hours per week on homework assignments (OECD, 2014), which was among the highest for all OECD member countries.

### 1.1. Effortful control

The construct of EC emerged from research on temperament and is defined as “constitutionally-based individual differences in emotional, motor, and attentional reactivity and self-regulation” (Rothbart & Bates, 2006, p. 100). EC refers to voluntary control over the approach (activation) or withdrawal (inhibition) of behavioral tendencies via attentional (shifting and focusing) and inhibitory control mechanisms (Bridgett et al., 2013; Eisenberg et al., 2010; Lengua, Bush, Long, Trancik, & Kovacs, 2008; Rothbart & Bates, 2006). As Muris, Mayer, van Lint, and Hofman (2008) describe, one of the most important aspects of EC is the skilled control of higher-order executive attention that plays a role in the regulation of emotional responses and associated behaviors. This aspect of self-regulation is associated with academic adjustment and functioning (Blair, Calkins, & Kopp, 2010), including achievement and engagement in school (e.g., Blair & Razza, 2007; Deater-Deckard, Mullineaux, Petrill, & Thompson, 2009; Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008). Effortful control becomes especially important in early adolescence, when children must cope with the physical, emotional, and social changes that go along with puberty in addition to higher demands at school (e.g., different teachers for each subject, building new skills on top of foundational skills, etc.; Eccles & Roeser, 2005). Therefore, the capacity for self-regulation expands during childhood and throughout adolescence (Monahan, Steinberg, & Cauffman, 2009; Roberts, Caspi, & Moffitt, 2001; Steinberg et al., 2008).

Self-reports (Snyder et al., 2015; Véronneau et al., 2014; Wang, Brinkworth, & Eccles, 2013), parental ratings (Blair & Razza, 2007; Deater-Deckard et al., 2009; Véronneau et al., 2014), and/or teacher ratings (Blair & Razza, 2007; Véronneau et al., 2014) have often been used to assess children's temperament-based EC. The measures of EC, including the widely-used EC subscale of the *Early Adolescent Temperament Questionnaire-Revised* (EATQ-R) (Ellis & Rothbart, 2001), have identified three primary dimensions: inhibitory control (willful inhibition or planning of behavior), attentional focusing (willful maintenance of attentional focus), and attentional shifting or activation control (willful shifting of attention to deal with task demands) (Eisenberg et al., 2001). These dimensions are highly intercorrelated and expected to load onto a single EC factor (e.g., Rothbart, Ahadi, Hershey, & Fisher, 2001). However, Snyder et al. (2015) showed recently that, although these three dimensions together account for the greatest variance in the EATQ-R as measured by adolescent self-reported EC, a factor specific to activation control needs to be considered as well, supporting the view of EC as a multifaceted construct. Although bifactor models are widely used to test multifaceted constructs (Chen, West, & Sousa, 2006), the structure of parent- and teacher-rated EC questionnaires has not been explored in a similar manner.

A growing body of literature reveals that EC predicts academic success in children and adolescents, even after controlling for prior academic performance and general cognitive ability (Allan & Lonigan, 2011; Blair & Razza, 2007; Checa & Rueda, 2011; Valiente et al., 2008; Zhou et al., 2010). For instance, Checa and Rueda (2011) found that parent-rated EC predicted childhood literacy rates, even after considering the effect of general intelligence.

### 1.2. Task persistence

The construct of TP reflects a child's capacity to engage consistently in challenging tasks without losing focus or becoming irritable in the

presence of internal and external distractions (Drake, Belsky, & Fearon, 2014). Rothbart and Hwang (2007) proposed that the ability to persist during challenging tasks is an important indicator of child's EC. Some studies have used the duration a child persists on a challenging task (e.g., the Puzzle Box Task; Eisenberg et al., 2001, 2005) as an index of the child's temperament-based EC (Zhou et al., 2007). However, task-persistent versus task-avoidant behavior may reflect not only a child's attentional and inhibitory control mechanisms, but also their motivational beliefs and strategies. First, task-avoidant behavior may develop when the child experiences repeated failures, which may decrease his/her self-efficacy (Bandura, 1997) or increase feelings of helplessness (Diener & Dweck, 1978). Second, students may also actively avoid challenging tasks because they might believe that trying hard and failing at a task indicates their low ability (Covington, 1984). Low effort, therefore, can serve as a buffer against negative feedback in the case of failure (Zhang et al., 2011). Unfortunately, such task-avoidant behavior can also restrict important opportunities to learn.

Research in the motivational field has widely used the Behavioral Strategy Rating scale (BSRS; Onatsu & Nurmi, 1995; Zhang et al., 2011) to measure children's task-persistent versus task-avoidant behavior in various learning contexts. Teacher ratings have been primarily used to assess children's TP in classroom (Georgiou et al., 2013; Hirvonen et al., 2009; Kikas & Mägi, 2015; Zhang et al., 2011). Fewer studies have used parent ratings to measure children's TP during homework (Mägi, Lerkkanen, Poikkeus, Rasku-Puttonen, & Nurmi, 2011; Silinskas & Kikas, 2017). Although motivational factors are important in self-regulating one's behavior and exerting effort in challenging tasks (Elliot & Thrash, 2002, 2010), low persistence due to maladaptive motivational beliefs and helplessness is not easily differentiated from low persistence due to other factors (e.g., individual differences in temperament and executive functions) when parent and teacher reports of task-persistent versus task-avoidant behavior are used. For example, it has been shown that, irrespective of academic performance, a low level of empathy and high levels of both impulsivity and disruptiveness in kindergarten seem to contribute to future teacher ratings of high task avoidance (Mägi et al., 2013). This suggests that issues other than low feelings of self-efficacy and high feelings of helplessness are involved in the development of low TP. Hence, the focus of this study was to investigate differences between TP and EC, as measured by parent and teacher ratings.

Earlier studies have consistently shown positive associations between TP and academic performance (Aunola, Leskinen, Lerkkanen, & Nurmi, 2004; Hirvonen, Tolvanen, Aunola, & Nurmi, 2012), including reading skills (Aunola, Nurmi, Niemi, Lerkkanen, & Rasku-Puttonen, 2002; Georgiou et al., 2013; Hirvonen et al., 2009; Kikas & Mägi, 2015; Kikas, Peets, & Hodges, 2014; Metsapelto et al., 2015; Mägi, Häidkind, & Kikas, 2010). However, low TP is not always associated with low skill development, and vice versa (Mägi et al., 2013). It has also been argued and demonstrated that the effects of self-regulation mechanisms on skill development may depend on the complexity of the skill. Georgiou, Manolitsis, Nurmi, and Parrila (2010) and Georgiou et al. (2013) found that teacher-rated TP is a stronger predictor of spelling skills and reading comprehension as compared to reading fluency. Similarly, when studying variations in self-regulation profile groups, Mägi, Männamaa, and Kikas (2016) found greater differences in reading comprehension as compared to reading fluency and math skills. While earlier studies have primarily examined the relationship between TP and academic skills in elementary school (with the exceptions of fourth grade (see Liao, Georgiou, Zhang, & Nurmi, 2013; Metsapelto et al., 2015) and sixth grade (see Kikas & Mägi, 2015; Silinskas & Kikas, 2017), TP might be especially important for academic success in middle school, where tasks become more complex and learning is based on knowledge and preliminary skills acquired in earlier years. If these foundational skills are not sufficient, more-demanding tasks in middle school can lead to considerable challenges.

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