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# Self-regulation and co-regulation in early childhood – development, assessment and supporting factors

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**Abstract**
The development of self-regulation represents one of the hallmarks in early childhood. This special issue addresses important questions regarding the assessment and development of self-regulation, as well as influencing factors in early childhood: (1) How can self-regulation be assessed in early childhood? (2) How can parents support the development of self-regulation at this age? (3) How do parent and child beliefs contribute to the development of self-regulation in young children? Targeting the first question, Mulder et al., *Metacognition and Learning* (2019) explore the dynamics of self-control strategies during delay of gratification in two- and three-year-old children. Neale and Whitebread, *Metacognition and Learning* (2019) emphasize the second question by analysing the stability of maternal scaffolding across toys and time with 12 to 24 month old infants and its relation to effortful control. Gärtner et al., *Metacognition and Learning, 13*(3), 241-264 (2018) contribute to the second and third question with their work on the relation of parents' self-efficacy beliefs and co-regulation behaviour to child inhibitory control in two-year-old toddlers. The third question is also addressed by Compagnoni et al., *Metacognition and Learning* (2019), who report on the validation of a self-report instrument for assessing mindsets in kindergartners and its relation to self-regulation. The commonalities and differences among the four papers, and their empirical and theoretical contributions to the rising field of self-regulation research in early childhood are discussed by Claire Hughes, *Metacognition and Learning* (2019) and Nancy Perry, *Metacognition and Learning* (2019). This special issue constitutes an important step towards an understanding of the interplay of self-regulation with child and parent characteristics in early childhood.

**Keywords** Self-regulation · Co-regulation · Early childhood

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## Introduction

It is widely acknowledged that the development of self-regulation, meaning "the ability of controlling or directing one's attention, thoughts, emotions, and actions" (McClelland and Cameron 2012, p. 136), represents one of the hallmarks in early childhood. Self-regulatory abilities evolve early in life and improve rapidly during toddlerhood and preschool, with progress observable even beyond adolescence (Best and Miller 2010; Carlson 2005; Garon et al. 2008; Hendry et al. 2016; Hughes 2011; Kloo and Sodian 2017; Kochanska et al. 2000). There is a general consensus that self-regulatory and metacognitive skills, among them executive functions, are key requirements for successful problem-solving and adaptation to the environment (Zelazo et al. 1997). They are key predictors for academic achievement, social competences, and adjustment (Eisenberg et al. 2011; Liew 2012; Raaijmakers et al. 2008; Valiente et al. 2013), and even more important than socio-economic status (SES) or IQ in predicting adult's physical health, wealth, life satisfaction, substance dependence, criminal offending outcomes, and parenting of the next generation more than 30 years later (Fergusson et al. 2013; Moffitt et al. 2011; Poulton et al. 2015). Hence, getting a deeper understanding of how these skills emerge and develop, as well as identifying factors that may influence and promote self-regulation development in early childhood, is fundamental.

Researchers who are interested in the development of self-regulation, however, are faced with several challenges. Apart from the diversity of measures (Duckworth and Kern 2011), one of the most demanding is the lack of conceptual clarity. Over the last decades, the development of self-regulation has been studied from a temperamental (*effortful control*; Rothbart 1989), neuropsychological (*executive functions*; Barkley 2001; Diamond 2006, 2013), affective (*emotion regulation*; Gross 2014), and motivational (*self-control*; Baumeister and Vohs 2007) perspective. As a consequence, self-regulation has become an umbrella term, making the consolidation of findings across fields difficult (Nigg 2017). Calls for and attempts to formulate an integrative framework have multiplied in recent years (Bridgett et al. 2013; Diamond 2013; Liew 2012; McClelland and Cameron 2012; Nigg 2017; Welsh and Peterson 2014; Zhou et al. 2012), yet no consensus has been reached.

In addition, while extensive research in the past years has focused on self-regulation, and especially executive functions (EF), in preschoolers aged between three and five years (Garon et al. 2008; Wiebe et al. 2008; Wiebe et al. 2011), still relatively little is known about the development of these skills in infancy and toddlerhood (Garon et al. 2008). One potential reason for this gap in the literature is the relative difficulty of testing infants and toddlers (Hughes and Ensor 2005; Mulder et al. 2014). Children at this young age generally have limited motor and language skills, as well as short attention spans. Hence, self-regulation measures designed for pre-schoolers tend to be too challenging for toddlers. In recent years, there is growing effort in developing age-appropriate self-regulation and EF tasks that allow assessing these skills in infancy and toddlerhood (Mulder et al. 2014; Neale et al. 2018; Pauen and Bechtel-Kuehne 2016).

Among the most commonly applied tasks in this age group are delay of gratification tasks. These require children to refrain from touching a reward in front of them, such as a wrapped gift, snack, or attractive toy, for a limited period of time (Kochanska et al. 1996; Vaughn et al. 1986). There is robust evidence that children successfully manage to delay the reward by two to three years of age (Kochanska et al. 2000; Mulder et al. 2014). In addition, many studies on self-regulation in early childhood rely on parent report, such as the *Early Childhood Behavior Questionnaire* (ECBQ) (Putnam et al. 2006) or the *Behavior Rating Inventory of Executive*

*Functions Preschool Version* (BRIEF-P) (Gioia et al. 2003; Isquith et al. 2004). However, as Toplak et al. (2013) pointed out in a recent review comparing performance-based to rating-based measures of EF, these methods might capture different aspects of self-regulation (i.e., optimal vs. typical performance). Thus, they may provide distinct information on children's regulatory abilities and should be treated complementary rather than interchangeably. This underscores the importance of collecting data using a multi-methodological approach to get a more thorough picture of young children's self-regulatory abilities (Duckworth and Kern 2011). Furthermore, recent research suggests that micro-analytic observation represents a promising approach in order to explore the underlying behaviours and strategies that allow and enhance self-regulation in early childhood (Manfra et al. 2014).

With regard to the factors that contribute and support the development of self-regulation in the early years, it is assumed that children highly depend upon external support to regulate their internal states and behaviours, for instance, parents' or preschool teachers' co-regulation (Bernier et al. 2010; Kopp 1982).

This co-regulation behaviour, respectively parents' or teachers' attempts to modify children's thoughts, behavior or emotions according to the expectations and values of a particular context (Colman et al. 2006; Kurki et al. 2016; Pauen 2016; Volet et al. 2009), allows children to gradually internalize the experienced co-regulatory strategies and to become more and more capable of regulating themselves. Internalization is considered to be the main mechanism that transforms co-regulation into self-regulation (Demetriou 2000).

Research with school aged children shows that parents may effectively support their child's self-regulation by encouraging autonomy, providing an adequate level of challenge and responding contingently to the child's instructional and emotional needs (Pino-Pasternak and Whitebread 2010). However, less is known about the contributions of parenting variables to children's developing self-regulation and EF from infancy to preschool (Fay-Stammbach et al. 2014). In a recent meta-analysis, Valcan et al. (2017) systematically analysed the role of positive (i.e., responsivity, sensitivity), negative (i.e., intrusiveness, control), and cognitive (i.e., scaffolding, cognitive stimulation) parental behaviours in the development of EF in children aged 0 to 8 years. The authors found significant associations in the expected direction: while positive and cognitive parental behaviours predicted better EF, negative parenting practices were associated with lower EF. Notably, associations between cognitive parental behaviours and EF were significantly moderated by child age, with a stronger effect size in young children.

Early childhood thus represents a critical period during which parenting practices seem especially influential. Although research in this field has advanced over the last decade (Fay-Stammbach et al. 2014; Hughes 2011; Hughes and Devine 2019; Valcan et al. 2017), many questions remain unanswered. For instance, little is known on how consistent parents' support is across context and time, or how parental beliefs shape the interplay of co- and self-regulation.

In addition, it is of major interest how children's own characteristics contribute to individual differences in their self-regulation development. Besides biological risk factors, like preterm birth (Brydges et al. 2018; Mulder et al. 2009), school aged children's motivational beliefs, for instance, whether they believe that human attributes are stable or malleable, and whether they show a mastery or performance orientation, have been shown to play an important role in their self-regulation development and achievement (Dweck 2006). Whether and how these beliefs interact with and influence kindergarten children's self-regulation, however, has not been studied yet.

In order to answer these open questions, the development of self-regulation and EF in early childhood needs to be studied more thoroughly. A special emphasis should be put on infancy and the toddler and preschool years (Johansson et al. 2016), as well as environmental influences, such as parenting practices.

## The contribution of this special issue for the study of self-regulation in early childhood

This special issue addresses important questions regarding the assessment and development of self-regulation, as well as influencing factors in early childhood (i.e. from infancy to preschool):

(1) How can self-regulation be assessed in early childhood?
(2) How can parents support the development of self-regulation at this age?
(3) How do parent and child beliefs contribute to the development of self-regulation in young children?

Focusing on the first major question, Mulder et al. (2019) investigate how two- and three-year-old children manage to exert self-control. Precisely, they explore the dynamics of self-control strategies during delay of gratification using a newly developed micro-analytic coding scheme. Their findings indicate that the percentage of time that children look away and withhold their hands from the reward positively predicts task success. The authors interpret this as a sign for strategic behaviour present already in toddlerhood. They further show that teacher-rated (but not parent-rated) self-control relates to both the timing and co-occurrence of these behaviours.

Neale and Whitebread (2019) put a special emphasis on the second major question by analysing the stability of maternal scaffolding across toys and time with 12 to 24 month old infants and its relation to effortful control (delay of gratification tasks) at 24 months. Applying a micro-genetic, utterance-by-utterance coding approach, the authors distinguish three features of maternal scaffolding: propensity to scaffold, directiveness, and contingency. Their findings indicate stability over time and/or across toys for parents' propensity to scaffold and their contingency, but little evidence of consistency in parents' directiveness. In addition, maternal contingency at 12 months predicts child effortful control at 24 months.

Gärtner et al. (2018)[1] contribute especially to the second and third question with their work on the relation of parents' self-efficacy beliefs and co-regulation behaviour to child inhibitory control in two-year-old toddlers. In their study, children between 24 to 36 months participate. Parents report on their positive and negative co-regulation behaviours, as well as their domain-specific and domain-general self-efficacy beliefs using questionnaires. Child inhibitory control is assessed six weeks later with a delay of gratification task as well as the BRIEF-P inhibition scale (parent rating). Results of multiple linear regression analyses reveal that parents' negative (but not positive) co-regulation behaviours and domain-specific (but not domain-general) self-efficacy beliefs predict child inhibitory control (parent report) six weeks later. A mediation analysis indicates no indirect effect from parents' domain-specific self-efficacy to child inhibitory control via parents' negative co-regulation behaviour, but independent direct effects.

[1] Although part of the special issue, this paper has accidentally been published in Metacognition and Learning, 13(3), 2018. Therefore, an extended summary is included in this section.

No effects are found for the observation data of child inhibitory control (delay of gratification task), possibly due to a ceiling effect.

Gärtner et al. (2018) conclude that investigating the role of parenting beliefs, such as self-efficacy, may contribute further to the understanding of how parents effect children's development of self-regulation. To identify mechanisms and factors that underlie and influence the interplay of parenting variables and child self-regulation is a key requisite in order to plan and design interventions that promote young children's self-regulation development at an early stage.

The third question of this special issue is also targeted by Compagnoni et al. (2019). The authors report on the validation of a self-report instrument for assessing mindsets (i.e., trait beliefs and goal orientations) in kindergartners (five to seven years of age), and its relation to self-regulation measures (Head-Toes-Knees-Shoulder-task and teacher report). Their findings suggest that children's trait beliefs and goal orientations represent two different but related beliefs that show differential effects on children's EF and classroom behavioural self-regulation.

Claire Hughes (2019) and Nancy Perry (2019) discuss in their commentaries the commonalities and differences among the four papers, focusing on conceptual and measurement issues, as well as their empirical and theoretical contributions to the rising field of self-regulation research in early childhood.

Table 1 outlines the main aspects of the empirical contributions in this special issue. With regard to the assessment of self-regulation in early childhood (question 1), three papers apply a delay of gratification paradigm in order to measure child self-regulation in toddlerhood. It could be argued that this only captures a limited aspect of children's self-regulation. However, in most of the reported studies in this special issue, behavioural observations were combined with parent and/or teacher report in order to gain a broader and more valid picture of young children's self-regulatory skills (Duckworth and Kern 2011; Toplak et al. 2013). In addition, in Mulder et al.' (2019) study, the authors developed and applied a micro-analytic coding scheme to further investigate the temporal and sequential characteristics and dynamics of children's behaviour during these delay of gratification tasks. Hence, combining behavioural observation with parent or teacher report, as well as including macro- and micro-level coding and analyses, provides a promising venue for the study of self-regulation in early childhood.

Neale and Whitebread (2019) and Gärtner et al. (2018) put a special emphasis on parents' co-regulation practices and how these relate to toddler's self-regulation (question 2). In order to analyse parents' scaffolding behaviour in detail, Neale and Whitebread (2019) adapt a micro-genetic approach. These fine-grain analyses provide important information on the consistency of parental support and the findings highlight the role of parents' contingent behaviour for toddlers' self-regulation development. Micro-analytic coding thus constitutes a promising venue and may advance our understanding of the processes and dynamics that underlie co- and self-regulation in early childhood.

As Compagnoni et al. (2019) and Gärtner et al. (2018) show, child and parent beliefs are significantly related to child self-regulation (question 3). Although the findings do not allow causal inferences due to the predominantly cross-sectional designs of the two studies, promoting favourable beliefs in parents and children may nevertheless be important to foster self-regulation development at an early stage.

To conclude, this special issue gives new insights into the development and assessment of self- and co-regulation in early childhood by (1) building on cross-sectional and longitudinal research, (2) taking into account multiple perspectives (e.g. child, parent, preschool teachers),

**Table 1** Overview of the main aspects of the studies in this special issue

| Paper | Sample | Questions addressed | Study Variables | Methods | Findings |
|---|---|---|---|---|---|
| Mulder et al. | 62 children (child age: 24–43 months) | How does the occurrence of children's visual attention, verbal, and motor behaviours predict DoG task success? | Self-control<br>Visual attention, verbal, and motor behaviours | Observation data, parent and teacher report, micro-level coding<br>*Measures:*<br>DoG (snack and gift delay)<br>ECBQ (parent and teacher report) | • The percentage of time that children look away and withhold their hands from the reward positively predicts task success (evidence for strategic behaviour)<br>• Teacher-rated (but not parent-rated) self-control relates to both the timing and co-occurrence of these behaviours |
| Neale & Whitebread | 36 mother-child dyads (assessed at child age: 12, 18, 24 months) | How consistent are features of maternal scaffolding across toys and over time?<br>How do these predict children's effortful control at 24 months? | Effortful control<br>Scaffolding (propensity to scaffold, contingency, directiveness) | Observation data, micro-level coding of maternal scaffolding and child task performance<br>*Measures:*<br>Grasping task<br>DoG (snack and gift delay)<br>Dyadic play (ring toy, stacking cups) | • Consistency over time and/or across toys for parents' propensity to scaffold and their contingency, no consistency in parents' directiveness.<br>• Maternal contingency at 12 months predicts child effortful control at 24 months. |
| Gärtner et al. | 90 parent-child dyads (child age: 24–35 months; 86.5% mothers) | How do parents' co-regulation behaviors and self-efficacy beliefs predict child inhibitory control? | Inhibitory control<br>Positive and negative co-regulation<br>Parental self-efficacy | Observation data, parent report<br>*Measures:*<br>DoG (snack delay)<br>BRIEF-P Inhibition Scale<br>IMMA 1–6 (parent report)<br>Self-efficacy scales (parent report) | • Parents' negative co-regulation and domain-specific self-efficacy predict child inhibitory control (parent-report)<br>• No indirect effect from parents' domain-specific self-efficacy on child inhibitory control via parents' negative co-regulation. |
| Compagnoni et al. | 147 children (range: 5–7 years) | Do children's trait beliefs and goal orientations have differing relations with executive functions and behavioural self-regulation? | Executive functions, behavioural self-regulation<br>Belief mindsets (goal orientation and trait beliefs)<br>Verbal and maths achievement | Observation data, self-report, teacher report<br>*Measures:*<br>Head-toes-knees-shoulder task<br>Child behavior rating scale (teacher report)<br>Berkeley Puppet Interview (self-report)<br>Achievement scores (verbal and maths) | • Differential effects of children's trait beliefs and goal orientations on their executive functions and behavioural self-regulation<br>• Children's trait beliefs and goal orientations relate to achievement via executive functions and behavioral self-regulation as mediators. |

*DoG* Delay of gratification, *ECBQ* Early Childhood Behavior Questionnaire, *BRIEF-P* Behavior Rating Inventory of Executive Functions Preschool Version

(3) and combining different conceptual and methodological approaches for studying the development of self-regulation and the interplay with co-regulation. As such, this special issue adds to the rising field of self-regulation research in early childhood and constitutes an important step towards an understanding of the interplay of self-regulation with child and parent characteristics in early childhood. Theoretical and practical implications regarding conceptual and methodological issues as well as opportunities to foster self- and co-regulation are discussed with a focus on early childhood.

## Compliance with ethical standards

**Disclosure of potential conflicts of interests** The authors declare that they have no conflict of interest.

**Research involving human participants and/ or animals** This paper does not contain any studies with human participants or animals performed by any of the authors.

**Informed consent** Since this paper does not contain any studies with human participants or animals, no informed consent was required.

## References


Barkley, R. A. (2001). The executive functions and self-regulation: An evolutionary neuropsychological perspective. *Neuropsychology Review, 11*(1), 1–29. https://doi.org/10.1023/a:1009085417776.

Baumeister, R. F., & Vohs, K. D. (2007). Self-regulation, ego depletion, and motivation. *Social and Personality Psychology Compass, 1*(1), 115–128. https://doi.org/10.1111/j.1751-9004.2007.00001.x.

Bernier, A., Carlson, S. M., & Whipple, N. (2010). From external regulation to self-regulation: Early parenting precursors of young children's executive functioning. *Child Development, 81*(1), 326–339. https://doi.org/10.1111/j.1467-8624.2009.01397.x.

Best, J. R., & Miller, P. H. (2010). A developmental perspective on executive function. *Child Development, 81*(6), 1641–1660. https://doi.org/10.1111/j.1467-8624.2010.01499.x.

Bridgett, D. J., Oddi, K. B., Laake, L. M., Murdock, K. W., & Bachmann, M. N. (2013). Integrating and differentiating aspects of self-regulation: Effortful control, executive functioning, and links to negative affectivity. *Emotion, 13*(1), 47. https://doi.org/10.1037/a0029536.

Brydges, C. R., Landes, J. K., Reid, C. L., Campbell, C., French, N., & Anderson, M. (2018). Cognitive outcomes in children and adolescents born very preterm: A meta-analysis. *Developmental Medicine and Child Neurology, 60*(5), 452–468. https://doi.org/10.1111/dmcn.13685.

Carlson, S. M. (2005). Developmentally sensitive measures of executive function in preschool children. *Developmental Neuropsychology, 28*(2), 595–616. https://doi.org/10.1207/s15326942dn2802_3.

Colman, R. A., Hardy, S. A., Albert, M., Raffaelli, M., & Crockett, L. (2006). Early predictors of self-regulation in middle childhood. *Infant and Child Development, 15*(4), 421–437. https://doi.org/10.1002/icd.469.

Compagnoni, M., Karlen, Y., & Maag Merki, K. (2019). Play it safe or play to learn: Mindsets and behavioral self-regulation in kindergarten. *Metacognition and Learning*. https://doi.org/10.1007/s11409-019-09190-y.

Demetriou, A. (2000). Organization and development of self-understanding and self-regulation: Toward a general theory. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 209-251). San Diego: Elsevier Academic Press.

Diamond, A. (2006). The early development of executive functions. In E. Bialystok & F. I. M. Craik (Eds.), *Lifespan cognition: Mechanisms of change* (pp. 70–95). Oxford: Oxford University Press.

Diamond, A. (2013). Executive functions. *Annual Review of Psychology, 64*(1), 135–168. https://doi.org/10.1146/annurev-psych-113011-143750.

Duckworth, A. L., & Kern, M. L. (2011). A meta-analysis of the convergent validity of self-control measures. *Journal of Research in Personality, 45*(3), 259–268. https://doi.org/10.1016/j.jrp.2011.02.004.

Dweck, C. (2006). *Mindset: The new psychology of success* (1st ed.). New York: Random House.

Eisenberg, N., Smith, C. L., & Spinrad, T. L. (2011). Effortful control – relations with emotion regulation, adjustment, and socialization in childhood. In K. D. Vohs & R. F. Baumeister (Eds.), *Handbook of self-regulation* (pp. 263–283). New York: Guilford Press.

Fay-Stammbach, T., Hawes, D. J., & Meredith, P. (2014). Parenting influences on executive function in early childhood: A review. *Child Development Perspectives, 8*(4), 258–264. https://doi.org/10.1111/cdep.12095.

Fergusson, D. M., Boden, J. M., & Horwood, L. J. (2013). Childhood self-control and adult outcomes: Results from a 30-year longitudinal study. *Journal of the American Academy of Child & Adolescent Psychiatry, 52*(7), 709–717.e1. https://doi.org/10.1016/j.jaac.2013.04.008.

Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: A review using an integrative framework. *Psychological Bulletin, 134*(1), 31–60. https://doi.org/10.1037/0033-2909.134.1.31.

Gärtner, K. A., Vetter, V. C., Schäferling, M., Reuner, G., & Hertel, S. (2018). Inhibitory control in toddlerhood – The role of parental co-regulation and self-efficacy beliefs. *Metacognition and Learning, 13*(3), 241–264. https://doi.org/10.1007/s11409-018-9184-7.

Gioia, G. A., Espy, K. A., & Isquith, P. K. (2003). *BRIEF-P: Behavior rating inventory of executive function - preschool version: Professional manual*. Lutz: Psychological Assessment Resources.

Gross, J. J. (2014). Emotion regulation: Conceptual and empirical foundations. In J. J. Gross (Ed.), *Handbook of emotion regulation* (Vol. 2, 2nd ed., pp. 3–20). New York: Guilford Press.

Hendry, A., Jones, E. J. H., & Charman, T. (2016). Executive function in the first three years of life: Precursors, predictors and patterns. *Developmental Review, 42*, 1–33. https://doi.org/10.1016/j.dr.2016.06.005.

Hughes, C. (2011). Changes and challenges in 20 years of research into the development of executive functions. *Infant and Child Development, 20*(3), 251–271. https://doi.org/10.1002/icd.736.

Hughes, C. (2019). How do parents guide children towards 'playing to learn'? Reflections on four studies in a special issue on self- and co-regulation in early childhood. *Metacognition and Learning* (this issue).

Hughes, C., & Devine, R. T. (2019). For better or for worse? Positive and vegative parental influences on young children's executive function. *Child Development, 90*, 593–609. https://doi.org/10.1111/cdev.12915.

Hughes, C., & Ensor, R. (2005). Executive function and theory of mind in 2 year olds: A family affair? *Developmental Neuropsychology, 28*(2), 645–668. https://doi.org/10.1207/s15326942dn2802_5.

Isquith, P. K., Gioia, G. A., & Espy, K. A. (2004). Executive function in preschool children: Examination through everyday behavior. *Developmental Neuropsychology, 26*(1), 403–422. https://doi.org/10.1207/s15326942dn2601_3.

Johansson, M., Marciszko, C., Brocki, K., & Bohlin, G. (2016). Individual differences in early executive functions: A longitudinal study from 12 to 36 months. *Infant and Child Development, 25*(6), 533–549. https://doi.org/10.1002/icd.1952.

Kloo, D., & Sodian, B. (2017). The developmental stability of inhibition from 2 to 5 years. *British Journal of Developmental Psychology, 35*, 582–595. https://doi.org/10.1111/bjdp.12197.

Kochanska, G., Murray, K. T., Jacques, T. Y., Koenig, A. L., & Vandegeest, K. A. (1996). Inhibitory control in young children and its role in emerging internalization. *Child Development, 67*(2), 490–507. https://doi.org/10.2307/1131828.

Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology, 36*(2), 220–232. https://doi.org/10.1037/0012-1649.36.2.220.

Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology, 18*(2), 199–214. https://doi.org/10.1037/0012-1649.18.2.199.

Kurki, K., Järvenoja, H., Järvelä, S., & Mykkänen, A. (2016). How teachers co-regulate children's emotions and behaviour in socio-emotionally challenging situations in day-care settings. *International Journal of Educational Research, 76*, 76–88. https://doi.org/10.1016/j.ijer.2016.02.002.

Liew, J. (2012). Effortful control, executive functions, and education: Bringing self-regulatory and social-emotional competencies to the table. *Child Development Perspectives, 6*(2), 105–111. https://doi.org/10.1111/j.1750-8606.2011.00196.x.

Manfra, L., Davis, K. D., Ducenne, L., & Winsler, A. (2014). Preschoolers' motor and verbal self-control strategies during a resistance-to-temptation task. *The Journal of Genetic Psychology, 175*(4), 332–345. https://doi.org/10.1080/00221325.2014.917067.

McClelland, M. M., & Cameron, C. E. (2012). Self-regulation in early childhood: Improving conceptual clarity and developing ecologically valid measures. *Child Development Perspectives, 6*(2), 136–142. https://doi.org/10.1111/j.1750-8606.2011.00191.x.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., et al. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences, 108*(7), 2693–2698. https://doi.org/10.1073/pnas.1010076108.

Mulder, H., Pitchford, N. J., Hagger, M. S., & Marlow, N. (2009). Development of executive function and attention in preterm children: A systematic review. *Developmental Neuropsychology, 34*(4), 393–421. https://doi.org/10.1080/87565640902964524.

Mulder, H., Hoofs, H., Verhagen, J., van der Veen, I., & Leseman, P. P. M. (2014). Psychometric properties and convergent and predictive validity of an executive function test battery for two-year-olds. *Frontiers in Psychology, 5*(733). https://doi.org/10.3389/fpsyg.2014.00733.

Mulder, H., van Ravenswaaij, H., Verhagen, J., Moerbeek, M., & Leseman, P. P. M. (2019). The process of early self-control: An observational study in two- and three-year-olds. *Metacognition and Learning*. https://doi.org/10.1007/s11409-019-09199-3.

Neale, D., & Whitebread, D. (2019). Maternal scaffolding during play with 12- to 24-month-old infants: Stability over time and relations with emerging effortful control. *Metacognition and Learning*. https://doi.org/10.1007/s11409-019-09196-6.

Neale, D., Basilio, M., & Whitebread, D. (2018). The grasping task: A 12-month predictor of 24-month delay task performance and BRIEF-P inhibition scores. *Infant and Child Development*, e2092. https://doi.org/10.1002/icd.2092.

Nigg, J. T. (2017). Annual research review: On the relations among self-regulation, self-control, executive functioning, effortful control, cognitive control, impulsivity, risk-taking, and inhibition for developmental psychopathology. *Journal of Child Psychology and Psychiatry, 58*(4), 361–383. https://doi.org/10.1111/jcpp.12675.

Pauen, S. (2016). Understanding early development of self-regulation and co-regulation: EDOS and PROSECO. *Journal of Self-Regulation and Regulation, 2*, 2–16. https://doi.org/10.11588/josar.2016.2.34350.

Pauen, S., & Bechtel-Kuehne, S. (2016). How toddlers acquire and transfer tool knowledge: Developmental changes and the role of executive functions. *Child Development, 87*(4), 1233–1249. https://doi.org/10.1111/cdev.12532.

Perry, N. (2019). Recognizing early childhood as a critical time for developing and supporting self-regulation. *Metacognition and Learning* (this issue).

Pino-Pasternak, D., & Whitebread, D. (2010). The role of parenting in children's self-regulated learning. *Educational Research Review, 5*(3), 220–242. https://doi.org/10.1016/j.edurev.2010.07.001.

Poulton, R., Moffitt, T. E., & Silva, P. A. (2015). The Dunedin Multidisciplinary Health and Development Study: Overview of the first 40 years, with an eye to the future. *Social Psychiatry and Psychiatric Epidemiology, 50*(5), 679–693. https://doi.org/10.1007/s00127-015-1048-8.

Putnam, S. P., Gartstein, M. A., & Rothbart, M. K. (2006). Measurement of fine-grained aspects of toddler temperament: The early childhood behavior questionnaire. *Infant Behavior and Development, 29*(3), 386–401. https://doi.org/10.1016/j.infbeh.2006.01.004.

Raaijmakers, M. A. J., Smidts, D. P., Sergeant, J. A., Maassen, G. H., Posthumus, J. A., van Engeland, H., & Matthys, W. (2008). Executive functions in preschool children with aggressive behavior: Impairments in inhibitory control. *Journal of Abnormal Child Psychology, 36*(7), 1097–1107. https://doi.org/10.1007/s10802-008-9235-7.

Rothbart, M. K. (1989). Temperament in childhood: A framework. In G. A. Kohnstamm, J. E. Bates & M. K. Rothbart (Eds.), *Temperament in childhood* (pp. 59-73). Chichester: Wiley.

Toplak, M. E., West, R. F., & Stanovich, K. E. (2013). Practitioner review: Do performance-based measures and ratings of executive function assess the same construct? *Journal of Child Psychology and Psychiatry, 54*(2), 131–143. https://doi.org/10.1111/jcpp.12001.

Valcan, D. S., Davis, H., & Pino-Pasternak, D. (2017). Parental behaviours predicting early childhood executive functions: A meta-analysis. *Educational Psychology Review*. https://doi.org/10.1007/s10648-017-9411-9.

Valiente, C., Eisenberg, N., Spinrad, T. L., Haugen, R., Thompson, M. S., & Kupfer, A. (2013). Effortful control and impulsivity as concurrent and longitudinal predictors of academic achievement. *The Journal of Early Adolescence, 33*(7), 946–972. https://doi.org/10.1177/0272431613477239.

Vaughn, B. E., Kopp, C. B., Krakow, J. B., Johnson, K., & Schwartz, S. S. (1986). Process analyses of the behavior of very young children in delay tasks. *Developmental Psychology, 22*(6), 752–759. https://doi.org/10.1037/0012-1649.22.6.752.

Volet, S., Summers, M., & Thurman, J. (2009). High-level co-regulation in collaborative learning: How does it emerge and how is it sustained? *Learning and Instruction, 19*(2), 128–143. https://doi.org/10.1016/j.learninstruc.2008.03.001.

Welsh, M., & Peterson, E. (2014). Issues in the conceptualization and assessment of hot executive functions in childhood. *Journal of the International Neuropsychological Society, 20*(2), 152–156. https://doi.org/10.1017/S1355617713001379.

Wiebe, S. A., Espy, K. A., & Charak, D. (2008). Using confirmatory factor analysis to understand executive control in preschool children: I. latent structure. *Developmental Psychology, 44*(2), 575–587. https://doi.org/10.1037/0012-1649.44.2.575.

Wiebe, S. A., Sheffield, T., Nelson, J. M., Clark, C. A. C., Chevalier, N., & Espy, K. A. (2011). The structure of executive function in 3-year-olds. *Journal of Experimental Child Psychology, 108*(3), 436–452. https://doi.org/10.1016/j.jecp.2010.08.008.

Zelazo, P. D., Carter, A., Reznick, J. S., & Frye, D. (1997). Early development of executive function: A problem-solving framework. *Review of General Psychology, 1*(2), 198–226. https://doi.org/10.1037/1089-2680.1.2.198.

Zhou, Q., Chen, S. H., & Main, A. (2012). Commonalities and differences in the research on children's effortful control and executive function: A call for an integrated model of self-regulation. *Child Development Perspectives, 6*(2), 112–121. https://doi.org/10.1111/j.1750-8606.2011.00176.x.