A Systematic Review and Meta-Analysis of Bidirectional Relations Between Parenting and Children's Effortful Control

by

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ABSTRACT

Effortful control (EC), the regulatory component of temperament, has been found to predict various types of developmental outcomes (Eisenberg et al., 2016). Parenting behaviors have been found to predict and be predicted by children's EC. However, existing findings on the magnitude and direction of the relations between parenting behaviors and children's EC are not conclusive. Thus, to help resolve replication crisis and obtain more comprehensive findings from both published and unpublished studies and from diverse populations, I conducted a meta-analysis of the existing literature focusing on the direction of effects and magnitude of the longitudinal relations between parenting behavior and children's EC. In this work, two research questions were addressed: 1) What were the magnitudes of the prediction from parenting behaviors to later children's EC, and of the prediction from children's EC to later parenting behaviors? 2) If heterogeneity existed among relations between parenting behaviors and children's EC, was the variance explained by a) publication status, and b) other moderators, such as sample characteristics, types of EC and parenting behaviors, and aspects of study design? Using 2506 effect sizes from 271 studies, I found significant small to moderate effect sizes for both the overall parent effect and the overall child effect. Further, heterogeneity existed among both the parent and the child effects. Moderators including child age, race and ethnicity, types of parenting behaviors, types of children's EC, method similarity of parenting versus EC, and consistency of informants were found to explain the heterogeneity of parent effects. Moderators including child age, child gender, family structure (i.e., whether the household has two parents), parent gender, types of parenting behaviors, the measurement of EC, method similarity of parenting versus EC, and

consistency of informants were found to explain the heterogeneity of child effects. Based on results of the overall effects, tests of publication bias, and moderation analyses, I provided theoretical and methodological implications and related future directions. Strength, limitations, and implications for intervention studies or practices of the present review were also discussed.

DEDICATION

To my parents, Yinghua and Yuan, who taught me the value of education and scientific research, and always supported me throughout my years of undergraduate and graduate education. Thank you for your love, encouragement, understanding, inspiration, and everything you did for me without asking for anything in return. Always love you!

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INTRODUCTION

Effortful control (EC) refers to a trait-level top-down self-regulation that involves attentional focusing, attentional shifting, inhibition and activation control of behavior, voluntary emotion-related regulation, and basic level cognitive control when it is used for self-regulation (Eisenberg et al., 2016; Nigg, 2017; Rothbart, 2012). EC has been found to predict various types of developmental outcomes, such as higher moral behaviors and academic achievement, and lower behavioral problems (see Eisenberg et al., 2016 for a review). EC begins to emerge at the end of the first year of life (Rothbart et al., 1994), improves significantly during toddlerhood (Posner & Rothbart, 1998), and becomes stable in the mean level in early childhood to adolescence (Eisenberg et al., 2016). Across different developmental periods, EC has often been studied as a mediator in the association between contextual factors such as parenting behavior, home environment, or children's early experience, and children's later development (Lecheile et al., 2020; Pérez-Edgar, 2015; Spinrad et al., 2012).

Based on theoretical reasoning and empirical evidence, parenting behaviors that provide context for children's development are both precursors and consequences of children's EC. In the past two decades, researchers have been increasingly examining the relations between parenting behaviors and children's EC. Whereas researchers generally have thought of parenting behavior as a predictor of children's EC, some researchers have studied child effects or bidirectional relations between children's EC and parenting behavior. "Bidirectional relations" refers to the mutual influence between parents and children. In the present review, specifically, bidirectional relations refer to parenting behaviors' longitudinal prediction to later children's EC (parent effect) and the

longitudinal prediction from children's EC to later parenting behaviors (child effect). However, studies on bidirectional relations have yielded mixed findings. Some parenting behaviors (e.g., maternal sensitivity) were found to be significant predictors of children's later EC in some studies (e.g., Gustafsson et al., 2012) but not others (e.g., Holochwost et al., 2018). Similarly, children's EC longitudinally predicted parenting behaviors (e.g., supportive parenting) in some studies (e.g., Tiberio et al., 2016) but not others (e.g., Hong et al., 2015). Existing findings of the magnitude and direction of the relations between parenting behaviors and children's EC were not conclusive, so a comprehensive systematic review and meta-analysis of this topic is necessary.

Through a systematic review, I sought to identify all relevant published and unpublished studies from different search engines and resources of data to conduct a meta-analytic study that would quantitatively summarize results of all studies in the systematic review (Card, 2015; Higgins & Green, 2011). Meta-analyses have important implications to their related fields of study. First, a meta-analysis is a good solution to deal with replication crisis (Loken & Gelman, 2017); in other words, it is not uncommon for results of an existing study to differ from findings obtained from another group of scholars. Findings in meta-analyses that combine results in different studies on a similar topic would be more persuasive and reliable, especially for longitudinal studies that were included in the present review because longitudinal studies could be more expensive and time-consuming to be replicated than concurrent studies. Second, instead of only using significance testing and only including significant results, meta-analyses emphasize the magnitude of effects synthesized from collected studies and identify heterogeneity of the effects (Cumming, 2013; Gurevitch et al., 2018). Because significant findings are more

likely to be published than non-significant findings, meta-analyses that include both published and unpublished studies and focus on effect sizes could identify and adjust for potential publication bias. Third, compared with findings in empirical studies that recruited participants who were often from the same location or had similar demographic characteristics, findings in a systematic review and meta-analysis that combine different empirical studies with larger and more diverse samples in terms of socioeconomic status, race and ethnicity, gender, nationality, clinical status, and other demographic characteristics are more robust. There could be a deeper and more comprehensive understanding in the field pertaining to how parenting behavior, as a part of the context in children's development, may predict and be predicted by children's EC. Findings could provide more accurate guidance for future directions of studies on parenting, family, and children's socio-emotional development. Scientists also could learn the focuses, gaps, strengths, and limitations in the content and methodology of the existing literature of this topic. The implications of this work for intervention studies on improving parenting and children's EC would also be more persuasive. Parents, teachers, and policymakers who intend to improve parenting, quality of parent-child interactions, and children's developmental outcomes could also find more specific guidance based on the results of a meta-analysis.

Using meta-analytic techniques, in this dissertation, I estimated the average magnitudes of the bidirectional relations between parenting and children’s EC, compared the magnitudes for parent effects and for child effects to see which one was stronger, and tested if any moderators may explain the variance among the relations and mixed findings across different empirical studies. The present review added to previous meta-

analyses that focused on similar topics in several important ways. Some previous meta-analyses have focused on specific parenting practices or indicators, such as parent–child synchrony (Davis et al., 2017) or attachment-security status (Pallini et al., 2018). I broadened the scope of parenting behaviors to all types of parenting behaviors and styles toward children in the present review because I would like to compare the magnitudes of effects for the bidirectional relations of different types of parenting behaviors and children's EC. In addition, among all the existing meta-analyses on parenting and children's self-regulation, Li et al. (2019)'s article was the only one that emphasized bidirectional relations between parenting and children's self-control that included EC. Because Li et al. (2019), who focused only on the adolescent age range (10-22 years), found evidence for both parent and child effects, the current study expanded this work by examining both parent and child effects across infancy and childhood (7 months-10 years).

The goal of the present work was to examine with meta-analyses the bidirectional relations between parenting behaviors and children's EC across the childhood and with a more general focus on different types of parenting behaviors. Specifically, I answered two research questions in this systematic review and meta-analysis: 1) What were the magnitudes of the prediction from parenting behaviors to later children's EC, and of the prediction from children's EC to later parenting behaviors? 2) If heterogeneity existed among relations between parenting behaviors and children's EC, was the variance explained by a) publication status, and b) other moderators, such as sample characteristics, types of EC and parenting behaviors, and aspects of study design?

Effortful Control

EC as a regulatory component of temperament has overlap with top-down (deliberate) self-regulation, which suggests that it is also an intrinsic process, rather than regulation due to external factors. Further, compared with bottom-up (automatic) self-regulation, EC is slower, more capacity-limited, more sequential, and more effortful (Nigg, 2017). Specifically, attention focusing, attention shifting, activational control, inhibitory control, and cognitive flexibility were included as subtypes of EC in the present review. Attention focusing and shifting are two ways of willfully deploying attention to support goal-directed behaviors or meet task demands. Attention focusing refers to maintaining focus on or persistence in an object or event (Belsky et al., 2001), whereas attention shifting means flexibly reallocating attention within one's internal and external environments (Perez-Edgar & Fox, 2005). Activational control refers to the ability to perform an action when people's tendency to avoid it is strong, whereas inhibitory control refers to the ability to suppress inappropriate responses (Zhou et al., 2007). Cognitive flexibility which is a component of executive functioning was also included as a subtype of EC in the present review. Cognitive flexibility refers to the ability of switching between tasks or rules or overcoming inertial tendencies (Davidson et al., 2006).

EC has often been compared with another important regulation skill in children's development, executive functioning, and they have overlaps and differences. Executive functioning is a broad construct, and inhibition, cognitive flexibility, and working memory were the three subtypes of lower-level executive functioning (Diamond, 2013). In this definition, inhibition refers to deliberate withholding dominant or automatic responses (Diamond, 2006), so it is similar to inhibitory control defined above as part of

EC. I decided to include cognitive flexibility as a subtype of EC because the inhibition of a dominant response and the activation of a subdominant response was involved in the switching process. I decided not to include working memory itself (i.e., composite or latent score of executive functioning that included working memory was included) as a subtype of EC because EC is defined as a temperamental self-regulation (Rothbart & Bates, 2006), but working memory is generally not viewed as an aspect of temperament. Instead, working memory that includes the ability to mentally manipulate the information for complex cognitive tasks (Baddeley, 1992) is also more distal and more general in cognition (Eisenberg, 2017). Besides working memory, another difference between EC and executive functioning is that EC includes both emotion-laden contexts seen as a hot system of self-regulation and emotionally neutral contexts seen as a cool system with more cognitive processing, whereas executive functioning is focused mostly on the cool system of self-regulation (Zhou et al., 2012).

EC appears to have both neurological bases and physiological underpinnings. For neurological bases, both the dorsal and ventral parts of the anterior cingulate cortex (ACC) are involved in EC processes, including the regulation of conflict in cognitive tasks (dorsal part) and emotional regulation (ventral part) (Posner et al., 2014). In addition, the executive attention network includes the underlying striatum and adjacent areas of the mid-prefrontal cortex, and in switching between tasks, evidence showed that the anterior insula is involved (Supekar & Menon, 2012). Vagal tone measured as the amplitude of respiratory sinus arrhythmia (RSA) and RSA suppression in response to evocative stimuli and events are the physiological underpinnings of EC (Calkins & Keane, 2004; Porges et al., 1996). RSA augment would occur when people intend to

maintain their internal equilibrium and engagement, while RSA suppression would occur when people respond to threat or challenge (Porges, 2007). Besides RSA, event-related potentials (ERPs) were used to examine neural mechanisms underlying EC (Rawls et al., 2018). Even though RSA, RSA suppression, and different ERP components have been associated with EC, I decided not to include studies that only had physiological forms of EC in the meta-analysis because the relations between these physiological measures and children's EC are not consistent and may be particularly dependent on the context (i.e., challenging or emotion-eliciting contexts versus baseline). Besides linear relations, researchers have found null results and quadratic relations between RSA reactivity and EC (e.g., Blair & Peters, 2003; Marcovitch et al., 2010; Staton et al., 2009).

Despite the biological basis, EC is not evident at birth. In fact, EC begins to emerge and mature during the late period of the first year of life (Rothbart et al., 1994). Infants show that the scalp activity arise in the anterior cingulate at seven months, indicating their ability of executive attention and error detection (Berger et al., 2006; Wynn, 1992). Thus, I decided that the earliest assessment time of children's EC would be seven months. Infants are able to reach for a target by 12 months of age, indicating the ability to control and coordinate reach and vision (Diamond, 1991). The development of EC continues to improve throughout toddlerhood, with marked improvement in selective/executive attention over second and third years of life (Jones et al., 2003; Rothbart & Posner, 2006). For example, in one study, children's accuracy in performance of a Stroop task, which involves conflict and is often used to study executive attention, showed significant improvement by 30 months and continued to improve between 36 to 38 months (Gerardi-Caulton, 2000). Similarly, children's other subtypes of EC improved

significantly from 22 to 33 months (Kochanska et al., 2000) and from 36 to 48 months (Posner & Rothbart, 1998). Children's ability to resolve conflict between stimuli improved rapidly from age two to five years, and continued to improve until it reached adults' level at seven years (Rueda et al., 2004). From preschool years, researchers found individual differences in children's EC became more stable as children grew older (Kochanksa & Knaack, 2003; Zhou et al., 2009), but the stability may also depend on measurement of EC. For example, adult-rated attention focusing was stable in the group mean level from five to 10 years, whereas the observed attention and behavioral persistence continued to show changes in different directions during this age period (Zhou et al., 2007). During adolescence, studies of EC focus more on its mediating or moderating role in behaviors that are developing during this period. These behaviors are more specific and complex, and EC as a context-free tool could help us understand these behaviors (Pérez-Edgar, 2015). However, in the present review, I examined the bidirectional relations between parenting, which is an important aspect of children's developmental context, and EC, so I was more interested in EC as a developmental outcome rather than a context-free tool. Li et al. (2019) found both parent-driven and child-driven effects in the relation between parenting behaviors and adolescents' self-control, which included EC, suggesting that the variance of adolescents' EC could still be explained by earlier parenting behaviors. Thus, I decided to exclude adolescents in the present study to avoid overlapping with Li et al. (2019)'s investigation and to focus on a period of development in which EC emerges and shows rapid growth.

Numerous researchers have demonstrated that EC plays an important role in different types of developmental outcomes. EC has been positively related to the

development of conscience (e.g., Kochanksa & Knaack, 2003), empathy and prosocial behavior (e.g., Eisenberg et al., 2007), compliance (Spinrad et al., 2012), social competence (See Eisenberg et al., 2010 for a review), and academic achievement (e.g., Blair & Razza, 2007), and has been negatively related to externalizing behavior (e.g., Gartstein & Fagot, 2003), internalizing behavior (e.g., Sportel et al., 2011), and antisocial-aggressive behaviors (e.g., Wang et al., 2015). Children's EC also was found to mediate the relation between parenting and children's developmental outcomes, such as behavioral problems and committed compliance (e.g., Spinrad et al., 2012; Zhou et al., 2004). However, compared with the prediction from EC to later developmental outcomes, less is known about its developmental precursors. Among the precursors of EC, parenting styles and behaviors have been widely studied.

Longitudinal Associations between Parenting Behaviors and Children's EC

The Relation of Parenting Behaviors to Children's EC

Although temperament that includes aspects of EC is considered hereditary and dispositional, context and environment play important roles in shaping temperamental experiences and expressions (Rothbart & Bates, 2006). In the present review, in particular, I focused on the role of parenting behavior on children's EC. Parents' own EC and parents' own characteristics (e.g., other aspects of parents' temperament and regulation, and parents' personality), parent-child relationship and attachment, and parenting behaviors toward children could be all regarded as aspects of the family environment that helps to shape children's EC. However, parenting behaviors are likely more directly related to children's EC with less complex mechanisms in between than other aspects of the family environment. Further, studying parenting behaviors rather

than parents' own characteristics are less likely to be explained hereditarily compared with the potential for intergenerational transmission from parents' EC to children's EC. The quality of parent-child relationship or attachment security is a relationship variable rather than a parenting variable per se. In fact, attachment has been seen as an outcome (Leerkes et al., 2011) or a context (Li et al., 2019) of parenting behaviors rather than reflecting parenting behaviors. Thus, in the present review, I only focused on the prediction of parenting behaviors toward children, rather than parents' own characteristics, parents' attitudes about parenting behavior, or parent-child relationships to children's EC.

In the present review, parenting behaviors could be self-reported or reported by others, as long as they were "behaviors" rather than attitudes about behaviors. Further, parenting behaviors could be divided into affirmative and sensitive parenting versus suppressing/permissive parenting. Affirmative parenting behaviors mainly include parents' positive control and warmth, such as parental warmth, sensitivity, monitoring, supervision, consistent discipline, positive control, support, and authoritative parenting. On the other hand, suppressing/permissive parenting behaviors mainly includes parents' negative control and hostility, such as harsh parenting, inconsistent discipline, harsh control, coercive punishment, authoritarian parenting, and permissive parenting (Darling & Steinberg, 1993; O'Connor, 2002). Permissive parenting does not include negative control and hostility, and its nature of under-controlling behavior could even be the opposite from other types of suppressing parenting behaviors, which are overcontrolling behaviors. However, it is still a type of inadequate parenting or nonconstructive control, rather than affirmative parenting, so I decided to include it in the same group with other

suppressing parenting behaviors and name it "suppressing/permissive" parenting. I avoided using terms like supportive and non-supportive parenting behaviors due to recent evidence that parents' behaviors may relate to children's outcomes in different ways for families with different races and ethnicities or different social and cultural backgrounds (Dunbar et al., 2021, Dunbar et al., in press; Thomas & Blackmon, 2015).

According to the seminal piece on the socialization of children's emotions (see Eisenberg et al., 1998a, 1998b), there are a variety of ways that parents can contribute to their children's regulatory skills. In this model, emotion-related parenting practices (e.g., parents' expressions of emotions, responses to children's emotions, and discussions of emotions) could both directly predict children's regulation or indirectly through the children's arousal. Eisenberg (2020) recently adapted the original model about the process of socializers teaching children about emotions and emotion management. When parents appropriately respond to children's emotions, children may learn in interactions with parents about emotional experiences and when emotions can be regulated. During emotion-related socialization practices, parents could model how to respond to stress, validate their children's feelings, and provide direct instructions. However, if parents' responses to children's emotions are inappropriate, children may learn in interactions with parents about ineffective strategies. In such interactions, parents could invalidate their children's feelings, react negatively to stress themselves, and/or provide maladaptive direct instructions. Consistent with these ideas, parents' positive expressivity, their use of strategies that facilitate emotion regulation, their encouragement of children's expression of emotion, and their discussion of emotion with children have been found to positively predict children's EC and other regulatory skills (e.g., Blair et

al., 2014; Cui et al., 2020; Curtis et al., 2020; Davidov & Grusec, 2006; Godleski et al., 2020; Lengua, 2008; Perry et al., 2020; Spinrad et al., 2007; Valiente et al., 2007; Yap et al., 2008). On the other hand, parents' minimizing their children's emotions, their punitive and dismissing responses to children's emotions, and their negative emotions have been found to negatively predict children's regulation (e.g., Blair et al., 2014; Lunkenheimer et al., 2007; Perry et al., 2020). Using this theoretical framework, researchers have found the positive prediction from parental warmth and negative predictions from harsh and intrusive parenting to later children's EC or self-control (Eisenberg et al., 2005; Meldrum et al., 2018; Taylor et al., 2013; Wang & Qi, 2017). Thus, different types of parenting behaviors toward children could predict children's EC.

In addition, social learning theory and attachment theory could also be used to explain how parenting behaviors may predict children's EC. According to social learning theory (Bandura & Walters, 1963), parenting behaviors could directly predict children's EC because children learn EC skills by observing and imitating the most relevant models. Parents' regulation process in their socialization with children could serve as opportunities for children to directly model their parents' own EC (Cumberland-Li et al., 2003). Previous studies showed that parental support and responsiveness (e.g., sensitivity, acceptance, warmth, cognitive assistance, and children's attachment security) were positively related to the emergence of EC in toddlerhood and its further development (Lengua et al., 2007; Lunkenheimer et al., 2008; Viddal et al., 2015). Harsh parental control, authoritarian parenting style, parental power assertion, parents' negative reactions to children's emotions, and intrusive parenting were negatively related to children's EC in toddlerhood and late childhood (Calkins, 1994; Kochanska et al., 2008;

Swanson et al., 2014; Taylor et al., 2013). These findings suggest that in parent-child interactions, children could observe and internalize supportive parenting behaviors which may help them develop EC skills. Children could also observe and internalize non-supportive parenting behaviors which may help them develop maladaptive regulation skills and weaken EC ability.

According to attachment theory, secure attachment relationships between parents and children could provide a safe relational context for children to learn top-down self-regulation (Thompson, 2015). Empirical studies also showed that children's attachment security was positively related to children's later EC (e.g., Nordling, et al., 2016; Viddal et al., 2015), and children's attachment insecurity like attachment avoidance was negatively related to EC (Heylen et al., 2017). According to a recent meta-analysis, compared with avoidant children, securely attached children were modestly higher in EC (Pallini et al., 2018). Affirmative parenting behaviors play important roles in creating and keeping the secure attachment relationships between parents and children. For example, sensitive and responsive parenting behaviors toward children predicted later attachment security (McElwain & Booth-LaForce, 2006). In addition, in a meta-analysis, De Wolff and van IJzendoorn (1997) found parental sensitivity to be an important condition of attachment security in stable and non-stressful settings. On the other hand, suppressing/ permissive parenting behaviors predicted insecure attachment relationships between parents and children. For example, maternal punitive and minimizing responses to infants' distress predicted children's attachment avoidance (Leerkes et al., 2011). Further, compared with insecurely attached children, mothers of securely attached children engaged more and higher-quality teaching children skills including self-regulation (e.g.,

Raikes & Thompson, 2008; West et al., 2013). Thus, parenting behaviors and parent-child attachment could predict each other, and their dynamic relations and development could be related to changes in children's EC skills.

Although many previous findings suggested that higher supportive parenting and lower non-supportive parenting would predict children's higher EC, some studies showed non-significant predictions (or as noted earlier, findings may differ for racially diverse families). Thus, it is useful to conduct a meta-analysis of parenting behaviors' prediction to children's EC to obtain a better understanding of the factors and contexts that could influence the predictions.

The Relation of Children's EC to Parenting Behaviors

The relations between parenting behavior and EC could be bidirectional. Although the default assumption in the field of child development is that parents shape children's development, Bell (1968) formally re-conceptualized socialization as a mutually interactive process and argued that "child effects" were important sources of variance in parent–child social interactions and relationships. Instead of being passive recipients of parenting behaviors, children could be part of the environment for parents in parent-child socialization (Bell, 1981). In addition, in their model of the socialization of emotion, Eisenberg et al. (1998b) argued that any model of socialization should have bidirectional parent-child effects, including the reciprocal relation between emotion-related parenting practices and children's regulation capacities. They explained that in the process of parental socialization's shaping of children's regulation, socialization could also have an effect on children's developing personalities. They also noted that children's

personalities that include temperament are children's pre-existing characteristics that could influence parenting practices (Eisenberg et al., 1998b).

Further, Belsky (1984) argued that child effects were determinants of parenting, such that children's temperament, gender, or health status could elicit different parenting behaviors. A child could be exposed to different parenting behaviors based on parents' perception and reactions to the child's temperament. Besides temperament, children's genetic factors could also affect parenting behaviors (Neiderhiser et al., 1999). Using genotype-environment correlation or data from adoptive children, researchers found that heritable characteristics of adolescents uniquely predicted fathers' and mothers' negative parenting (Ge et al., 1996; Neiderhiser et al., 2004). Because EC is defined as a temperamental self-regulation (Rothbart & Bates, 2006) with hereditary basis (Kim & Kim, 2019), children's EC could be a determinant of parenting behaviors.

In addition, theories that describe family as a system emphasize the bidirectional relations between parents and children. According to family systems theory and Relational Developmental Systems Perspective, systems are active, plastic, and self-organizing, and individual parts within the same system engage in "reciprocal interpenetrating actions" (Overton, 2013, p. 102). Then we could understand family as a system which includes both parents and children as individual parts in the family, and parents and children should still have bidirectional relations with each other. For children's EC, in particular, if children are able to voluntarily control their attention and action, their parents may feel more confident and efficient in assisting children to regulate themselves and adapt to the environment in appropriate ways (Eisenberg & Morris, 2002; Derryberry & Rothbart, 1997), and parents are more likely to trust their children and

respond positively to them (Buyukcan-Tetik et al., 2015). Children who are higher in EC are less impulsive and more socially desirable, so their relationships with parents will also be improved (Meldrum et al., 2012), which may change other parenting behaviors. Previous studies have shown bidirectional relations between children's EC and different parenting behaviors, such as parental support and authoritarian parenting (e.g., Lee et al., 2013; Li et al., 2014). Because Li et al. (2019) found bidirectional relations between parenting and adolescents' self-control in a meta-analysis, I decided to extend the examination of child effects in the relations between parenting behavior and children's EC across infancy to middle childhood. Based on findings in Li et al. (2019)'s study, I predicted that the overall parent effect and child effect in the relations between parenting behavior and children's EC would be small to moderate for the magnitude of the effect.

Potential Moderators

In order to explain inconsistent findings of the relations between parenting behavior and children's EC, I explored a number of potential moderators that might impact the magnitude of the bidirectional relations between parenting behaviors and children's EC. Potential moderators included sample characteristics (e.g., age of child, sex of child, racial/ethnic background, socioeconomic status, sex of parent), types or aspects of EC and parenting (e.g., subtypes of EC, parental warmth, authoritarian parenting), and study design (e.g., measurements of EC and parenting, the gap between assessments, consistency of informants).

Sample Characteristics

As children grow older, they become more independent, and their increased exposure to contexts outside of the family and orientation toward autonomy has led many

theorists to propose that peers, media, and other extra-familial influences may be more influential as socialization agents than parents (Bariola et al., 2011). According to a longitudinal study that examined EC from early childhood to early adolescence, the association between parenting and children's EC decreased as children developed (Tiberio et al., 2016). In children's early development, parenting behaviors may be more strongly predictive of children's behavior, but the direction of effects may be more likely to be transactional as children grow older (Eisenberg et al., 1998a). Thus, in the present review, I examined children's age as a moderator of the magnitude of relations between parenting behaviors and children's EC and computed overall parent effect and child effect during different developmental periods (i.e., infancy, toddlerhood, preschool period, early elementary period, and middle elementary period). I expected that parent-driven effects would decrease whereas child-driven effects would increase as children grew older.

There is also the possibility that child sex moderates the relations between parenting and children's EC. Results regarding sex differences have been mixed. Both empirical and meta-analytical studies showed that girls' EC is generally higher than boys' EC (Else-Quest et al., 2006; Kochanska & Knaack, 2003; Kochanska et al., 2000; Olson et al., 2005). However, in other studies these sex differences were not found (Bjorklund & Kipp, 1996). More importantly, the association between parenting and children's EC was sometimes stronger for girls than for boys (e.g., Mandara & Pikes, 2008), suggesting that girls may be more attune to parents' socialization efforts than boys. However, researchers have also found stronger relations for boys than girls (e.g., Olson et al., 1990). In the present review, to examine if children's sex moderated the relations

between parenting behavior and children's EC, I compared effect sizes for parent effects and child effects between boys and girls.

For diversity of the families, previous studies have shown that the same parenting behavior could have different relations with children's behavior when participants differ in their race, ethnicity, or cultural background. For example, the association between parental monitoring and children's self-control was significant for Swiss, Dutch, and Hungarian adolescents but not for Slovenian or Japanese adolescents (Vazsonyi & Belliston, 2007). However, for both American and Chinese children, authoritative parenting was positively associated with children's self-regulation whereas authoritarian parenting was negatively associated with children's self-regulation, indicating that parenting functioned the same way across these cultures (Zhou et al., 2004). Further, among African American families, parents' use of punitive and minimizing responses to children's emotions has been found to predict more competent behavioral and emotional regulation, but only in contexts when parents validate children's emotions and discuss about racism (Dunbar et al., 2021, Dunbar et al., in press; Thomas & Blackmon, 2015). Thus, the same type of parenting behavior may play similar or different roles in children's EC under different cultural and ethnic backgrounds. In the present review, I examined if participants' racial and ethnic background moderated the relations between parenting behavior and children's EC.

The effects of parenting behaviors were also found to be dependent on families' socioeconomic status (SES). In less advantaged families, children may have fewer alternative resources besides their parents compared with their peers in higher SES homes, and the lack of diverse resources in lower SES families increase both parents'

responsibility and their impact on children (Beyers et al., 2003). Jenkins et al. (2003) found that in higher SES families, the association between children's temperamental difficultness and negative parenting was weaker than the association in lower SES families. In addition, Rochette and Bernier (2014) found that maternal responsiveness predicted better performance of executive functioning among children from lower SES families but not among children from higher SES families. Thus, it was worthwhile to explore whether SES moderated the association between parenting behaviors and children's EC. I predicted that the association would be stronger for lower SES families compared with higher SES families.

Besides SES, other at-risk factors (e.g., mental and physical health problems of either the child or the parent) could moderate the relations between parenting and children's outcomes. For example, the prediction from maternal harshness at children's infancy (seven months) to children's EC at three years was higher for children who were exposed to cocaine during prenatal period compared with children who were not exposed to (Eiden et al., 2015). However, the prediction from mothers' negative affect at children's infancy (12 months) to children's inhibitory control at two years was lower for children with alcoholic fathers compared with children without alcoholic fathers (Eiden et al., 2004). Thus, the same type of parenting behavior's association with children's EC could differ between families with and without at-risk factors. Thus, it was worthwhile to explore whether at-risk factors would moderate the association between parenting behaviors and children's EC.

The relation between parenting behaviors and children's outcomes could be different between families with two parents (intact families) and single-parent families.

For example, parents' psychological control's relation with children's internalizing problems was higher in the intact families compared with the divorce families (Fauber et al., 1990). However, in a study on Latino families, researchers found that perceived parenting behaviors including support, monitoring, punitiveness, and psychological control had stronger relations with children's self-esteem in the intact families than in the single-mother families (Plunkett et al., 2007). Similar to these findings, the association between the same type of parenting behavior and children's EC could differ between the intact families and single-parent families. Thus, I explored whether family structure (whether the household had two parents or not) would moderate the association between parenting behaviors and children's EC.

For parents' sex, although compared with fathers, mothers are more likely to be considered as children's primary caregiver and more widely studied in the fields of parenting, researchers argue that fathers and mothers are both important in children's development (Lamb, 2010). However, the relations between parents' behaviors and children's developmental overcomes could be different between mothers and fathers (e.g., Kawabata et al., 2011). Previous studies that compared the prediction of mothers' and fathers' parenting behaviors to children's outcomes had mixed findings. Researchers found that for the relation between parenting behaviors and children's EC, maternal behavior could have stronger relation than paternal behavior (e.g., Karreman et al., 2008), paternal behavior could have stronger relation than maternal behavior (e.g., Morris & Age, 2009), and no differences could exist between maternal behavior and paternal behavior (e.g., Karreman et al., 2008). In the present review, I compared effect sizes

between studies that included mostly mothers and those that included mostly fathers in the association between parenting behaviors and children's EC.

Types of Parenting Behaviors and Children's EC

Different types of parenting may have different relations with children's EC. For example, Kok et al., (2015) found that maternal sensitivity positively predicted children's EC, whereas maternal positive discipline was unrelated to children's EC. Based on different theories and empirical studies (Buri, 1991; Karreman et al., 2006; Kawabata et al., 2011; Maccoby & Martin, 1983; Pinquart, 2017; Valcan et al., 2018), I categorized all parenting behaviors into the following types: warmth/sensitivity, harshness/rejection, autonomy support, scaffolding/teaching, supervision/involvement, intrusiveness, authoritative parenting (i.e., behaviors with high levels of warmth/sensitivity and positive control), authoritarian parenting (e.g., behaviors with high levels of harshness/rejection and negative control), permissive parenting, and ignoring/neglect.

Similarly, the same type of parenting may have different relations with different types of children's EC. For example, Moilanen et al. (2018) found that mothers' support positively predicted children's emotion regulation but did not predict children's attention focusing. Based on these findings, I decided to compare relations between parenting behaviors and children's EC based on different types of EC and different parenting behaviors. I categorized EC by 1) different subtypes of EC including inhibitory control, activational control, attention focusing and shifting, 2) composite score or latent variable including more than one subtype of EC, and 3) other types of regulation behaviors that EC are involved in including self-regulation, emotion regulation, and executive function.

Study Design

Both EC and parenting have different types of measurement (i.e., questionnaire measures and behavioral measures). For children's EC, questionnaire measures include the TBAQ -Toddler Behavior Assessment Questionnaire (Goldsmith, 1996), ECBQ (early childhood behavior questionnaire) Child Behavior Questionnaire (Rothbart et al., 2001), Early Adolescent Temperament Questionnaire (Capaldi & Rothbart, 1992), and Effortful Control Scale (ECS; Lonigan & Phillips, 2001). Because inhibition and cognitive flexibility, which are subtypes of executive functioning were also included as subtypes of EC, Behavior Rating Inventory of Executive Function (BRIEF; Gioia et al., 2002) and other questionnaires used to measure executive functioning were included as questionnaire measures. Behavioral measures of children's EC included Go／No Go task (e.g., Lonigan & Phillips, 2001), Head-Toes-Knees-Shoulders task (Ponitz et al., 2008), Stroop task (e.g., Ellis et al., 2004), Kochanska's battery (e.g., Walk a Line, Turtle's House, Telephone Poles, Circle, Star, and lowering voice; Kochanska & Knaack, 2003), Puzzle box task (Eisenberg et al., 2001), Delay tasks (e.g., Carlson, 2005; Hunter, 1913), and Shifting or conflict resolution tasks (e.g., Bunge et al., 2002). For parenting behavior, researchers also used questionnaire measures (e.g., Self-Expressiveness in the Family Questionnaire SEFQ; Halberstadt et al., 1995) and behavioral measures (e.g., parent–child interaction system coding scheme; Deater-Deckard et al., 1997) which were observations of parent-child interactions.

Researchers' choices of measures may be associated with findings in the relation between parenting behaviors and children's EC. For example, because people are more likely to be consistent in answering the same questions across different time periods, using questionnaires could increase the variables' stability across times. Thus, in the

present review, I examined if using different types of measures (i.e., questionnaires and behavioral measures) of parenting behaviors and EC would explain the magnitude of relations between parenting behaviors and children's EC. In addition, I also examined if similarity of methods (i.e., both parenting and EC were measured by questionnaires, both parenting and EC were measured by behavioral tasks, or for parenting and EC, one was measured by questionnaires and the other was measured by behavioral tasks) would explain the magnitude of relations between parenting behaviors and children's EC.

The amount of time between measurement occasions is an important factor to consider when researchers plan their research design and modeling strategy because it may be associated with the results of the study (Hertzog & Nesselroade, 2003). If the length of time that elapses between occasions is too short, the effect of the predictor may not be significant to the outcome because longer time of exposure to the predictor may be needed to change the outcome. In addition, if the length of time between measurement occasions is longer than the time needed for outcome's exposure to the predictor, the effect of predictor may decrease as the time increases. In this review, I examined if the relation between parenting behaviors and children's EC would depend on the amount of time between assessments of the two variables. I compared results between studies that differed in the length of time between assessments of parenting behaviors and EC.

For consistency of informants, researchers found that the correlation between two variables were higher when they were assessed by the same informant than when they were assessed by different informants (Willems et al., 2018). In the present review, consistency of informants was examined between studies whose informants of parenting behavior and EC were the same and studies whose informants of the two variables were

different. I predicted that if the informants of parenting behavior and children's EC were the same (e.g., if both were mother-reported), the relation between them would be stronger than if the informants were different (e.g., mother reported parenting behavior, teacher reported EC).

Hypotheses

Based on related theories and findings in similar meta-analyses, I hypothesized that parenting behaviors would predict children's later EC, and children's EC would predict later parenting behaviors. Further, I predicted that the magnitudes of predictions for the overall parent-effect and the overall child-effect would be small to moderate. For publication status, I hypothesized that the magnitude of parent-effect sizes and child-effect sizes would be larger for findings in published studies. In terms of moderators, based on previous literature and theories, I hypothesized that warmth/sensitivity, autonomy support, scaffolding/teaching, supervision/involvement, and authoritative parenting would positively, and harshness/rejection, intrusiveness, authoritarian parenting, permissive parenting, and ignoring/neglect would negatively predict children's later EC. In addition, I hypothesized that children's EC would positively predict later warmth/sensitivity, autonomy support, scaffolding/teaching, supervision/involvement, and authoritative parenting, and negatively predict later harshness/rejection, intrusiveness, authoritarian parenting, permissive parenting, and ignoring/neglect. For other moderators, I hypothesized that the magnitude of parent effect sizes and child effect sizes would be larger when information on parenting behaviors and EC was derived from the same reporter, and when researchers used questionnaires rather than observational tasks for either variable. I hypothesized that parent effect sizes would be smaller and

child effect sizes would be larger as children grew older. I hypothesized that the magnitude of parent-effect sizes would be larger when families were lower in SES.

METHOD

Protocol and Registration

I followed the PRISMA reporting standards for meta-analyses of individual participant data (PRISMA-IPD; Stewart et al., 2015). This study was pre-registered in PROSPERO and Open Science Framework (OSF).

Literature Search

The databases I used were *PsycInfo, Web of Science, ERIC,* and *PubMed* for published articles, and *ProQuest Dissertation & Thesis Global* for dissertations and theses. I used the following search string: (parenting OR "parental behavior" OR "parent behavior" OR "parenting behavior" OR socializ* OR mothering OR fathering OR "mother behavior" OR "father behavior" OR "maternal behavior" OR "paternal behavior") AND ("attentive process" OR "duration of orienting" OR persistence OR delay* OR "effortful control" OR "emotion* regulation" OR self-regulation OR "self regulation" OR inhibit* OR "cognitive flexibility" OR "activation* control" OR dysregulation OR "executive function*" OR "executive control" OR "attention* control" OR "attention* focus*" OR "attention* shift*" OR "behavioral control" OR "behavior* regulation" OR "atten* regulation" OR "atten* control" OR self-control OR “self control”). Because the ranges of disciplines in PubMed and Web of Science were broad, I decided to restrict the keywords to the title and abstract for PubMed and applied additional restrictions in the field of articles for Web of Science. Besides using databases, I also searched through references list of relevant reviews and book chapters. Besides

searching for articles, thesis, and dissertations that have been published online, I emailed 20 researchers who studied parenting and children's self-regulation to ask for additional manuscripts being prepared and conferences presentations that could not be found online. I found the 20 researchers based on the number of publications they had in the area of parenting behavior and children's EC. Among the 20 researchers, four of them responded with studies that met the criteria to be included in the review.

Selection Procedure

Published and unpublished studies were selected using the PRISMA statement on systematic report of data collection (see the flow diagram in Figure 1; Moher et al., 2009). The initial search from different databases, reference lists, and emails from researchers yielded 9417 studies after removing duplicated ones. I downloaded the searching results and uploaded them into Rayyan to decide which articles should be included in the review. Rayyan (http://rayyan.qcri.org) is a free website and mobile app that extract the title and abstract of each paper to expedite the initial screening (Ouzzani et al., 2016). Two independent reviewers were involved in the article selection process which had two phases. At Phase I, the two reviewers decided which articles to include in the meta-analysis by reading only the titles and abstracts (see inclusion and exclusion criteria, below). One reviewer (myself) read all articles and the other reviewer read 30% articles (titles and abstracts) to make sure that the selections were reliable, and the inter-reviewer agreement was high (91%). All disagreements between reviewers were resolved through discussion. After Phase I, 1395 studies were retained. At Phase II, the goal was to check the retained papers carefully to determine if they should be included or excluded and required a more careful read of the full papers. The first reviewer (myself) examined

all the studies at Phase II. A second reviewer selected a random subsample of 280 studies (20% of the 1395 studies selected at Phase I) to determine the reliability of the selection process. The inter-rater agreement was high (93%). The disagreement between reviewers was resolved by discussion. At both phases, there was a training period in which the two reviewers discussed to make sure that they both understood and agreed on the inclusion and exclusion criteria. Studies selected in the two training periods were not included in the reliability analyses as they were considered "training" studies. After the training period, reviewers carefully screened the articles to determine whether they met the inclusion and exclusion criteria and reliability analyses on selection to include in the meta-analysis were conducted on these papers (see below). After Phase II, 364 studies were kept. Among the 364 studies, 113 of them did not provide the necessary parent effects or child effects (i.e., correlation analyses). Of these 113 studies, I could not obtain current email addresses for 22 authors. I emailed 91 authors to obtain the effect sizes and provided them a month to prepare for the data. If an author replied saying they would respond soon, I sent them reminder emails one week before the deadline if I still had not heard from them. For authors that never replied, I did not send reminder emails. Authors of 20 studies responded with necessary effect sizes. At the end of this period, data from 271 studies met the inclusion and exclusion criteria and were included in the meta-analysis (all studies' references were included). Figure 1 depicts the process for inclusion and exclusion.

Inclusion and Exclusion Criteria

Variables and Measures

If an article examined at least one type of parenting behaviors and at least one component or subtype of children's EC, it was included in the present review. Parenting behaviors included any behaviors that parents did toward their children (e.g., sensitivity, socialization) in parent-child interactions, but did not include parents' own characteristics such as parents' own stress or personality, or the quality of the parent-child relationship, including parent-child attachment. Components of children's EC included children's attention focusing and shifting, activational control, inhibitory control, and cognitive flexibility. Components could be examined individually, combined with each other (e.g., composite of attention focusing and shifting and inhibitory control), or combined with other types of children's behaviors that did not belong to EC (e.g., working memory, emotion expressions, or impulsivity). Children's dysregulation or problems in EC (e.g., attention problems or emotion dysregulation) were not included because I focused on children's EC ability in the present review. Questionnaires and observational tasks as measures of parenting behaviors and children's EC were included, but physiological measures of EC were not included.

Population

The target population was children between 7 months old and 10 years old and (mostly) their parents (i.e., mother, father, or both). Although the studies included in the meta-analyses may recruit a minimal number of adoptive parents or stepparents, studies that exclusively focused on stepparents, adoptive parents, or other caregivers (e.g., teachers, nonparental caregivers, siblings, grandparents) were excluded. For children's age, the oldest children included in the present review were equal to or younger than 10 years at Time 1 which was the time parenting was measured for parent effects and the

time EC was measured for child effects. Because EC begins to emerge and mature at the end of the first year of life (Rothbart et al., 1994), children's age should be equal to or higher than seven months when EC was measured but children's age could be younger than seven months when parenting was measured. That is, for parent effects, children's age range when parenting was measured was 0-10 years, and children's age range when EC was measured was equal to or higher than seven months without an upper limit. For child effects, children's age range when parenting was measured did not have any limits, and children's age range when EC was measured was seven months to 10 years. Clinical and non-clinical populations were both included.

Research Design

Because all studies were correlational, if they examined at least one longitudinal path between parenting behavior and children's EC (either direction of the prediction), the study would be included in the present review. I excluded studies that only examined concurrent relations between parenting behavior and children's EC. I only included empirical studies and excluded meta-analyses.

Publication Status and Dates

To avoid publication bias, peer-reviewed journals articles as well as manuscripts in progress, dissertations, and theses were included. The date of publication was not restricted. Because I did all the coding processes and data analyses in 2021, the latest publication year of the studies was 2020.

Animal Studies

I only included studies on human participants.

Language and Geographic Location

I only included articles available in English. Geographic locations of data collection were not restricted and could be anywhere in the world.

Coding of The Studies

Coding Procedure

All required information was coded from articles using a well-developed codebook (see Appendix I) with four trained coders. For any information that was not provided by the article, I contacted the authors to obtain details. Coder A coded 151 (56%) articles, Coder B coded 93 (34%) articles, Coder C coded 15 (6%) articles, and Coder D coded 12 (4%) articles. Coder A coded about 25% articles coded by the other three coders to calculate reliability, including 23 articles overlapping with Coder B's coding, 4 articles overlapping with Coder C's coding, and 4 articles overlapping with Coder D's coding. Reliabilities between Coders A and B, between Coders A and C, and between Coders A and D on continuous moderators (e.g., income) ranged from K = .81 to K = 1, and for categorical moderators (e.g., child sex) was from K = .76 to K = 1. For race and ethnicity, special population, and publication status, the Ks were 1 for all groups of coders.

Effect Sizes

If researchers examined parent effects, coders looked for all effect sizes (i.e., Pearson's correlations) of earlier parenting behaviors' correlation with later children's EC. If researchers examined child effects, coders looked for all effect sizes of earlier children's EC with later parenting behaviors. If the relations were examined at multiple time points or through different measures in the study, all effect sizes in the correlation tables were coded. If both individual subtypes and a composite score of EC were in the

correlation table, they were all coded. Thus, the number of effect sizes was far more than the number of studies included in the present review.

Moderators

Moderators included sample characteristics, types of variables, and aspects of study design. Moderators that were sample characteristics were children's age, children's sex, parents' sex, family socioeconomic status (SES), family structure (intact family vs single-parent family), race and ethnicity, and whether the participants were from special populations. First, other coders and I coded the mean age (in months) of children at each assessment of parenting behavior and EC. We also coded the length of time between measurement occasions of parenting behavior and EC in months. Second, we coded the sex composition (i.e., percentage of male children) of children in the sample. If effect sizes were provided separately by children's sexes, we coded both of them. Third, we coded the sex composition (i.e., percentage of mothers) of parents in the sample. If effect sizes were provided separately by mothers and fathers, we coded both of them. Fourth, for family SES, we extracted the mean or median annual family income as well as the mean or median years of parents' education level in each study. If the authors provided both parents' education levels, we used the average level between mothers and fathers. If the authors provided one parent's education level, we used it to represent both parents' education. We also coded how authors described the sample's average socioeconomic status, whether it was low, middle, or high. Fifth, we coded the family structure, which means whether the child was from a two-parent family or a single parent family. Sixth, participants' race and ethnicity were coded as the major racial or ethnic group examined in the study and its percentage of the entire sample (e.g., African American, 65%, or

Non-Hispanic White, 80%). Last, special populations included children or parents with mental health problems or substance use (e.g., depression, personality disorder, developmental delay, ADHD, ODD, alcoholism, drug abuse), children or parents with physical health problems (e.g., born preterm, low birth weight, spina bifida), and other at-risk families except low SES families (e.g., intimate partner violence, history of physical abuse, adolescent mothers).

Moderators also included types of parenting behaviors and types of EC. First, we coded different types of parenting behaviors. Because we expected that there would be too many types of parenting behaviors to assign a number to each of them, we first coded the specific type of parenting behavior studied in each paper using short phrases (e.g., warmth, physical punishment) and then decided how to categorize it into a more general type. Based on different theories and empirical studies (Buri, 1991; Karreman et al., 2006; Kawabata et al., 2011; Maccoby & Martin, 1983; Pinquart, 2017; Valcan et al., 2018), I categorized all parenting behaviors into 12 general types: warmth/sensitivity (e.g., support, acceptance, warmth, positive expressivity, responsiveness, sensitivity), autonomy support, scaffolding/teaching, supervision/involvement, intrusiveness, authoritative parenting (e.g., authoritative parenting style, inductive reasoning, positive control), authoritarian parenting (e.g., authoritarian parenting style, negative or harsh control, punishment), harshness/rejection (e.g., harshness, coercion, rejection, love withdrawal, negative expressivity, hostility), permissive parenting (e.g., permissive parenting style, inconsistent/poor discipline, granting the wish), ignoring/neglect, affirmative parenting composite (i.e. composite score or latent variable created by the author including more than one type of affirmative parenting behavior and/or one or more

types of reverse coded suppressing/permissive parenting behaviors among the 12 types), and suppressing/permissive parenting composite (i.e. composite score or latent variable created by the author including more than one type of suppressing/permissive parenting behavior and/or one or more types of reverse coded affirmative parenting behaviors among the 12 types).

Second, we coded children's EC by six types: EC (i.e., composite score or latent variable including more than one subtype of EC), self-regulation (i.e., composite score or latent variable including subtypes of EC as well as other types of behavior like developing a plan), emotion regulation with processes of attention and/or inhibitory control (e.g., self-distraction by attention shifting, inhibition of aggressive impulses when angered), executive function (i.e., composite score or latent variable including inhibition, working memory, and cognitive flexibility), attention control (i.e., concentration, attention focusing, and attention shifting), and inhibitory control (i.e., inhibition, inhibitory control, impulse control, and delay of gratification).

Moderators related to aspects of study design were publication status, measures of parenting behaviors, measures of EC, similarity of methods, and consistency of informants. First, we coded the publication status of the study, which means if it was a published peer-reviewed article or not. Second, we coded measures of parenting behavior by three types, survey only, observation/task only, or the combination of both. Third, we coded measures of EC by three types, survey only, observation/task only, or the combination of both. Fourth, for similarity of methods, we coded if both parenting behaviors and EC were measured through observational tasks, through surveys, or through different types of measures for the same effect size. Last, consistency of

informants was coded only for studies that measured both parenting behaviors and EC through surveys to see if the same informant reported both parenting behaviors and EC.

Data Analysis Plan

Synthesis

I synthesized data of parent effects and child effects separately. Because most studies included more than one effect size, cluster-robust variance estimation was used to control for the variance of studies for all analyses. However, cluster-robust variance estimation could control for either only the variance at the study-level when multiple effect sizes were from the same study, or only the variance at the dataset-level when the same dataset was used by different studies (Tanner-Smith et al., 2016), rather than the variances at both the study-level and the dataset-level at the same time. I decided to control for variance at the study-level rather than the variance at the dataset-level. Among the 271 studies included in the present review, seven datasets, which were either public datasets or big datasets collected by one lab or multiple labs, were used repeatedly by 72 studies. For studies that used the same dataset, if two or more studies included the exact same effect size, I kept one of the effect sizes among all studies. For studies that used the same dataset but included different effect sizes (e.g., different ages, different variables, different races or ethnicities), I included all effect sizes without controlling for the variance at the dataset-level (Tanner-Smith et al., 2016).

For both the parent effect and the child effect, first, I obtained the effect size of all paths that met the criteria of the relation between parenting and children's EC using Pearson's *r*. I used Fisher's r-to-z transformation (Fisher, 1921) to correct for skewness in the sampling distribution of *r*. Standardized effect sizes were used in the analyses and

were transformed back to Pearson's *r* for interpretations. I calculated the variance of the effect size based on the formula provided by Borenstein et al., (2009). I expected the effect size to be similar as previous studies and explained them using Cohen (1988)'s standards: *r* around .1 suggests small effect, *r* around .3 suggests moderate effect, and *r* higher than .5 suggests large effect. Because both parenting behaviors and children's behaviors could be accumulative and repetitive in their daily lives and may have long-term effects, I also interpreted the effect sizes based on Funder and Ozer (2019)'s standards and guidelines with meaningful comparisons and benchmarks. According to Funder and Ozer (2019), *r* around .05 indicates an effect that is very small, *r* around.10 indicates an effect that is still small but potentially more consequential, *r* around .20 indicates a moderate effect that is more explanatory, *r* around .30 indicates a large effect that is potentially powerful in both the short run and the long run, and *r* around .40 indicates a very large effect size and is likely to be an overestimate in the field of psychology. Besides overall parent and child effects across all developmental periods, I also obtained overall parent and child effects at each individual developmental period (i.e., infancy, toddlerhood, preschool period, early elementary period, and middle elementary period).

Second, to examine the main level and heterogeneity of effect sizes across all developmental periods and at each individual developmental period, I used the metafor package in the R platform (Version 3.4.2; R Core Team, 2017). For the magnitude of parent effects and child effects, I estimated the overall mean effect size with 95% confidence interval using a random-effects model, which does not have the assumption that all studies tested in the meta-analysis have a common effect size as the fixed-effects

model. Using a random-effects model means that effect sizes are weighted by both their within-study variance and between-study variance because results in studies with larger sample sizes are usually more precise. Because most studies included more than one effect size, I decided to use cluster-robust variance estimation to control for the variance of studies. I reported Q, τ^2, and I^2 for parent effects and child effects separately. τ^2 is the estimated population variance between studies, and I^2 is the percentage of systematic variance between effect sizes and was not directly influenced by the number of studies included in the analysis (Borenstein et al., 2009). I also checked out if outliers (i.e., effect sizes larger or smaller than 2.5 standard deviations from the median; Leys et al., 2013) existed in the distribution of effect sizes and did not find any.

Third, I examined publication bias in three ways: testing publication status as a moderator, Egger's test, and sensitivity analysis. Using multiple methods to examine publication bias in meta-analyses is encouraged because the methods differ in assumptions, Type I error rates, and relations they investigate (Ekholm & Chow, 2018). First, to test the publication status of studies as a moderator, I coded published studies as the reference group. Then the intercept suggested the average effect size of published studies and the slope showed the difference in the average effect sizes between published and unpublished studies. A significant slope ($p < .05$) would mean that the magnitudes of the average effect size differed significantly between published and unpublished studies. Second, I used Egger's test, which is a linear regression of the standardized effect on its inverse standard error (Egger et al., 1997). Instead of using Egger's test's original version (Egger et al., 1997), I used an equivalent weighted regression of the effect sizes on their standard errors (Rothstein et al., 2005). The regression's slope weighed by the

inverse of effect size's variance is expected to be zero if there is not publication bias. Thus, a slope significantly differs from zero ($p < .05$) would mean that the magnitudes of the average effect size differed significantly between published and unpublished studies (Rothstein et al., 2005). Third, I conducted the sensitivity analysis using the selection method (Vevea & Woods, 2005). The selection method assumes that whether an effect size is included in the present review could depend on the *p* value of the effect size. I can specify weights to represent the probability that an effect size with a certain *p* value could be included in the present review or not. The priori weights I used represent moderate one-tailed selection and severe one-tailed selection (Vevea & Woods, 2005). If the average effect size under the weights of the two types of selections decreased, then effects sizes near zero were less likely to be included in the analysis. I used the weightr package (version 1.1.2; Coburn & Vevea, 2017) in the R platform to conduct the sensitivity analysis.

Fourth, if heterogeneity existed in effect sizes (i.e., when *Q*-value was significant), I would examine if each moderator coded in the study could explain the variance by its own model. It means that I added one moderator as a predictor into the model at a time to see if the moderator explained significant amount of variance between effect sizes. For categorical moderators (e.g., child sex, race and ethnicity, type of EC), I dummy coded the categories that I was interested in comparing. For example, if I would like to know if studies that focused on inhibitory control had different effect sizes compared with studies that focused on all other types of EC, I coded all effect sizes of inhibitory control to be one, and effect sizes of other types of EC to be zero, so other types of EC would be the reference group of the comparison. After adding the dummy

coded categorical moderator into the model, the intercept suggested the average effect size of the reference group. And if the slope was positive, it suggested that studies on inhibitory control had larger effect sizes than studies on other types of EC. In addition, according to Card (2015)'s suggestion, a category of a moderator was compared with the reference group only if it had five or more studies. For continuous moderators (e.g., child age, household income, parent education), I centered the mean of the moderator by the grand mean across different studies. After adding the continuous moderator in the model, the intercept suggested the average effect size when the moderator equaled to the grand mean, and the slope showed the difference in the average effect size for each unit increase in the moderator. I examined the moderation effects of parent and child effects across all developmental periods and at each individual developmental period.

RESULTS

The results are organized by the two research questions: 1) Was there evidence for parenting behaviors predicting later children's EC (parent effects), and for children's EC predicting later parenting behaviors (child effects)? 2) If heterogeneity existed among relations between parenting behaviors and children's EC, would the variance be explained by moderators, such as sample characteristics, types of EC and parenting behaviors, aspects of study design, and publication status of the literature? Three sections in the results section answer the two research questions. The first section answers the first research question by examining the overall parent effect and overall child effect. The second and third sections answer the second research question separately by publication bias and moderation of parent effects and publication bias and moderations of child effects. When magnitudes of the effects were compared, the absolute values of the effect

sizes were used (Li et al., 2019). Thus, correlations closer to zero indicate an effect smaller in magnitude and correlations farther from zero mean an effect larger in magnitude.

In the first section, I present general descriptive information of all the studies, including the number of studies, effect sizes, overall sample sizes, publication years, location/country of data collection, publication status, and other descriptive information. I also present the overall parent effect and child effect with 95% confidence intervals along with various heterogeneity tests. I statistically compared the magnitude of effects between parent effects and child effects. Because the sample ranged in age from 7 months to 10 years, I next examined whether effect sizes differed across different developmental periods (i.e., infancy, toddlerhood, preschool period, early elementary period, and middle elementary period).

In the second section, I focused on the results for parent effects. First, I examined publication bias of parent effects using three tests (i.e., moderation analysis, Egger's regression test, and sensitivity analysis) and then included results of moderation analyses of continuous moderators and categorical moderators for parent effects. For continuous moderators, moderation analyses were conducted using both effect sizes across all developmental periods and within each individual developmental period. For categorical moderators, moderation analyses were conducted using effect sizes across all developmental periods, but not within each individual developmental period because the statistical power of some developmental periods was not large enough to compare categories within a categorical moderator.

In the third section, I focused on the results for child effects. Again, I first present

the results for publication bias and then present the results for the moderation analyses, similar to the method described above for parent effects.

Overall Parent Effect and Overall Child Effect

The present study included 271 longitudinal studies with 257 studies that examined parent effects (i.e., parenting was measured before EC) and 85 studies that examined child effects (i.e., EC was measured before parenting). More specifically, there were 186 studies that tested only parent effects, 14 studies that tested only child effects, and 71 studies that tested both child and parent effects. Because all studies were longitudinal studies with multiple waves, variables, and measures of parenting behaviors and EC, the number of effect sizes (bivariate correlations) had a range from one to 72. On average, there were about seven parent effects per study and seven to eight child effects per study. The total number of effect sizes were 2506, including 1863 parent effects and 643 child effects (see Figure 1). The overall sample size was N = 181851, and this sample size was calculated by summing the largest sample size of each unique study. That is, if more than one effect size was obtained within the same study, the largest sample size was used (Li et al., 2019). The publication year (or if unpublished, year data were collected) ranged from 1991 to 2020. The 271 Studies were conducted worldwide, with 81% in the United States, 4% in Canada, 3% in United Kingdom, 2% in China, and 10% in other countries including Germany, the Netherlands, Switzerland, Sweden, Norway, Spain, Portugal, Belgium, Australia, New Zealand, Korea, Singapore, South Africa, and Chile. Among all the studies, 78.6% were published peer-reviewed articles, and 21.4% were unpublished studies, including dissertations, theses, and manuscripts in progress. Other descriptive information is summarized in Table 1.

Overall effects were conducted separately for parent effect and child effect using random-effects models. Because most studies included more than one effect size, cluster-robust variance estimation was used to control for the variance of studies for all analyses, including the overall effects, publication bias (except the sensitivity analysis), and moderation analysis (Tanner-Smith et al., 2016).

The overall parent effect using the standardized effect size (*ES*) was statistically significant, $ES = .164$, $SE = .007$, $t(256) = 24.042$, $p < .001$, 95%CI = [.150, .177], with substantial heterogeneity, $Q(1862) = 7947.364$, $p < .001$, $\tau^2 = .007$, suggesting the quantification of among-study variance, and $I^2 = 74.57\%$, suggesting the proportion of the variance in study estimates that is due to heterogeneity rather than sampling error, regardless of the number of studies (Borenstein et al., 2009). Using an inverse version of Fisher's *r*-to-*z* formula, I transformed this effect size back to Pearson's *r* and found that the effect size for the longitudinal prediction of children's EC from earlier parenting behavior was small to moderate, $r = .162$, 95%CI = [.157, .167], according to both Cohen (1988)'s and Funder and Ozer (2019)'s standards of the effect sizes of Pearson's *r*.

Similarly, the overall child effect in the standardized effect size (*ES*) was statistically significant, $ES = .147$, $SE = .011$, $t(84) = 12.913$, $p < .001$, 95%CI = [.125, .170], with substantial heterogeneity, $Q(642) = 1761.116$, $p < .001$, $\tau^2 = .005$, suggesting the quantification of among-study variance, and $I^2 = 64.34\%$ suggesting the proportion of the variance in study estimates that is due to heterogeneity rather than sampling error, regardless of the number of studies (Borenstein et al., 2009). Using an inverse version of Fisher's *r*-to-*z* formula, I transformed this effect size back to Pearson's *r* and found that the effect size for the relation of earlier children's EC to later parenting

behavior was small to moderate, r = .146, 95%CI = [.138, .154], according to both Cohen (1988)'s and Funder and Ozer (2019)'s standards of the effect sizes of Pearson's r. No significant difference was found between the overall parent effect and the overall child effect, $t(269) = -1.732$, p = .085, 95%CI = [-.035, .002].

Because it is possible that parent effects would be stronger in early development and child effects would be stronger in later development, I conducted some post-hoc analyses to examine whether the effects differed across developmental periods (see Table 2 for all results). I first divided the studies based on children's age into five developmental periods: infancy (7-15 months), toddlerhood (15-30 months), preschool period (30-60 months), early elementary period (60-90 months), and middle elementary period (90-120 months) based on children's age at the first assessment (when parenting was measured for parent effects and when EC was measured for child effects). Given that fewer studies included child effects, I combined the infancy and toddler periods for the child effects analyses (creating an infancy/toddlerhood developmental period from 7-30 months). As indicated in Table 2, the overall parent effect of each developmental period was significant and was small to moderate in size. Similarly, child effects at each developmental period were significant. The overall child effect for the infant/toddler period (7-30 months) was somewhat weaker than other periods (i.e., small effect size), and it was small to moderate for the preschool period, early elementary period, and middle elementary period. For heterogeneity of effect sizes, parent effects at all five periods had significant heterogeneity and child effects had significant heterogeneity at preschool period, early elementary period, and middle elementary period, but not the infancy/toddlerhood period. These results suggest that moderation analyses are

unnecessary when examining child effects within the infancy/toddlerhood period.

Publication Bias and Moderation Analyses of Parent Effects

Given that parent effects' heterogeneity was significant, the next step was to understand whether publication bias accounted for these effects and if any potential moderators accounted for the parent effects. Publication bias was examined through three tests using data across all developmental periods. Moderation analyses were conducted with both continuous and categorical moderators across the sample. Because it is possible that some moderators would have larger effects at different developmental periods, I also conducted exploratory analyses to examine moderation within each of the developmental periods.

Publication Bias

Examining publication bias is an important advantage and a necessary step of a meta-analysis because a meta-analysis includes data from published peer-reviewed articles and unpublished studies (e.g., dissertations, manuscripts in progress). I used three methods to examine publication bias: moderation analysis using publication status as a moderator, Egger's regression test, and sensitivity analysis. Using multiple methods to examine publication bias in meta-analyses is encouraged because the methods differ in assumptions, Type I error rates, and relations they investigate (Ekholm & Chow, 2018). For moderation analysis, compared with effect sizes retrieved from published articles (r = .179, ES = .178), effect sizes in unpublished studies (r = .134, ES = .133) were significantly smaller, $t(255) = -3.760$, $p = .0002$, 95% CI = [-.068, -.021], after using cluster-robust variance estimation to control for study variances.

For Egger's regression test, I used the equivalent weighted regression of the effect

sizes on their standard errors (Rothstein et al., 2005). The weighted slope should not be significantly different from zero under the conditions of no publication bias. According to this weighted regression test, parent effects showed no evidence of publication bias, $B = .270$, $t(255) = 1.491$, $p = .137$, 95% CI = [-.086, .626], after using cluster-robust variance estimation to control for study variances.

For sensitivity analysis, I used the moderate one-tailed selection and severe one-tailed selection suggested by Vevea & Woods (2005). Under moderate one-tail selection weights, assuming that there is a .50 probability of including nonsignificant findings, across all studies, the average parent effect size was .148. Under severe one-tail selection weights, assuming that there is a .10 probability of including nonsignificant findings, across all studies, the average parent effect size was .128. Because cluster-robust variance estimation could not be used for sensitivity analysis, I compared the two average weighted effect sizes with the unadjusted overall parent effect, .164, without controlling for study variances. It was clear that as the probability of including nonsignificant findings decreased, the average effect size also decreased, suggesting that effect sizes near zero were less likely to be included in published studies. Given evidence from all three tests of publication bias, Egger's regression test was the only test that did not show publication bias, suggesting that there was some evidence of publication bias among all the parent effects. Because effect sizes in unpublished studies were significantly smaller than effect sizes in published studies, the real overall parent effect without publication bias could be smaller than the overall parent effect found in the present review.

Moderation Analyses

Moderation analysis included continuous moderators and categorical moderators.

For both continuous and categorical moderators, I first present the results of parent effects across all developmental periods. Then, I present the exploratory results of moderators within each individual developmental period when sample sizes allowed.

Moderators across all developmental periods. Meta-regressions were conducted to examine if continuous moderators, which were household income, parents' education, child age when parenting was assessed, child age when EC was assessed, and the length of time between the assessments of parenting and EC, could explain the heterogeneity of all parent effects. The results for moderation of the continuous variables showed few moderation effects. That is, only child age when EC was assessed was a significant moderator. As the age of children's EC increased, parent effects also increased. All other continuous moderators (i.e., household income, parents' education, child age when parenting was assessed, and the length of time between the assessments of parenting and EC) were non-significant (see all results in Table 3). These results suggest that, contrary to prediction, parenting more strongly predicted later EC, as children got older.

Some of the moderators were coded categorically (see the codebook, Appendix B). Categorical moderators (i.e., child sex, race and ethnicity, SES, family structure, whether data were collected from special population or not, type of parenting behavior, type of EC, type of parenting's measure, type of EC's measure, similarity of methods, and consistency of informants) were examined to see if they could explain the heterogeneity of all parent effects. According to Card (2015)'s suggestion, a category of a moderator would be excluded if it had fewer than five studies. Results of these analyses are shown in Table 4. For each of the moderators, I first decided a reference group among

all the categories of the moderator. The reference group usually had the largest number of effect sizes compared with other categories of the moderator, except similarity of methods (see explanations below). Then, for each moderator, I dummy coded each category in it and put all dummy-coded categories into the same model to compare. The model would have an intercept, different slopes for each category, and the overall model fit indices to see if the model would significantly explain heterogeneity of effect sizes or not. The intercept suggested the average effect size of the reference group. A positive slope of a category suggested that studies of this particular category had larger effect sizes than the reference group. A negative slope of a category suggested that studies of this particular category had smaller effect sizes than the reference group. *F* test was used and reported for the overall model fit of each moderator's model, after using cluster-robust variance estimation to control for the variance of studies (Card, 2015; Tanner-Smith et al., 2016).

As shown in Table 4, child sex was the first moderator that I examined. Balanced which means the study recruited about half boys and half girls was the reference group because it had the largest sample size compared with the group with 60% or more boys and the group with 60% or more girls. Although both the group with 60% or more boys and the group with 60% or more girls had larger overall standardized (*ES*) and unstandardized (*r*) effect sizes than the balanced group, neither of the slopes was significant, suggesting no significant differences between the reference group and other categories. Further, the non-significant *F* score suggested that child sex did not significantly moderate parent effects.

In terms of participants' race and ethnicity, the reference group was 60% or more

Non-Hispanic White because it had the largest sample size compared with all other categories. Balanced means that researchers recruited participants from more than one racial or ethnic group and none of the groups had more than 60% of the sample size. As shown in Table 4, results of this test showed that minority group categories had smaller parent effects compared with studies that recruited mostly Non-Hispanic White families. However, only studies that focused on Black families and Latino families had significantly smaller parent effects compared with the reference group, $t(245)$s = -2.10 and -6.06, ps < .04, respectively. Further, the significant F score suggested that participants' race and ethnicity significantly moderated parent effects.

In terms of SES, middle and high SES was the reference group because it had larger sample size compared with the low SES group. As shown in Table 4, overall standardized (*ES*) and unstandardized (*r*) effect sizes of the two categories were similar and did not differ significantly. Further, the non-significant F score suggested that SES did not significantly moderate parent effects.

In terms of family structure, the group with 60% or more two-parent household was the reference group because it had larger sample size compared with the fewer than 60% two-parent household group. As shown in Table 4, overall standardized (*ES*) and unstandardized (*r*) effect sizes of the two categories were similar and did not differ significantly. Further, the non-significant F score suggested that family structure did not significantly moderate parent effects.

In terms of special population, the special population group included children or parents with mental health problems, substance use, and physical health problems, and other at-risk families except low SES families. The non-special population group was the

reference group because it had larger sample size compared with the special population group. As shown in Table 4, overall standardized (*ES*) and unstandardized (*r*) effect sizes of the two categories were similar and did not differ significantly. Further, the non-significant *F* score suggested that special population did not significantly moderate parent effects.

In terms of parent sex, the group with 60% or more mothers was the reference group because it had larger sample size compared with the group with 60% or more fathers and the balanced group, which means researchers recruited similar amounts of mothers and fathers. As shown in Table 4, although the group with mostly fathers had smaller and the balanced group had larger overall standardized (*ES*) and unstandardized (*r*) effect sizes than the reference group, neither of the slopes was significant, suggesting no significant differences between the reference group and other categories. Further, the non-significant *F* score suggested that parent sex as did not significantly moderate parent effects.

In terms of parenting behaviors, I divided all types of parenting into 12 categories and because the majority of effect sizes were about parental warmth/or sensitivity, I made it the reference group. As shown in Table 4, I used raw effect sizes rather than the absolute values of effect sizes to estimate overall standardized (*ES*) and unstandardized (*r*) effect sizes of each category. Results showed that warmth/sensitivity, autonomy support, teaching/scaffolding, supervision/involvement, affirmative parenting composite, and authoritative parenting significantly and positively predicted later children's EC, whereas intrusiveness, suppressing/permissive parenting composite, authoritarian parenting, harshness/rejection, and ignoring/neglect significantly and negatively

predicted later children's EC. The prediction of permissive parenting was negative but non-significant. For the comparison between the prediction of warmth/sensitivity and the prediction of all other categories of parenting behaviors, autonomy support, affirmative parenting composite, and suppressing/permissive parenting composite had larger effect sizes, $t(245)$s = 2.65, 4.43, and 2.33, ps < .03, respectively, and supervision/involvement and ignoring/neglect had smaller effect sizes, $t(245)$s = -5.30 and -3.02, ps < .003, respectively. Further, the significant F score suggested that the type of parenting behaviors significantly moderated parent effects.

In terms of the type of children's EC, EC, which means a composite or latent variable created by two or more subtypes of EC, was the reference group because it had the largest number of effect sizes among all the categories. As shown in Table 4, compared with the reference group EC, executive function had larger effect sizes, $t(251)$s = 2.06, p = .04. Further, the significant F score suggested that the type of children's EC significantly moderated parent effects.

In terms of method of measuring parenting, observation/task only group was the reference group because it had larger sample size compared with the survey only group and the survey and observation/task combined group. As shown in Table 4, although the observation/task combined group had a little smaller overall standardized (*ES*) and unstandardized (*r*) effect sizes than the other two groups, neither of the slopes was significant, suggesting no significant differences between the reference group and other categories. Further, the non-significant F score suggested that the method of measuring parenting did not significantly moderate all parent effects.

In terms of method of measuring EC, observation/task only group was the

reference group because it had larger sample size compared with the survey only group and the survey and observation/task combined group. As shown in Table 4, although the observation/task combined group had a little larger overall standardized (*ES*) and unstandardized (*r*) effect sizes than the other two groups, neither of the slopes was significant, suggesting no significant differences between the reference group and other categories. Further, the non-significant *F* score suggested that the method of measuring EC did not significantly moderate parent effects.

In terms of similarity of methods, I divided all effect sizes into three groups, observation/task consistent, which means observation/tasks were used for both parenting and EC, survey consistent, which means surveys were used for both parenting and EC, and "others," which means the measures of parenting and EC were not consistent with one measured by observation/tasks and the other measured by survey, or at least one of them measured by observation/tasks and survey combined. Because I would like to compare if using consistent or inconsistent types of measures of parenting and EC would explain the variance of all parent effects, and "others" was the only inconsistent group, it became the reference group. As shown in Table 4, results showed that both observation/task consistent and survey consistent groups had larger effect sizes than the reference group, $t(254)$s = 2.67 and 3.01, ps < .01, respectively. Further, the significant *F* score suggested that similarity of methods significantly moderated parent effects.

For studies that used survey method for both parenting behavior and EC, I also examined the moderation of consistency of informants, which means whether the same person reported both parenting behavior and EC. Effect sizes that had the same person to report parenting and EC were in the consistent informant group while effect sizes that had

different people to report parenting and EC were in the inconsistent informants group. The consistent informant group was the reference group because it had larger sample size compared with the inconsistent informants group. As shown in Table 4, compared with studies asked the same informants to fill out the surveys, studies with inconsistent informants had smaller parent effects, $t(51) = -2.06$, $p = .04$. Further, the significant F score suggested that consistency of informants significantly moderated parent effects among studies that used survey method for both parenting behavior and EC.

In summary, for the results of continuous moderators of parent effects across all developmental periods, child age at EC's assessment (larger effect sizes with age) significantly explained the variance among parent effects. For categorical moderators, race and ethnicity (smaller effect sizes for Black and Latino participants), types of parenting behaviors (larger effect sizes for autonomy support, affirmative parenting composite, and suppressing/permissive parenting composite, and smaller effect sizes for supervision/involvement and ignoring/neglect), types of EC (larger effect sizes for executive function), similarity of methods (larger effect sizes for using observation/task to measure both parenting and EC and for using surveys to measure both parenting and EC), and consistency of informants (larger effect sizes for the same informant answering surveys of both parenting and EC) significantly explained the variance among parent effects. All other moderators were non-significant.

Moderators within each developmental period (when possible). Because it is possible that some moderators would be more strongly related to parent effects within different developmental periods, I conducted exploratory moderation analyses for moderators within each developmental period to examine whether the results of the

moderators also depended on the child's developmental level. These analyses could not be conducted with the categorical moderators because there were few effects within each category once divided into multiple developmental periods. Results for moderation of the continuous moderators within each period indicated that in the infancy period (7-15 months), as the time difference between assessments of parenting and EC increased, parent effects increased. During the early elementary period (60-90 months), as household income and parents' education increased, parent effects also increased. All other continuous moderators were non-significant (see Table 5 for all results).

Publication Bias and Moderation Analyses of Child Effects

Given that child effects' heterogeneity was significant, the next step was to understand whether publication bias accounted for these effects and if any potential moderators accounted for the child effects. Publication bias was examined through three tests using data across all developmental periods. Moderation analyses were conducted with both continuous and categorical moderators across the sample. Because it is possible that some moderators would have larger effects at different developmental periods, I also conducted exploratory analyses to examine moderation within each of the developmental periods.

Publication Bias

Similar to examining publication bias for parent effects, I used three methods to examine publication bias for child effects: moderation analysis using publication status as a moderator, Egger's regression test, and sensitivity analysis. For moderation analysis, effect sizes retrieved from published articles (r = .160, ES = .157) did not significantly differ from effect sizes in unpublished studies (r = .128, ES = .128), $t(83) = -1.741$, p

= .085, 95% CI = [-.064, .004], after using cluster-robust variance estimation to control for study variances.

For Egger's regression test, like I did for parent effects, I used an equivalent weighted regression of the effect sizes on their standard errors (Rothstein et al., 2005). The weighted slope should not be significantly different from zero under the conditions of no publication bias. According to this weighted regression test, child effects showed no evidence of publication bias, $B = .373$, $t(83) = 1.411$, $p = .162$, 95% CI = [-.153, .899], after using cluster-robust variance estimation to control for study variances.

For sensitivity analysis, I used the moderate one-tailed selection and severe one-tailed selection used by Vevea & Woods (2005). Under moderate one-tail selection weights, assuming that there is a .50 probability of including nonsignificant findings, across all studies, the average child effect size was .131. Under severe one-tail selection weights, assuming that there is a .10 probability of including nonsignificant findings, across all studies, the average child effect size was .112. Because cluster-robust variance estimation could not be used for sensitivity analysis, I compared the two average weighted effect sizes with the unadjusted overall child effect, .147, without controlling for study variances. It was clear that as the probability of including nonsignificant findings decreased, the average effect size also decreased, suggesting that effect sizes near zero were less likely to be included in published studies. Given evidence from all three tests of publication bias, sensitivity analysis was the only test that showed publication bias, suggesting that some publication bias existed among all studies that examined child effect, but the bias may not be severe. Because effect sizes in unpublished studies were smaller than effect sizes in published studies, although the difference was

not significant, the real overall child effect without publication bias could be smaller than the overall child effect found in the present review.

Moderation Analyses

Moderation analysis included continuous moderators and categorical moderators. For both continuous and categorical moderators, I first present the results of child effects across all developmental periods. Then, I present the exploratory results of moderators within each individual developmental period when sample sizes allowed.

Moderators across all developmental periods. Meta-regressions were conducted to examine if continuous moderators (the same moderators as parent effects) could explain the heterogeneity of all child effects. For results across all developmental periods, child age when parenting was assessed, child age when EC was assessed, and the time difference between assessments of parenting and EC were significant moderators. Child effects were stronger as children's age (when both parenting and EC was assessed) increased. Child effects were stronger as the time between assessments of parenting and EC increased. All other continuous moderators (i.e., household income and parents' education) were non-significant (see all results in Table 6). Interestingly, for both parent effects and child effects, the effect sizes were larger when children were older when EC was assessed. Child effects also depended on the age when parenting was assessed and the length of time between assessments.

Some of the moderators were coded categorically (see the codebook, Appendix B). Categorical moderators that were the same as moderators examined for parent effects (i.e., child sex, race and ethnicity, SES, family structure, whether data were collected from special population or not, type of parenting behavior, type of EC, type of

parenting's measure, type of EC's measure, similarity of methods, and consistency of informants) were also examined to see if they could explain the heterogeneity of all child effects. A category of a moderator would be excluded if it had fewer than five studies. Results of these analyses are shown in Table 7. For each of the moderators, the reference group was the same as the references group decided for parent effects. I dummy coded and examined all moderators in the same statistical model as I did for parent effects.

As shown in Table 7, child sex was the first moderator that I examined. Balanced which means the study recruited about half boys and half girls was the reference group because it had the largest sample size compared with groups with 60% or more boys or with 60% or more girls. Because the group with 60% or more girls had fewer than five studies, it was excluded in the comparison. Results showed that the group with 60% or more boys had larger effect sizes than the balanced group, $t(78) = 2.15$, $p = .03$. Further, the significant *F* score suggested that child sex significantly moderated child effects.

In terms of participants' race and ethnicity, the reference group was 60% or more Non-Hispanic White because it had the largest sample size compared with all other categories. Balanced means that researchers recruited participants from more than one racial or ethnic group and none of the groups had more than 60% of the sample size. Because the group of Black participants had fewer than five studies, it was excluded in the comparison. As shown in Table 7, overall standardized (*ES*) and unstandardized (*r*) effect sizes of all other categories were similar and did not differ significantly. Further, the non-significant *F* score suggested that race and ethnicity did not significantly moderate child effects.

In terms of SES, middle and high SES was the reference group because it had

larger sample size compared with the low SES group. As shown in Table 7, overall standardized (*ES*) and unstandardized (*r*) effect sizes of the two categories were similar and did not differ significantly. Further, the non-significant *F* score suggested that SES as a moderator did not significantly moderate child effects.

In terms of family structure, the group with 60% or more two-parent household was the reference group because it had larger sample size compared with the fewer than 60% two-parent household group. As shown in Table 7, the effect sizes of the fewer than 60% two-parent household group were smaller than the effect sizes of the group with 60% or more two-parent household, $t(48) = -3.21$, $p = .002$. Further, the significant *F* score suggested that family structure significantly moderated child effects, with two-parent families showing stronger child effects than single parent families.

In terms of special population, the special population group included children or parents with mental health problems, substance use, and physical health problems, and other at-risk families except low SES families. The non-special population group was the reference group because it had larger sample size compared with the special population group. As shown in Table 7, overall standardized (*ES*) and unstandardized (*r*) effect sizes of the two categories were similar and did not differ significantly. Further, the non-significant *F* score suggested that special population did not significantly moderate child effects.

In terms of parent sex, the group with 60% or more mothers was the reference group because it had larger sample size compared with the group with 60% or more fathers and the balanced group, which means researchers recruited similar amounts of mothers and fathers. Because the balanced group had fewer than five studies, it was

excluded in the comparison. As shown in Table 7, the group with mostly fathers had larger effect sizes than the reference group, $t(75) = 2.08$, $p = .04$. Further, the significant F score suggested that parent sex significantly moderated child effects.

In terms of parenting behaviors, I divided all types of parenting into 12 categories and because the majority of effect sizes were about parental warmth/or sensitivity, I made it the reference group. Because autonomy support and ignoring/neglect had fewer than five studies, they were excluded in the comparisons. As shown in Table 7, I used raw effect sizes rather than the absolute values of effect sizes to estimate overall standardized (*ES*) and unstandardized (*r*) effect sizes of each category. Results showed that children's EC significantly and positively predicted later warmth/sensitivity, teaching/scaffolding, supervision/involvement, affirmative parenting composite, and authoritative parenting positively, and significantly and negatively predicted later intrusiveness, suppressing/permissive parenting, authoritarian parenting, and harshness/rejection. The prediction from children's EC to later permissive parenting was negative but non-significant. Compared with warmth/sensitivity, suppressing/permissive parenting composite had larger child effects, $t(74) = 2.76$, $p = .007$. Further, the significant F score suggested that the type of parenting behaviors significantly moderated child effects.

In terms of the type of children's EC, EC, a composite or latent variable created by two or more subtypes of EC, was the reference group because it had the largest number of effect sizes among all the categories. As shown in Table 7, the overall standardized (*ES*) and unstandardized (*r*) effect sizes were similar among all the groups and none of the slopes was significant, suggesting no significant differences between the reference group and other categories. Further, the non-significant F score suggested that

the type of children's EC did not significantly moderate child effects.

In terms of method of assessment for parenting, observation/task only group was the reference group because it had larger sample size compared with the survey only group and the survey and observation/task combined group. Because the survey and observation/task combined group had fewer than five studies, it was excluded in the comparisons. As shown in Table 7, the observation/task only group and survey only group had similar effect sizes, and the slope was not significant, suggesting no significant differences between the reference group and the other category. Further, the non-significant *F* score suggested that method for examining parenting did not significantly moderate child effects.

In terms of EC's method, observation/task only group was the reference group because it had larger sample size compared with the survey only group and the survey and observation/task combined group. Because the survey and observation/task combined group had fewer than five studies, it was excluded in the comparison. As shown in Table 7, effect sizes in the survey only group were significantly larger than effect sizes in the observation/task only group, $t(79) = 2.12$, $p = .04$. Further, the significant *F* score suggested that method of measuring EC significantly moderated child effects.

In terms of similarity of methods, I divided all effect sizes into three groups, observation/task consistent, which means observation/tasks were used for both parenting and EC, survey consistent, which means surveys were used for both parenting and EC, and "others," which means the measures of parenting and EC were not consistent with one measured by observation/tasks and the other measured by survey, or at least one of them measured by observation/tasks and survey combined. Because I would like to

compare if using consistent or inconsistent types of measures of parenting and EC would explain the variance of all parent effects, and "others" was the only inconsistent group, it became the reference group. As shown in Table 7, results showed that survey consistent group had larger effect sizes than the reference group, $t(82) = 2.34$, $p = .02$. Further, the significant F score suggested that similarity of methods significantly moderated child effects.

For studies that used survey method for both parenting behavior and EC, I also examined the moderation of consistency of informants, which means whether the same person reported both parenting behavior and EC. Effect sizes that had the same person to report parenting and EC were in the consistent informant group while effect sizes that had different people to report parenting and EC were in the inconsistent informants group. The consistent informant group was the reference group because it had larger sample size compared with the inconsistent informants group. As shown in Table 7, compared with studies asked the same informants to report both parenting and EC, studies with different informants to report parenting and EC had smaller parent effects, $t(32) = -2.58$, $p = .01$. Further, the significant F score suggested that consistency of informants significantly moderated of child effects among studies that used survey method for both parenting behavior and EC.

In summary, for the results of continuous moderators of child effects across all developmental periods, child age at parenting's assessment (larger effect sizes with age), child age at EC's assessment (larger effect sizes with age), and the time difference between parenting's and EC's assessments (larger effect sizes with higher difference scores) significantly explained the variance among child effects. For categorical

moderators, child sex (larger effect sizes for samples with 60% or more boys), parent sex (larger effect sizes for samples with 60% or more fathers), family structure (smaller effect sizes for samples with fewer than 60% two-parent households) types of parenting behaviors (larger effect sizes for suppressing/permissive parenting composite), types of EC's measurement (larger effect sizes for survey only), similarity of methods (larger effect sizes for using surveys to measure both parenting and EC), and consistency of informants (larger effect sizes for the same informant answering surveys of both parenting and EC) significantly explained the variance among child effects. All other moderators were non-significant.

Moderators within each developmental period (when possible). Because it is possible that some moderators would be more strongly related to parent effects within different developmental periods, I conducted exploratory moderation analyses for moderators within each developmental period to examine whether the results of the moderators also depended on the child's developmental level. These analyses could not be conducted with the categorical moderators because there were few effects within each category once divided into multiple developmental periods. Because the heterogeneity of effect sizes in the infancy/toddlerhood period (7-30 months) was not significant, moderation analyses of child effects were not conducted for this period. Results for moderation of the continuous moderators within each period indicated that in the middle elementary period (90-120 months), as the time difference between parenting and EC increased, the prediction from children's EC to later parenting increased. All other continuous moderations were non-significant (see Table 8 for all results).

Summary of All the Results

In summary, the overall parent effect and overall child effect across all developmental periods were significant and small to moderate in size. Although parent effect was a little larger than child effect, they did not differ significantly. The variances of both parent effect and child effect were significant. Parent effect at each of the five developmental periods (i.e., 7-15 months, 15-30 months, 30-60 months, 60-90 months, and 90-120 months) was significant with significant heterogeneity. Child effects at each of the four developmental periods (i.e., 7-30 months, 30-60 months, 60-90 months, and 90-120 months) were significant. The heterogeneity of child effect was significant at 30-60 months, 60-90 months, and 90-120 months, but not at 7-30 months.

Publication bias of the overall parent effect was supported by two of the three tests (moderation analysis and sensitivity analysis), but not Egger's regression test. Publication bias of the overall child effect was supported by one of the three tests (sensitivity analysis), but not moderation analysis or Egger's regression test. Thus, for both overall parent effect and overall child effect, there were some evidence of publication bias (See Table 9 for the summary of all results).

Moderation analyses including both continuous and categorical moderators were conducted across all developmental periods for parent effects and child effects (See Table 9 for the summary of all results). More significant moderators were found for child effects compared with parent effects. Moderators including children's age at EC's assessment, type of parenting behaviors, similarity of methods, and consistency of informants were significant for both parent effects and child effects. Specifically, both parent effects and child effects increased with children's age of EC's assessment. For types of parenting behaviors, larger parent effects were found for autonomy support,

affirmative parenting composite, and suppressing/permissive parenting composite, smaller parent effects were found for supervision/involvement and ignoring/neglect, and larger child effects were found for suppressing/permissive parenting composite. For similarity of methods, larger parent effects were found for using observation/task to measure both parenting and EC and for using surveys to measure both parenting and EC, and larger child effects were found for using surveys to measure both parenting and EC. For consistency of informants, both parent effects and child effects were larger when the same informant answered surveys of both parenting and EC.

Moderators including race and ethnicity and types of EC were significant only for parent effects. Specifically, for race and ethnicity, smaller parent effects were found for Black and Latino participants. For types of EC, larger parent effects were found for executive function.

Moderators including child age at parenting's assessment, the time difference between parenting's and EC's assessments, child sex, parent sex, family structure, and types of EC's measurement were significantly only for child effects. Child effects increased as child age at parenting's assessment increased and as the time difference between parenting's and EC's assessments increased. For child sex, larger child effects were found for samples with 60% or more boys. For parent sex, larger child effects were found for samples with 60% or more fathers. For family structure, smaller child effects were found for samples with fewer than 60% two-parent households. For types of EC's measurement, larger child effects were found for using survey only.

For continuous moderators within each developmental period, in the infancy period (7-15 months), as the time difference between assessments of parenting and EC

increased, parent effects increased. During the early elementary period (60-90 months), as household income and parents' education increased, parent effects also increased. In the middle elementary period (90-120 months), as the time difference between parenting and EC increased, the prediction from children's EC to later parenting also increased. For all the significant moderators, they were significant only within a particular developmental period but not other developmental periods. Thus, it was worth consideration to conduct moderation analyses within each developmental period.

DISCUSSION

The development of children's EC has long been attributed to parenting behaviors (Eisenberg et al., 1998a, 1998b; Kopp, 1982). Although empirical evidence has supported the notion that parenting behaviors may serve as both precursors and outcomes of children's EC (e.g., Bell, 1981; Eisenberg, 2020; Overton, 2013), the present meta-analysis is the first to synthesize bidirectional relations between a broad range of parenting behaviors and children's EC for children aged 7 months to 10 years. Using 2506 effect sizes from 271 studies, I found significant effect sizes for the relations from earlier parenting behaviors to later children's EC and from earlier children's EC to later parenting behaviors. Effect sizes for both parent-effects and child-effects were small to moderate, and they did not differ from each other in magnitude. Further, there was evidence of publication bias for both parent effects and child effects, particularly for parent effects. Heterogeneities of parent and child effects were significant and were in part explained by various moderators (e.g., types of parenting behaviors and EC, demographic variables, aspects of study design).

In the discussion, I first explain the overall parent and child effects by situating this study with other previous meta-analyses on similar topics. Second, I explain the findings related to publication bias and the moderators of both parent effects and child effects. Third, I discuss theoretical and methodological implications of the findings in the present review and provide ideas for future directions for research in this area. Finally, I acknowledge the strengths and limitations of the dissertation and end with a conclusion.

Overall Parent Effect and Overall Child Effect

In the current study, I found that parenting longitudinally predicted children's EC, with a small to moderate effect size. The size of the parent effects in this meta-analysis is consistent with other, smaller, meta-analyses. That is, other meta-analyses produced similar effect sizes for the relations of parenting behaviors to adolescents' later self-control (Li et al., 2019), parent-child attachment status to children's EC (Pallini et al., 2018), and effective parenting to children's low self-control (Tehrani & Yamini, 2020). Thus, the hypothesis on the magnitude of overall parent effect was supported. EC is an aspect of temperament that is considered to be somewhat dispositional, as well as shaped by context and environment (Rothbart & Bates, 2006), including parenting and other factors like SES and demographic and psychosocial risk factors (Lecheile et al., 2020; Lengua et al., 2007). Specifically, during parent-child interactions, when parents appropriately respond to their children's emotions and needs, children may learn effective strategies that improve their EC ability over time. Children could also feel loved and supported by parents when parents engage in affirmative parenting strategies which are consistent with positive behavior support strategies (e.g., positive reinforcement, prompts and suggestions of positive activities; Dishion et al., 2008), so that children could engage

in more positive behaviors including EC. However, if parents' responses to children are inappropriate, overcontrolling, or punitive, children may become overly aroused or do not make connections between their emotions and ways to regulate their impulses and attention. Similarly, children could feel less loved or supported if parenting behaviors do not support their positive behavior, so that children may engage in fewer positive behaviors including EC. Over time, children are thought to learn regulatory strategies from their parents' responses to their emotions, from observing parents' own regulatory behaviors, and/or through establishing secure or insure attachment relationships with parents (Bandura & Walters, 1963; Eisenberg, 2020; Thompson, 2015). Thus, it is reasonable that parenting behaviors longitudinally predict children's EC. The fact that the prediction is not very strong may be due to other contextual or dispositional factors, such as peer relationships and genetic factors responsible for change in children's EC over time.

Although the default assumption is that parents shape children's behavior in the process of child development, I also found a small to moderate overall child effect (i.e., the prediction from children's EC to later parenting behaviors) in the present review. A similar effect size was found in another recent meta-analysis examining the role of adolescents' self-control to parenting (Li et al., 2019). In the current meta-analysis that focused on infancy to late childhood, findings demonstrate that parents adjust their parenting behaviors in response to children's EC. That is, as predicted, parents behave in more sensitive, supportive, and less harsh or intrusive ways when children are better regulated. It is likely that a host of other factors (e.g., personality, coparenting, childhood experiences in the family context, Belsky et al., 1995; Morrill et al., 2010; Simons et al.,

1993) may also predict parenting behaviors. Thus, it was not surprising that the magnitude of child effects was small to moderate.

The comparison between the magnitudes of the overall parent effect and the overall child effect showed that they did not differ significantly from each other. There has been only one other meta-analysis that examined and compared the two effects, and that study, using an adolescent sample, found a similar nonsignificant difference between the effects (Li et al., 2019). Thus, the current study extended this finding to younger children. The result indicates that in the relation between parenting behaviors and children's EC, parents and children play similarly important roles to predict each other's behavior. The default direction from parental influence on child outcomes is not enough to study the dynamic relations between parents and children. Instead, researchers should focus on both parent- and child-driven effects in the relations between parental behaviors and child behaviors.

Publication Bias

Evidence of publication bias was found for both parent effects and child effects. Published studies had larger effect sizes compared with unpublished studies. As a strength of meta-analyses, including results of published and unpublished studies and comparing the magnitudes of the results showed that, not surprisingly, published studies tend to have larger effect sizes. However, because I included more published studies (i.e., 205 published studies with 1327 published effect sizes for parent effects, 68 published studies with 429 published effect sizes for child effects) than unpublished studies (52 unpublished studies with 536 unpublished effect sizes for parent effects, 17 unpublished studies with 214 unpublished effect sizes for child effects) in the present review, the

results of comparisons between published and unpublished effect sizes could be somewhat biased. Unpublished studies were included in the meta-analyses by reviewing unpublished dissertations as well as sending inquiries to expert researchers in the field of self-regulation. Because inclusion in the current study relied somewhat on authors replying to my emails and sending me their unpublished effect sizes, it is very likely that the unpublished work included in the current meta-analysis was biased. Undoubtedly, there are many more unpublished data that were not included in the current meta-analysis—either because I was unaware of the work or because the authors did not respond to my requests. This issue is problematic for all researchers who conduct meta-analyses. More consistent pre-registration and peer reviewing of a large body of studies before results are known (e.g., Center for Open Science) could help resolve this issue for future scientists interested in conducting meta-analyses.

Based on the three methods I used to examine publication bias, the true overall parent effect and child effect could be smaller than the effect sizes found in the present work. Further, slightly more evidence of publication bias was found for parent effects (two of the three tests showed publication bias) compared with child effects (one of the three tests showed publication bias). Again, this difference may be due to the fewer number of unpublished child effect studies included in the present review. The publication bias results indicate that researchers should be aware that the relation between parenting behavior and children's EC could be inflated in published articles, especially for parent effects. Thus, it is important for researchers to provide both significant and non-significant results when they submit manuscripts to peer-reviewed journals.

Moderation Analyses of Parent Effects

Because heterogeneity existed among all parent effects, I conducted moderation analyses to examine whether the predicted moderators could explain the variance among the effect sizes. Moderators included types of parenting behaviors, types of EC, sample characteristics, and different aspects of the study design.

Type of Parenting Behaviors

The type of parenting behaviors explained the variance of parent effects. Among the 12 types of parenting behaviors, 10 of them were individual parenting behaviors (i.e., warmth/sensitivity, autonomy support, teaching/scaffolding, supervision/involvement, intrusiveness, authoritative parenting, authoritarian parenting, harshness/rejection, permissive parenting, ignoring/neglect). The other two parenting dimensions were composite scores or latent variables of more than one type of parenting behavior, including the affirmative parenting composite (e.g., combined warmth/sensitivity, teaching/scaffolding, autonomy support, and reverse coded rejection) and the suppressing/permissive parenting composite (e.g., combined harshness, ignoring/neglect, and reverse coded warmth/sensitivity). Thus, these two composite scores captured more diverse aspects of parenting behaviors than did the individual parenting behavior types. All the affirmative parenting behaviors (i.e., warmth/sensitivity, autonomy support, teaching/scaffolding, authoritative parenting, and affirmative parenting composite) were positively related to children's later EC. All the suppressing/permissive parenting behaviors (i.e., intrusiveness, authoritarian parenting, harshness/rejection, permissive parenting, ignoring/neglect, and suppressing/permissive parenting composite) were negatively related to children's later EC. In moderation analyses of parenting behaviors, I used the absolute value of the effect sizes to compare the strength of parent effects of all

the affirmative and suppressing/permissive parenting behaviors. Because the majority of studies examined warmth/support, this form of parenting was compared to each of the other dimensions as a first step to understand how different forms of parenting were more or less related to children's later EC.

The moderation findings showed that supervision/involvement and ignoring/neglect had weaker relations to children's later EC than did warmth/support. Both ignoring/neglect and supervision/involvement were mainly coded as whether and how long the parent spent time with the child or engaged meaningfully with the child. That is, parents who ignored their children or who were low on involvement were those who may have few interactions with their children or who were relatively disengaged (or "hands-off") in their children's day-to-day lives. However, these forms of parenting behaviors do not capture parents' interaction style or the quality of parents' involvement. The amount or frequency of parental involvement may be less strongly related to desirable child outcomes than more specific parenting behaviors because these assessments do not capture whether parents are harsh or warm during parent-child interactions (Cabrera et al., 2000). Thus, it is reasonable that measuring the quality, rather than the quantity, of parenting behaviors could more strongly predict children's EC.

Interestingly, the moderation findings showed that the two parenting composites (i.e., affirmative parenting, suppressing/permissive parenting) had stronger relations with children's later EC compared to warmth/support. Recall that the parenting composites were coded when a latent variable that included multiple parenting behaviors or a large composite of parenting was assessed. It is likely that using composite variables to describe parenting behaviors more accurately and comprehensively captures global

parenting behaviors across multiple contexts. In addition, creating a composite score is likely to incorporate multiple sources like multiple reporters or different measures, so parenting composites could be a more rigorous assessment methodologically (DeBoard-Lucas et al., 2010). Thus, it is reasonable that the effect sizes for both affirmative and corrective/permissive parenting were stronger in predicting children's later EC than was warmth/sensitivity.

Finally, the moderation analyses indicated that autonomy support was more strongly related to children's later EC than was warmth/sensitivity. It is possible that because EC is an intrinsic process of regulation (Nigg, 2017), parents' autonomy support is particularly important in supporting children's regulatory skills. Specifically, most studies (seven out of ten) that examined autonomy support coded autonomy support during parent-child interactions when children were completing a challenging problem-solving task (e.g., puzzle task; Matte-Gagné & Bernier, 2011; Meuwissen & Carlson, 2018). Thus, parents who were high on autonomy support were most likely encouraging their children to find flexible ways to solve problems during potentially frustrating situations without doing it for them. This type of parenting behavior supports children's attention to tasks, mastery motivation, and resiliency. Such behaviors are likely to foster later EC skills, including inhibitory control and attentional control. When parents allow their children independence during challenging tasks, it is likely that children become motivated to persist on similar tasks in the future. For example, Bernier et al. (2012) examined the prediction from both maternal sensitivity and maternal autonomy support to children's later EC across four tasks. They found that maternal autonomy support was positively and significantly correlated with three of the four tasks, whereas maternal

sensitivity was positively and significantly correlated with only one of the four tasks (Bernier et al., 2012). Thus, parents' autonomy support could directly encourage children's EC skills, such as persistence and flexibility, more than simply being warm and responsive to children.

Type of EC

The type of EC explained the variance of parent effects. Compared with children's global EC (i.e., composite score or latent variable of inhibitory control and attentional control), children's executive functioning (i.e., composite score or latent variable of inhibitory control, cognitive flexibility, and working memory) had stronger parent effects. The overall effect size, .22, between parenting and later children's executive function was similar to the magnitude of the overall effect size between the two variables found in another recent meta-analysis (Valcan et al., 2018, effect size of .25). It is likely that the stronger effect for executive functioning is due to the role of working memory in children's executive functioning. Indeed, Valcan et al. (2018) showed stronger effects for working memory compared to other aspects of executive functioning (.21 for working memory, .15 for inhibition, and .10 for shifting). Working memory includes the ability to mentally manipulate the information for complex cognitive tasks (Baddeley, 1992), and it is generally not viewed as an aspect of temperament. Thus, parenting could play a very important role in the development of working memory because such skills are more easily "learned" and are less temperamental in nature. Thus, it is believed that the construct of working memory, which is often included in composites of executive functioning, is responsible for the stronger parent effect for this form of EC. There were no other indications of moderation for other types or

subcomponents of EC, including self-regulation, emotion-regulation, attention control, and inhibitory control; the magnitude of the parent effects for these subtypes were not significantly different from the parent effect of the EC composite.

Sample Characteristics

Children's Age. The hypothesis that as children aged, the magnitude of parent effects would be smaller was not supported. Instead, children's age when EC was assessed was positively related to the magnitude of parent effects. One possible explanation for this finding may be due to the development and stability of EC from infancy to late childhood. Indeed, most researchers agree that components of EC are evident in late infancy, but it is that during early childhood when most aspects of EC emerge and start to develop rapidly. Thus, parents may have few expectations for children's EC during infancy, toddlerhood, and early childhood, as parents may view very young children's dysregulation as temporary and normative. Parents' expectation of the "terrible twos" may reduce the prediction of parenting behaviors when children were around two years (Xu et al., 2021). Children's EC becomes more stable when children grow older, especially after five or seven years (Rueda et al., 2004; Zhou et al., 2009). During elementary school, parents may expect their children to be more regulated than at younger ages, so they may try to improve children's EC through their parenting behaviors. Similarly, a meta-analysis showed stronger relations between parenting behaviors and children's problem behaviors (a construct related to children's dysregulation) as children age from infancy to adolescence (Rothbaum & Weisz, 1994).

Another possible explanation for the unexpected finding is that there was some overlap between children's age and other study characteristics. For example, both

parenting and EC were more likely to be measured using surveys when children were older at the time of EC assessment, whereas when parenting and EC were measured using observations/tasks or different methods (i.e., one measured by survey and the other measured by observations/tasks), children were more likely to be somewhat younger. This finding raises the issue that perhaps studies that focused on older children were more likely to use surveys to measures both parenting behaviors and EC. Shared method variance could increase the correlation between parenting and EC if both variables were measured by surveys, especially when the surveys were reported by the same person (Podsakoff et al., 2012).

Children's Race and Ethnicity. For race and ethnicity, parent effects for studies using Black and Latino samples were weaker than parent effects for studies using samples that were mostly non-Hispanic White. Differences in values, goals, and specific ecological niches across racial and ethnic groups could explain the different strengths of relations between parenting behaviors and child outcomes across groups (Hill & Bush, 2001). According to a meta-analysis on the association between parenting styles and children's academic outcomes, researchers found that in Western countries, the negative association between authoritarian parenting and children's academic achievement was stronger in non-Hispanic White families than in Hispanic families, and no negative association was found between authoritarian parenting and children's academic outcomes in African American families (Pinquart & Kauser, 2018). According to the integrative model for the study of developmental competencies in minority children, environmental factors like racism, discrimination, migration, and acculturation are so important in the process of children's development of competencies including cognitive, social, and

emotional aspects (Coll et al., 1996). Compared with non-Hispanic White children who do not experience issues such as discrimination and racism, the prediction from the family context to children's regulation for historically marginalized children may be weaker due to the prediction from these other important factors. Interestingly, there were no differences in effect sizes between non-Hispanic White and Asian families. This result could be explained because, unlike studies that focused on mostly Black and Latino participants, most studies that including the majority Asian families (seven out of nine) recruited participants from Asian countries (e.g., China, Korea, and Singapore). That is, the researchers were studying majority racial groups in these studies. Thus, factors related to racism and international migration were unlikely to be relevant factors in these Asian children's development.

Study Design

For the moderation of study design, effect sizes of parent effects did not vary based solely on the method (i.e., survey or observation) for studying either parenting or EC. Instead, the similarity of methods and consistency of informants both moderated parent effects. Specifically, if both parenting and EC were measured by observation or both were measured by surveys, the magnitudes of parent effects were larger than if parenting and EC were measured differently (i.e., one by observation/tasks and the other by survey). Shared method variance could explain this result. Indeed, when studying personality (a construct closely related to temperament), higher correlations have been found between questionnaire reports (self-report and other-report) compared to correlations between self-reported questionnaires and behavioral measures (Duckworth & Kern, 2011; Harden et al., 2017; Meyer et al., 2001). In addition, if both parenting and

EC were measured through observations or behavioral tasks, the two variables were sometimes measured through the same task, in the same laboratory environment, or coded by the same coder. These potential factors could all contribute to the shared method variance between observational measures or tasks of parenting behaviors and EC.

Similarly, among the studies that measured both parenting and children's EC through surveys, parent effects were stronger when the informants of both variables were the same compared with when the informants were different. Consistency of informants is the most common type of shared method variance between measures of two variables. Specifically, for both child behaviors and parenting behaviors, discrepancies often exist among different informants (e.g., parents, children, teachers; Reyes & Kazdin, 2005; Hou et al., 2020), because different family members and teachers may have different experiences or ideas related to parenting behavior, parent-child interaction, and children's EC. Informant discrepancies on the same variable could then be transferred to lower correlations between parenting behaviors and EC if they were reported by different informants.

In summary, the findings indicated that the strength of parent effects depended on a number of factors. That is, compared with children who were younger when EC was measured, the prediction from earlier parenting to later EC was stronger for children who were older when EC was measured. Compared with warmth/sensitivity and EC composite, the prediction from earlier parenting to later EC was stronger for autonomy support, affirmative and suppressive/permissive composites, and for executive function. Compared with using different types of measures (i.e., survey and behavioral tasks) for parenting and EC, and inconsistent informants to complete surveys on parenting and EC,

the prediction from earlier parenting to later EC was stronger for using the same type of measures for parenting and EC, and consistent informant to complete surveys on parenting and EC. In addition, compared with non-Hispanic White families and warmth/sensitivity, the prediction from earlier parenting to later EC was weaker for Black and Latino families and supervision/involvement and ignoring/neglect.

Moderation Analyses of Child Effects

Because heterogeneity existed among all child effects, I conducted moderation analyses to see if moderators could explain the differences between the effect sizes. Moderators included types of parenting and EC, sample characteristics, and different aspects of study design.

Type of Parenting Behaviors

Children's EC positively predicted all the affirmative parenting behaviors (i.e., warmth/sensitivity, teaching/scaffolding, authoritative parenting, and affirmative parenting composite), and negatively predicted all the suppressing/permissive parenting behaviors (i.e., intrusiveness, authoritarian parenting, harshness/rejection, permissive parenting, and suppressing/permissive parenting composite). In moderation analyses of parenting behaviors, I used the absolute value of the effect sizes to compare the strength of child effects of all the affirmative and suppressing/permissive parenting behaviors. Because the majority of studies examined warmth/support, this form of parenting was compared to each of the other dimensions as a first step to understand how children's EC were more or less related to different forms of parenting.

The strength of the child effect varied when I compared the effect between warmth/sensitivity and the suppressing/permissive parenting composite but not with any

other comparisons. Interestingly, there were fewer significant comparisons in effect sizes for child effects compared to parent effects (five differences in effect sizes were found based on type of parenting when testing moderation of parent effects compared to one difference for child effects). For child effects, the effect size was larger when using the suppressing/permissive composite variable compared to warmth/sensitivity. It is possible that children's dysregulation is more strongly related to later parental frustration and negative disciplinary behaviors or harshness compared to warmth or support (Tiberio et al., 2016). Consistent with this notion, Marceau et al. (2013) found that evocative gene-environment correlation (i.e., parenting as a response to children's genetically influenced behavior) rather than passive gene-environment correlation (i.e., direct environmental effects of parenting on child behavior) explained the association between parental negativity and adolescent externalizing problems—a concern that has been associated with low EC (e.g., Gartstein & Fagot, 2003). Thus, behavioral genetics work also indicates that suppressing/permissive parenting behavior is partially a response to children's heritable traits related to EC. Further, similar to findings of parent effects, compared with other individual suppressing/permissive parenting behavior, the composite variable could be a more valid measure of parenting behaviors. The comprehensiveness and rigorousness of suppressing/permissive parenting composite could explain why it was the only type of parenting behavior whose child effect was significantly stronger than warmth/sensitivity.

Type of EC

Unlike parent effects, type of EC did not significantly explain the variance of child effects. Child effects of all other types of EC were similar compared with EC composite.

Sample Characteristics

Children's Age. For sample characteristics, the hypothesis on the relation between children's age and child effects was supported. As children's age increased, the magnitude of child effects increased. This finding supported the argument in the model of socialization of children's emotions that as children grow older and their behaviors are more predictable and stable, parenting could become more "reactive" to their children's behaviors (Eisenberg et al., 1998a). According to the attributional model of parent cognition (Dix et al., 1986), as children develop, parents' beliefs about their children's behaviors are more likely to be attributed to children's dispositions, intentions, and behaviors. In turn, these attributions predict their actual parenting behaviors (Dix et al., 1986; Nix et al., 1999). Thus, when children grow older, parents may be more likely to attribute children's dysregulation and regulation as dispositional or as personality traits. When parents view their children's behavior as "just who they are," (as opposed to something temporary or due to the context), it is likely that parents react and behave in response to their children's attributes.

Similar to parent effects, another possible explanation for the moderation by age for child effects is that studies that focused on older children were more likely to use surveys to measure both parenting behaviors and EC. Shared method variance could increase the correlation between parenting and EC if both of them were measured by

surveys, especially when the surveys were reported by the same person (Podsakoff et al., 2012).

Children's Sex. For child sex, because most studies did not provide the correlations between parenting behaviors and EC separately for boys and girls, I compared effect sizes among studies that recruited about half boys and half girls, studies that recruited 60% and more boys, and studies that recruited 60% and more girls. Child effects were larger among studies that recruited mostly boys compared to studies with more even distribution of boys and girls. Perhaps child effects were stronger for samples that oversampled for boys because many studies that recruited mostly boys focused on children's risk for delinquency, aggression, and behavioral problems or difficulties (e.g., Abenavoli et al., 2015; Pears et al., 2015; Tiberio et al., 2016). Thus, it is possible, that child effects were stronger in "mostly boys" samples because EC (or lack thereof) in boys may be particularly eliciting of parents' behavior when children are at risk for misbehavior or externalizing symptoms. In the present review, because I did not compare the magnitudes of parent and child effects between boys and girls, whether child sex could explain variances of child effects needs more direct evidence to investigate.

Family Structure. For family structure (i.e., whether the family was a two-parent household), child effects of studies with fewer than 60% two-parent households were lower than child effects of studies with 60% or more two-parent households. All the eight studies that recruited fewer than 60% two-parent households had participants from low SES families on average. This finding indicates that compared with two-parent households, there could be more risk factors (e.g., low SES, mothers were adolescents) that were not coded in the present review in single-parent households. Due to these

potential risk factors, parents in single-parent households have reported more symptoms of depression, anxiety, and other health problems, and higher levels of parenting stress than parents in two-parent households (Compas & Williams, 1990; Louie et al., 2017). Because all the potential risk factors and stressors of parents' living condition and well-being could predict their parenting behaviors (e.g., Crnic et al., 2005; Gaertner, 2012; Lovejoy et al., 2000), the prediction from children's EC to parenting could be smaller in single-parent households than in two-parent households. In the present review, because I did not directly compare the magnitudes of parent and child effects between two-parent households and single-parent households, whether family structure could explain variance of child effects needs more direct evidence to investigate.

Parents' Sex. For sex of parent, child effects were stronger for studies that recruited 60% or more fathers than for studies that recruited 60% or more mothers. Although fathers are viewed not only providers but also active participants in their children's development now, many men may still view their primary role in the family as breadwinners and that their parenting role is somewhat voluntary (Cabrera et al., 2000). In other words, fathers may be more likely to choose when and how much they are involved in childcare; thus, it stands to reason that fathers might be particularly susceptible to children's characteristics, such as EC. In one study, child temperament indirectly predicted father involvement (through parents' marital satisfaction) but not mother involvement (Mehall et al., 2009). In addition, Leve et al. (2001) found a similar indirect relation between child temperament and fathers' pleasure with parenting mediated by fathers' marital satisfaction. These researchers showed child effects for fathers (but not necessarily for mothers). In the present review, because I did not directly

compare the magnitudes of parent and child effects between mothers and fathers, and there were many more studies that focused on mothers than on fathers, whether parent sex could explain variance of child effects needs more direct evidence to investigate.

Study Design

In terms of the role of measurement on the strength of child effects, the magnitude of child effects was higher if EC was measured by surveys compared with if EC was measured by observation/tasks. In addition, if both parenting and EC were measured by surveys, the magnitudes of child effects was larger than if parenting and EC were measured differently (i.e., one by observation/tasks and the other by survey). Because 67% studies that measured EC through surveys also measured parenting behaviors through surveys, similarity of methods could be the reason to explain this finding. Further, similar to parent effects, due to shared method variance, child effects were stronger when the informants of both variables were the same compared with when the informants were different. Consistency of informants could be a reason to explain the stronger child effects when both variables were measured through surveys.

There was also a moderating effect of the time difference between assessments when examining child effects. Unexpectedly, as the time lag between assessments increased, the magnitude of child effects increased. It is possible that this unexpected finding was due to the fact that the longer the gap, the older the child when parenting was observed. To determine if the gap between assessments was significant above and beyond the effect of child age, I re-ran the analyses using age (at both assessment points) as control variables. Results showed that the time gap between the assessments did not explain the variance in the multiple-moderator model, once the age was controlled. Thus,

the moderating effect of the time difference between assessments is likely due to the overlap with child age which was still significantly related to child effects after controlling for the time difference.

In summary, the findings indicated that the strength of child effects depended on a number of factors. In addition, there are more factors that explained the variance of child effects (10 factors) than the factors that explained the variance of parent effects (6 factors). Specifically, compared with children who were younger when parenting and EC were measured, and the time difference between parenting and EC was smaller, the prediction from earlier EC to later parenting was stronger for children who were older when parenting and EC were measured, and the time difference between parenting and EC was larger. Compared with samples who had similar amounts of boys and girls and more mothers, the prediction from earlier EC to later parenting was stronger for samples who had more boys and more fathers. Compared with warmth/sensitivity, the prediction from earlier EC to later parenting was stronger for suppressive/permissive composites. Compared with using observations/tasks to measure EC, using different types of measures (i.e., survey and behavioral tasks) for parenting and EC, and inconsistent informants to complete surveys on parenting and EC, the prediction from earlier EC to later parenting was stronger for using survey to measure EC, using surveys for both parenting and EC, and consistent informants to complete surveys on parenting and EC. Compared with samples who had more two-parent households, the prediction from earlier EC to later parenting was weaker for samples who had fewer two-parent household.

Theoretical and Methodological Implications and Future Directions

Results of the present study have the following theoretical implications. For parent effects, affirmative parenting behaviors may be especially beneficial to children's later EC, whereas suppressive/permissive parenting behaviors may hinder the development of children's EC. According to socialization of children's emotions model and social learning theory (Bandura & Walters, 1963; Eisenberg, 2020), children could learn effective and ineffective regulation strategies in their interactions with parents and their observations of parenting behaviors. That is, when parents use support and gentle guidance with their children, children are likely to learn to approach challenge in calm and attentive ways. On the other hand, if parents are harsh or overcontrolling, it is likely that children become overly aroused in challenging situations, which may promote dysregulated behaviors.

Similarly, attachment theory would suggest that affirmative parenting behaviors could positively predict children's EC through building a secure attachment relationship between the parent and the child, in which the child develops a working model of themselves as worthy of support and someone who can count on others in the future. Thus, children who develop secure attachment relationships are thought to be able to approach challenges with the belief that they can accomplish their goals rather than becoming anxious or frustrated (e.g., Leerkes et al., 2011; Nordling, et al., 2016; Thompson, 2015). Children may become less aroused if they feel supported and loved in the secure attachment relationship formed with their parents, and the warm and secure environment allows children to be more regulated. Stupica et al. (2017) found that priming of secure attachment between parents and children (6-7 years) decreased children's physiological responses to threat. Affirmative parenting behaviors like

responsiveness and sensitivity which are positively associated with secure attachment (e.g., McElwain & Booth-LaForce, 2006) could negatively predict children's arousal in general and in the situation involved with EC (e.g., Morris et al., 2011).

For child effects, children's EC ability may encourage parents to increase their use of affirmative parenting behaviors and reduce their use of suppressive/permissive parenting behaviors later. These findings support the argument that instead of being passive recipients of parenting behaviors, children could be part of the environment for parents in parent-child socialization (Bell, 1981). Specifically, theories on socialization of children's emotions and genotype-environment correlation suggested that children's EC could be a determinant of parenting behaviors because of its hereditary basis and its overlap with temperament and personality. Children's personalities that include temperament are children's pre-existing characteristics that could influence parenting practices (Eisenberg et al., 1998b), and children's genetic factors and heritable characteristics could also affect parenting behaviors (Ge et al., 1996; Neiderhiser et al., 1999). In addition, according to theories that explain family as a dynamic system (e.g., Relational Developmental Systems Perspective, Overton, 2013), parents and children as individual parts in the family could have both parent-driven and child-driven relations with each other rather than only relations of one direction. We could also understand both the child and the parent as subsystems in the family, which are dynamic and open to changes, have transactional relations, and are mutual socializers of parenting behaviors, children's development, and relationship quality (Cox & Paley, 1997). Thus, the prediction from children's EC to later parenting behaviors supported theories that

empathize child-driven effects and bidirectional relations between parental and children's behaviors.

Besides the theoretical explanations, intergenerational transmission from parents' EC to children's EC could be another reason to interpret the significant parent effects and child effects. Although I did not examine parents' EC in the present review, it has been found to relate to different types of parenting behaviors. Parents' EC ability is positively related with their warm and supportive responses toward children and negatively related to coercive and non-supportive parenting behaviors (Cumberland-Li et al., 2003; Valiente et al., 2007). In addition, individual differences in EC could be transmitted from parents to children through genetic factors. For example, Deater-Deckard (2011) found the correlations between first-degree biological relatives' (i.e., parent-child or sibling pairs) executive function to be .35-.44, but the correlations were near zero for adoptive relatives. Thus, the relation between parenting behaviors and children's EC could be partially explained by the hereditary transmission between parents' EC and children's EC no matter what the direction of the relation is.

Results of the current meta-analysis have the following methodological implications. First, the overall parent and child effects are effect sizes that researchers could use for power analyses if they would like to examine longitudinal relations between parenting behaviors and children's EC in either direction of the effect. When the estimated effect size is known, researchers could estimate the sample size required for the study. In addition, using results of this meta-analysis, researchers can estimate the power of analyses given any particular sample size. Overall effect sizes estimated by a meta-

analysis are much more reliable than effect sizes estimated by any individual empirical study.

Second, based on the finding that combined parenting behaviors (i.e., latent variables or composite scores) had stronger prediction to children's later EC compared with warmth/sensitivity, the results from this work suggest that researchers should use combined forms of parenting behaviors whenever possible. To further understand the role of parenting behaviors on children's later EC, person-centered approaches, such as cluster analysis and latent class analysis, also could be applied. Using person-centered approaches, researchers can examine the prediction of children's EC from unique combination of different parenting behaviors to child outcomes (Power, 2013). For example, Darling and Steinberg (1993) argued that the effects of parenting practices may vary when they were under different parenting styles which had larger dimensions. Using person-centered approach, researchers can examine if physical punishment has different effects when it was used by authoritarian or authoritative parents (Power, 2013). Rather than only focusing on a major type of parenting behavior and subsystems of parenting dimensions or types, a person-centered approach could focus on the functioning of parenting behaviors as a whole system (Mandara, 2003).

Third, if both parenting and children's EC are only measured by the same persons' reports without controlling for method variance, the relation of them could be inflated by reporter bias and the validity of the measures could be reduced (Podsakoff et al., 2012). Thus, it is important to control for shared method variance when studying the relation between them. Including control variables and using multitrait-multimethod (MTMM) designs have been suggested to deal with shared method variance (e.g.,

Brannick et al., 2010; Orth, 2013). MTMM is often conducted using confirmatory factor analysis and assumes that there are constructs or "traits" measured by different methods and the aim of MTMM is to isolate the trait variance from the method variance (Campbell & Fiske, 1959). Both multi-measures on the same variable and large sample size are required for robust results of MTMM (Brannick et al., 2010).

In addition, for studies using cross-lagged panel model, if they include three time points, both fixed effect model and random-intercept cross-lagged panel model (RI-CLPM; Hamaker et al., 2015) could control for all time-invariant variables that are not measured in the study through including latent intercept factors. Further, these two models are suggested to be used to examine the relations between parenting behavior and children's EC because the data of both parenting behavior and children's EC are required for all three time points. Thus, using fixed effect model and random-intercept cross-lagged panel model means testing the bidirectional relations between parenting behavior and children's EC.

Fourth, in the moderation analyses of both parent effects and child effects, categorical moderators created some issues for testing differences in effect sizes. That is, for many categorical moderators, although I compared their categories, the number of studies of each category were different from each other. To make the comparison more reliable between different categories in each demographic variable, future studies on parenting and children's EC should first recruit generalizable samples with more focuses on ethnic minority families, low-SES families, single-parent households, special population, and fathers. Second, it is important for researchers to examine correlations between parenting and children's EC separately among different categories. For example,

researchers could provide the correlation table separately for boys and girls if they recruited similar numbers of boys and girls. Relatedly, although I provided hypothetical explanations to results of moderation analyses for both parent effects and child effects, these explanations could not be tested in the present review. Thus, future empirical studies could examine potential processes (i.e., mediators and moderators) that explain how parenting predicts later EC or vice versa.

Strengths

The present review had several notable strengths. First, to our knowledge, this study was the first meta-analysis to examine the relation between parenting behaviors and children's EC, with focuses on bidirectional relations and children between seven months and 10 years. Because Li et al. (2019) have examined bidirectional relations between parenting behaviors and adolescents' self-control, the present review filled the gap in the literature by focusing on a younger population. Second, the huge number of studies and effect sizes in the present review provides a deep and comprehensive understanding in how parenting behaviors predict and are predicted by children's EC. The number was also enough to conduct most moderation analyses. Compared with individual empirical studies, using a large and diverse sample, the present review could provide more accurate guidance for future directions in the field as well as suggestions for parents, teachers, and policymakers to improve parenting, quality of parent-child interactions, and children's developmental outcomes. Third, in the present review, I provided detailed descriptions for the processes of selecting studies and coding all the information and effect sizes from studies. Further, two reviewers and four coders worked together for the present review to make sure all the processes were reliable. Fourth, I included both published and

unpublished studies in the present review and used three different methods to examine publication bias. Because the methods differ in assumptions, Type I error rates, and relations they investigate (Ekholm & Chow, 2018), using multiple methods could more comprehensively examine publication bias in meta-analyses.

Limitations

Despite the implications and strengths of the present meta-analysis, results should be considered in the context of some limitations of the present work. First, although I used cluster-robust variance estimation to control for the variance of studies for all analyses (Tanner-Smith et al., 2016), the level of dataset could not be controlled. This limitation means that different studies that used the same dataset were treated as independent samples in the analyses. Controlling for the variance of dataset may impact the results of the study. Techniques like metaSEM (Cheung, 2015) could be used to control for different levels of variances. In addition, a more ideal approach is to obtain the raw data of all the datasets used by the studies included in the present review and then run correlations for parent and child effects based on individual participant's data (Rogozińska et al., 2017).

Second, for moderation analyses of categorical moderators, because the reference group was determined based on the sample size of each group (i.e., the reference group usually had the largest sample size), other groups of the moderator were only compared with the reference group. This decision was problematic because if the moderator has more than two groups, besides the reference group, other groups of the same moderator were not compared with each other. For example, the reference group of the type of parenting behaviors was warmth/sensitivity, so all other 11 types of parenting behaviors

were only compared with warmth/sensitivity, but not with other types of parenting behaviors. Thus, the moderation analyses would be more specific if each group is set as the reference group to make all possible comparisons among all the groups.

Third, although I examined longitudinal bidirectional relations between parenting behaviors and children's EC, the effect sizes synthesized in the meta-analysis were still correlations, which could not imply causal relations between the two variables. Thus, to explore if changes in parenting could influence children's EC and if changes in children's EC could influence parenting, meta-analyses on experimental and intervention studies could be conducted in the future. Instead of using correlations, effect sizes of the comparisons between the intervention group and the control group or before and after an intervention could be synthesized and analyzed through meta-analytic methods.

Fourth, most authors (71 out of 91) that I contacted to request effect sizes did not respond to the email. Thus, data analyses were not based on all potential effect sizes in the studies that I collected. Results could be different if all potential effect sizes were obtained and used in the analyses.

Fifth, I did not examine the moderation effects of year of publication and year of data collection of either parent effects or child effects. Year of publication may be important given increased sophistication in measurement of EC and parenting over time. Further, given the potential impact of racial unrest, financial crisis, or the COVID-19 pandemic on families' experience of stress, it is possible that data collected between 2019 and beyond might look different than data collected earlier. Specifically, given the current findings, it is possible that the relations between parenting behaviors and children's EC during periods that include increased collective stress could be weaker than

during other periods. Researchers should consider those issues when additional data are published that include these historically relevant periods of time.

Conclusion

Small to moderate effect sizes of parenting behavior's prediction to children's later EC and the prediction from children's EC to later parenting behavior were found in the present study. Demographic variables, types of parenting behaviors and children's EC, and types of measurements of the two variables moderated parent effects or child effects. Using meta-analytic approach, the present review examined diverse data in terms of demographic variables, measurement types, and publication statuses, and focused on effect sizes and confidence intervals without significant testing. Thus, compared with empirical studies, findings in the present review could be more reliable and applicable to future directions.

Findings in the present review suggest that it is important for researchers to continue to examine the mechanisms in the dynamic relations between different parenting behaviors and children's EC. Although studies included in the present review collected data before COVID-19 started to spread, findings in the present review could inform research on parenting and children's EC in families, during and after the pandemic. For example, the increased stress brought by COVID-19 may reduce the relation between parenting and children's EC because stress itself could predict both parenting and children's EC. Additionally, although parents and children could spend more time together at home during the quarantine periods, the relations between parenting and children's EC may not be stronger because as I found in the present review, the quality of parenting behaviors is more important than then quantity of parenting behaviors.

Further, child-driven effects and bidirectional relations between parenting behaviors and children's EC are so important even from infancy. There are many benefits if we can better understand the relation between parenting and children's EC. For example, because bidirectional relations were found between parenting and children's EC in the present study, both parent and child effects could be applied in intervention studies. When children are old enough to participate in intervention programs, combined child training and parenting training programs may be the most effective to improve both parenting behaviors and children's EC. Moreover, because EC could predict many developmental outcomes related to children's socioemotional, psychological, and academic functioning, a better understanding of the relations between parenting behaviors and children's EC could have implications for how to improve children's socioemotional and academic competence, and their well-being.

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APPENDIX A

TABLES & FIGURES

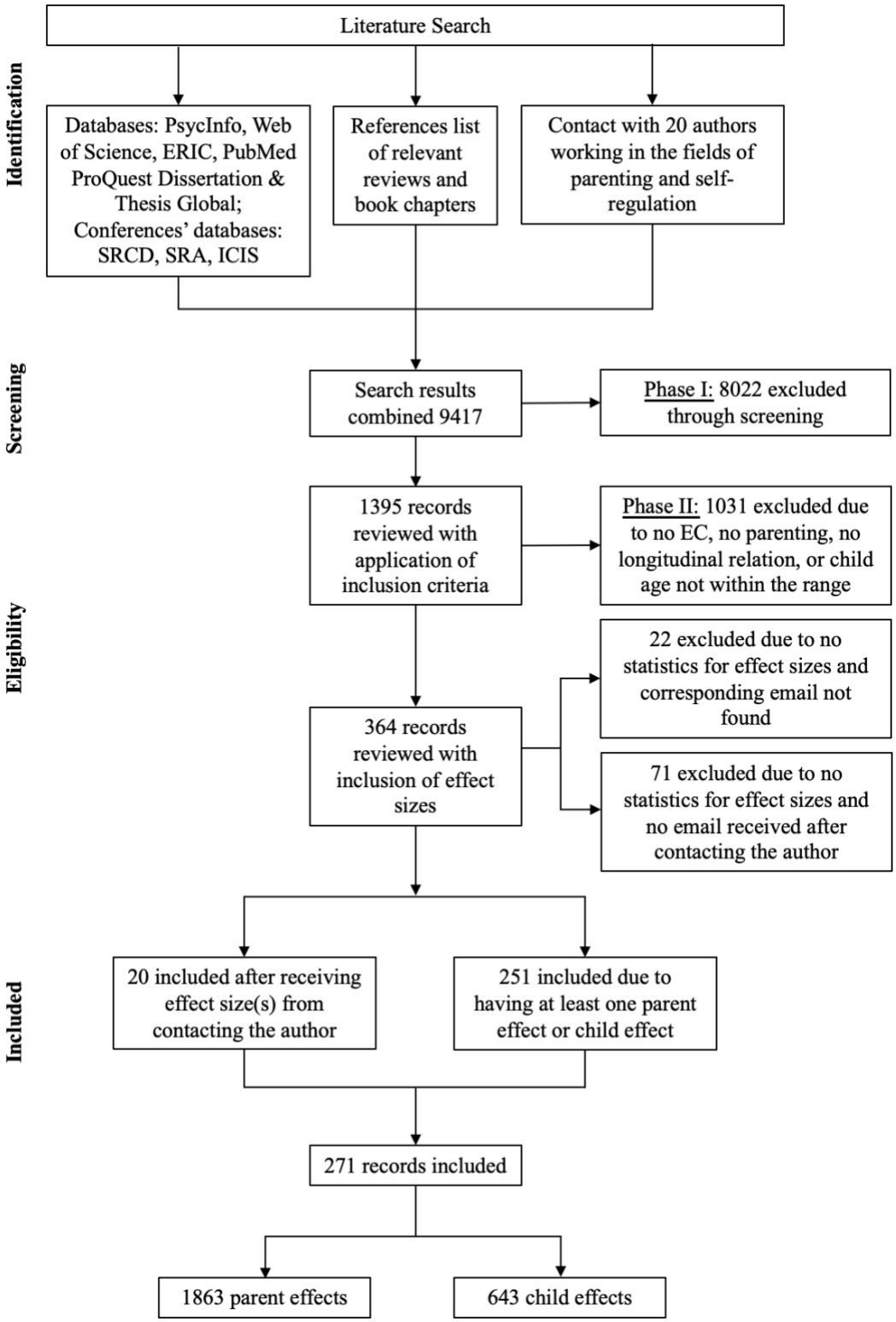

Figure 1. PRISMA flow used to identify studies for detailed analysis of bidirectional relations between parenting behaviors and children's EC.

Table 1
Descriptive Information of All Studies Included in the Present Review

	Parent effects	Child effects
Demographic variables (continuous)	*M* (*SD*)	*M* (*SD*)
Household income (in dollar)	47105.24 (18737.86)	49712.98 (16065.43)
Parents' education (in year)	14.07 (1.64)	13.85 (1.57)
Age at parenting's assessment (in month)	33.07 (25.43)	64.12 (37.96)
Age at EC's assessment (in month)	55.39 (31.40)	44.39 (29.38)
Time difference between parenting and EC (in month)	22.32 (17.37)	19.73 (18.16)
Demographic variables (categorical)	*N* (*k*)	*N* (*k*)
Child sex	1767 (245)	624 (83)
Boys and girls (each < 60%) combined	1527 (218)	506 (72)
= > 60% boys	141 (26)	72 (8)
= > 60% girls	99 (10)	46 (3)
Race and Ethnicity	1787 (250)	629 (83)
= > 60% Non-Hispanic White	1215 (157)	492 (55)
Two or more groups (each < 60%) combined	326 (64)	76 (14)
Black	119 (18)	8 (3)
Asian	61 (9)	30 (6)
Latino	66 (9)	24 (4)
SES	1604 (225)	586 (73)
Middle and high SES	1051 (142)	375 (41)
Low SES	553 (85)	211 (32)
Family structure	1294 (151)	480 (50)
= > 60% two-parent households	1152 (126)	453 (42)
< 60% two-parent households	142 (25)	27 (8)
Special population	1863 (257)	643 (85)
Non-special population	1557 (217)	569 (76)
Special population	229 (34)	74 (9)
Parent sex	1761 (240)	587 (77)
= > 60% mothers	1612 (231)	547 (76)
= > 60% fathers	163 (23)	40 (9)
Mothers and fathers (each < 60%) combined	19 (6)	1 (1)
Type of the main variables	*N* (*k*)	*N* (*k*)
Type of parenting behaviors	1863 (257)	643 (85)
Warmth/sensitivity	690 (137)	223 (42)
Autonomy support	33 (10)	5 (4)
Teaching/scaffolding	147 (41)	32 (13)
Supervision/involvement	85 (12)	17 (5)
Intrusiveness	110 (24)	43 (6)

Affirmative parenting composite	211 (57)	59 (14)
Suppressing/permissive parenting composite	93 (28)	27 (5)
Authoritative parenting	108 (30)	49 (9)
Authoritarian parenting	140 (46)	96 (20)
Harshness/rejection	203 (44)	81 (21)
Permissive parenting	18 (6)	10 (5)
Ignoring/neglect	25 (7)	1 (1)
Type of children's EC	1863 (257)	643 (85)
EC	473 (57)	365 (34)
Self-regulation	202 (38)	45 (11)
Emotion-regulation	246 (46)	55 (14)
Executive function	204 (51)	41 (11)
Attention control	307 (56)	87 (12)
Inhibitory control	431 (81)	50 (15)
Study design	*N* (*k*)	*N* (*k*)
Parenting's measure	1863 (257)	643 (85)
Survey only	1405 (202)	395 (50)
Observation/task only	384 (68)	248 (39)
Survey and observation/task combined	74 (7)	0 (0)
EC's measure	1863 (257)	643 (85)
Survey only	1211 (178)	338 (46)
Observation/task only	673 (104)	295 (49)
Survey and observation/task combined	16 (5)	10 (4)
Similarity of methods of parenting and EC	1863 (257)	643 (85)
Observations/tasks used for both	576 (92)	207 (32)
Surveys used for both	1028 (160)	263 (36)
Different methods used for both	259 (52)	173 (33)
Consistency of informants	326 (53)	205 (34)
Consistent	219 (36)	136 (27)
Inconsistent	107 (29)	69 (16)

Note. *N* = number of effect sizes, *k* = number of studies; *M* = mean; *SD* = standard deviation. *N* and *k* in the row of the name of each characteristic were the total number of effect sizes and study that reported the characteristic.

Table 2

Overall Effect Sizes by Age Periods for Parent Effects and Child Effects

	N (*k*)	*ES* [95%CI]	*r* [95%CI]	*SE*	*t*	*Q*	τ^2	I^2
Parent effects								
All periods combined	1863 (257)	.164 [.150, .177]	.162 [.157, .167]	.007	24.04**	7947.36**	.007	74.57%
7-15 months	480 (75)	.145 [.120, .170]	.144 [.135, .154]	.012	11.67**	1638.42**	.005	68.20%
15-30 months	638 (99)	.167 [.149, .185]	.165 [.157, .174]	.009	18.07**	2099.03**	.007	66.59%
30-60 months	557 (88)	.173 [.151, .194]	.171 [.162, .180]	.011	15.70**	2088.83**	.007	74.78%
60-90 months	101 (23)	.141 [.093, .189]	.140 [.118, .161]	.023	6.07**	536.39**	.007	85.75%
90-120 months	87 (20)	.199 [.156, .241]	.196 [.172, .220]	.020	9.75**	842.97**	.010	89.51%
Child effects								
All periods combined	643 (85)	.147 [.124, .170]	.146 [.138, .154]	.011	12.91**	1761.12**	.005	64.34%
7-30 months	101 (26)	.096 [.081, .111]	.096 [.082, .109]	.007	13.20**	108.07	.0004	9.41%
30-60 months	339 (42)	.141 [.123, .160]	.141 [.130, .151]	.009	15.47**	703.98**	.004	52.30%
60-90 months	77 (17)	.183 [.127, .238]	.181 [.154, .207]	.026	6.98**	236.03**	.008	77.49%
90-120 months	126 (18)	.179 [.126, .233]	.178 [.159, .196]	.025	7.11**	664.52**	.007	78.41%

Note. *N* = number of effect sizes, *k* = number of studies; *ES* = standardized estimated effect size using Fisher's *r*-to-*z* transformation; *SE* = standard error; CI = confidence interval.

*$p < .05$.

**$p < .01$.

Table 3

Results of Meta-Regressions of Continuous Moderators for The Parent Effect Model across All Developmental Periods

Continuous moderators	*N* (*k*)	Slope	*SE*	*t*	*p*
Household income	891 (107)	.0000	.0000	1.44	.15
Parents' education	1302 (180)	.0025	.0037	.66	.51
Age at parenting's assessment	1863 (257)	.0004	.0003	1.64	.10
Age at EC's assessment	1863 (257)	.0004	.0002	2.06	.04
Time difference between parenting and EC	1863 (257)	.0006	.0003	1.95	.05

Note. *N* = number of effect sizes, *k* = number of studies; *SE* = standard error.

Table 4

Results of Analyses of Categorical Moderators for The Parent Effect Model across All Developmental Periods

Categorical moderators	*N* (*k*)	*ES* [95% CI]	*r* [95% CI]	*F*
Child sex	1767 (245)			1.11
Balanced	1527 (218)	.16** [.15, .18]	.16** [.16, .18]	
= > 60% boys	141 (26)	.20** [.13, .27]	.21** [.19, .23]	
= > 60% girls	99 (10)	.21** [.12, .29]	.25** [.22, .28]	
Race and Ethnicity	1787 (250)			15.57**
= > 60% Non-Hispanic White	1215 (157)	.18** [.16, .20]	.18** [.16, .20]	
Balanced	326 (64)	.16** [.15, .18]	.16** [.15, .18]	
Black[a]	119 (18)	.12** [.08, .16]	.12** [.08, .16]	
Asian	61 (9)	.14** [.11, .16]	.14** [.11, .17]	
Latino[a]	66 (9)	.10** [.09, .11]	.10** [.09, .11]	
SES	1604 (225)			.22
Middle and high SES	1051 (142)	.16** [.15, .17]	.16** [.15, .17]	
Low SES	553 (85)	.17** [.14, .20]	.17** [.14, .20]	
Family structure	1294 (151)			.69
= > 60% two-parent households	1152 (126)	.16** [.14, .18]	.16** [.14, .18]	
< 60% two-parent households	142 (25)	.14** [.10, .18]	.14** [.11, .18]	
Special population	1863 (257)			.95
Non-special population	1557 (217)	.16** [.15, .18]	.16** [.15, .18]	
Special population	229 (34)	.18** [.15, .21]	.19** [.15, .23]	
Parent sex	1761 (240)			1.25
= > 60% mothers	1612 (231)	.17** [.15, .18]	.17** [.15, .18]	
= > 60% fathers	163 (23)	.14** [.08, .19]	.14** [.08, .19]	
Balanced	19 (6)	.21** [.13, .29]	.21** [.13, .29]	
Type of parenting behaviors	1863 (257)			9.49**
Warmth/sensitivity	690 (137)	.13** [.11, .15]	.13** [.11, .15]	
Autonomy support[a]	33 (10)	.20** [.14, .25]	.19** [.14, .24]	
Teaching/scaffolding	147 (41)	.14** [.11, .18]	.14** [.11, .18]	
Supervision/involvement[a]	85 (12)	.05** [.02, .09]	.05** [.02, .09]	
Intrusiveness	110 (24)	-.14** [-.19, -.09]	-.14** [-.19, -.09]	
Affirmative parenting composite[a]	211 (57)	.21** [.18, .25]	.21** [.17, .25]	
Suppressing/permissive parenting[a] composite	93 (28)	-.15** [-.26, -.04]	-.15** [-.26, -.04]	
Authoritative parenting	108 (30)	.11** [.05, .16]	.11** [.05, .17]	
Authoritarian parenting	140 (46)	-.11** [-.14, -.07]	-.11** [-.14, -.07]	
Harshness/rejection	203 (44)	-.10** [-.15, -.05]	-.10** [-.15, -.05]	
Permissive parenting	18 (6)	-.10 [-.20, .01]	-.09 [-.20, .01]	
Ignoring/neglect[a]	25 (7)	-.06** [-.07, -.05]	-.07** [-.08, -.05]	
Type of Children's EC	1863 (257)			2.92*

EC	473 (57)	.17** [.14, .21]	.17** [.14, .20]	
Self-regulation	202 (38)	.15** [.12, .18]	.15** [.12, .18]	
Emotion-regulation	246 (46)	.14** [.12, .17]	.14** [.12, .17]	
Executive function[a]	204 (51)	.22** [.19, .25]	.21** [.19, .24]	
Attention control	307 (56)	.15** [.13, .18]	.16** [.13, .19]	
Inhibitory control	431 (81)	.16** [.14, .18]	.16** [.14, .18]	
Parenting's measure	1863 (257)			1.20
Observation/task only	1405 (202)	.17** [.16, .18]	.17** [.16, .18]	
Survey only	384 (68)	.15** [.13, .18]	.15** [.13, .18]	
Survey and observation/task combined	74 (7)	.12** [.06, .19]	.13** [.06, .19]	
EC's measure	1863 (257)			1.72
Observation/task only	1211 (178)	.16** [.14, .17]	.16** [.14, .18]	
Survey only	673 (104)	.17** [.15, .19]	.17** [.15, .19]	
Survey and observation/task combined	16 (5)	.25** [.15, .35]	.25** [.15, .34]	
Similarity of methods	1863 (257)			6.25**
Others	576 (92)	.14** [.12, .16]	.14** [.12, .16]	
Observation/tasks consistent[a]	1028 (160)	.17** [.16, .19]	.17** [.16, .19]	
Survey consistent[a]	259 (52)	.18** [.16, .21]	.18** [.16, .21]	
Consistency of informants	326 (53)			4.25*
Consistent	219 (36)	.18** [.14, .23]	.18** [.14, .23]	
Inconsistent[a]	107 (29)	.13** [.11, .15]	.13** [.11, .15]	

Note. *N* = number of effect sizes, *k* = number of studies; *ES* = standardized estimated effect size using Fisher's *r*-to-*z* transformation; *r* = raw effect size without transformation; EC = effortful control; For child sex, race and ethnicity, and parent sex, Balanced = having more than one category of the moderator and each category's percentage was smaller than .60. For similarity of methods, Others = parenting behavior and children's EC were measured by different methods, one by observation/tasks, the other by survey, or at least one of them measured by observation/task and survey combined. For all moderators, the first category presented in the table is the reference group. *ES* was used for all moderation analyses.

[a]The category that was significantly different from the reference group of the moderator.

*$p < .05$, **$p < .01$

Table 5

Results of Meta-Regressions of Continuous Moderators for The Parent Effect Model by Developmental Periods

Continuous moderators	*N* (*k*)	Slope	*SE*	*t*	*p*
Household income					
7-15 months	203 (25)	-.0000	.0000	-1.05	.31
15-30 months	395 (47)	.0000	.0000	1.47	.15
30-60 months	193 (32)	.0000	.0000	.64	.53
60-90 months	43 (7)	.0000	.0000	2.80	.04
90-120 months	57 (13)	.0000	.0000	1.01	.34
Parents' education					
7-15 months	312 (53)	-.0037	.0059	-.63	.53
15-30 months	483 (67)	.0092	.0087	1.06	.29
30-60 months	385 (62)	-.0012	.0057	-.21	.83
60-90 months	55 (12)	.0182	.0067	2.71	.02
90-120 months	67 (15)	.0118	.0096	1.23	.24

Note. *N* = number of effect sizes, *k* = number of studies; *SE* = standard error; The age periods 7-15 months, 15-30 months, 30-60 months, 60-90 months, and 90-120 months were the age of the child when the parenting behavior was measured.

Table 6

Results of Meta-Regressions of Continuous Moderators for The Child Effect Model across All Developmental Periods

Continuous moderators	*N* (*k*)	Slope	*SE*	*t*	*p*
Household income	417 (46)	.0000	.0000	1.14	.26
Parents' education	513 (23)	.0039	.0045	.87	.39
Age at parenting's assessment	643 (85)	.0007	.0002	3.45	<.001
Age at EC's assessment	643 (85)	.0008	.0003	3.12	.003
Time difference between parenting and EC	643 (85)	.0012	.0003	3.97	<.001

Note. *N* = number of effect sizes, *k* = number of studies; *SE* = standard error.

Table 7

Results of Analyses of Categorical Moderators for The Child Effect Model across All Developmental Periods

Categorical moderators	*N* (*k*)	*ES* [95% CI]	*r* [95% CI]	*F*
Child sex	624 (83)			4.61*
Balanced	506 (72)	.14** [.12, .15]	.14** [.12, .15]	
= > 60% boys[a]	72 (8)	.23** [.14, .32]	.23** [.15, .31]	
= > 60% girls	46 (3)	N/A	N/A	
Race and Ethnicity	629 (83)			.26
= > 60% Non-Hispanic White	492 (55)	.15** [.12, .18]	.15** [.12, .19]	
Balanced	76 (14)	.14** [.10, .18]	.14** [.10, .17]	
Black	8 (3)	N/A	N/A	
Asian	30 (6)	.14** [.08, .21]	.14** [.08, .20]	
Latino	24 (4)	N/A	N/A	
SES	586 (73)			.52
Middle and high SES	375 (41)	.14** [.12, .16]	.14** [.12, .16]	
Low SES	211 (32)	.16** [.11, .21]	.16** [.11, .22]	
Family structure	480 (50)			10.33**
= > 60% two-parent households	453 (42)	.16** [.12, .19]	.16** [.13, .20]	
< 60% two-parent households[a]	27 (8)	.09** [.05, .12]	.09** [.06, .12]	
Special population	643 (85)			.12
Non-special population	569 (76)	.15** [.12, .17]	.15** [.12, .18]	
Special population	74 (9)	.16** [.10, .21]	.18** [.09, .28]	
Parent sex	587 (77)			4.31*
= > 60% mothers	547 (76)	.14** [.13, .16]	.15** [.13, .16]	
= > 60% fathers[a]	40 (9)	.23** [.14, .33]	.23** [.15, .32]	
Balanced	1 (1)	N/A	N/A	
Type of parenting behaviors	643 (85)			2.33*
Warmth/sensitivity	223 (42)	.12** [.09, .14]	.12** [.09, .14]	
Autonomy Support	5 (4)	N/A	N/A	
Teaching/scaffolding	32 (13)	.11** [.05, .16]	.11** [.05, .16]	
Supervision/involvement	17 (5)	.09** [.04, .15]	.10** [.04, .15]	
Intrusiveness	43 (6)	-.18** [-.23, -.13]	-.18** [-.23, -.13]	
Affirmative parenting composite	59 (14)	.17** [.12, .22]	.17** [.12, .22]	
Suppressing/permissive parenting[a] composite	27 (5)	-.30** [-.40, -.19]	-.29** [-.38, -.19]	
Authoritative parenting	49 (9)	.12** [.05, .18]	.13** [.04, .21]	
Authoritarian parenting	96 (20)	-.07** [-.12, -.02]	-.07** [-.12, -.02]	
Harshness/rejection	81 (21)	-.09** [-.15, -.03]	-.09** [-.15, -.03]	
Permissive parenting	10 (5)	-.15 [-.31, .02]	-.14 [-.31, .02]	
Ignoring/neglect	1 (1)	N/A	N/A	
Type of Children's EC	643 (85)			.93

EC	365 (34)	.16** [.12, .20]	.16** [.12, .20]	
Self-regulation	45 (11)	.14** [.11, .17]	.14** [.11, .17]	
Emotion-regulation	55 (14)	.12** [.09, .15]	.12** [.09, .15]	
Executive function	41 (11)	.16** [.11, .21]	.16** [.11, .20]	
Attention control	87 (12)	.13** [.09, .18]	.15** [.08, .21]	
Inhibitory control	50 (15)	.12** [.08, .16]	.13** [.08, .17]	
Parenting's measure	643 (85)			.51
Observation/task only	395 (50)	.14** [.12, .16]	.14** [.12, .16]	
Survey only	248 (39)	.16** [.11, .20]	.16** [.11, .20]	
Survey and observation/task combined	0 (0)	N/A	N/A	
EC's measure	643 (85)			4.51*
Observation/task only	338 (46)	.13** [.11, .14]	.13** [.11, .15]	
Survey only[a]	295 (49)	.17** [.13, .20]	.17** [.13, .20]	
Survey and observation/task combined	10 (4)	N/A	N/A	
Similarity of methods	643 (85)			2.92*
Others	207 (32)	.12** [.10, .15]	.12** [.10, .15]	
Observation/tasks consistent	263 (36)	.14** [.12, .15]	.14** [.12, .16]	
Survey consistent[a]	173 (33)	.18** [.14, .23]	.18** [.14, .23]	
Consistency of informants	205 (34)			6.65*
Consistent	136 (27)	.20** [.14, .26]	.20** [.14, .26]	
Inconsistent[a]	69 (16)	.13** [.10, .15]	.13** [.10, .15]	

Note. *N* = number of effect sizes, *k* = number of studies; *ES* = standardized estimated effect size using Fisher's *r*-to-*z* transformation; *r* = raw effect size without transformation; EC = effortful control; For child sex, race and ethnicity, and parent sex, Balanced = having more than one category of the moderator and each category's percentage was smaller than .60. For similarity of methods, Others = parenting behavior and children's EC were measured by different methods, one by observation/tasks, the other by survey, or at least one of them measured by observation/task and survey combined. For all moderators, the first category presented in the table is the reference group. *ES* was used for all moderation analyses.

[a]The category that was significantly different from the reference group of the moderator.

*$p < .05$, **$p < .01$

Table 8

Results of Meta-Regressions of Continuous Moderators for The Child Effect Model by Developmental Periods

Continuous moderators	*N* (*k*)	Slope	*SE*	*t*	*p*
Household income					
30-60 months	269 (24)	.0000	.0000	1.73	.10
60-90 months	5 (4)	.0000	.0000	.85	.49
90-120 months	82 (12)	.0000	.0000	.78	.45
Parents' education					
30-60 months	285 (30)	-.0032	.0060	-.54	.60
60-90 months	56 (12)	.0025	.0078	.33	.75
90-120 months	85 (13)	.0131	.0109	1.21	.25

Note. *N* = number of effect sizes, *k* = number of studies; *SE* = standard error; The age periods 30-60 months, 60-90 months, and 90-120 months were the age of the child when the EC was measured.

Table 9

Summary of Results of Publication Bias and Moderation Analyses of Parent Effects and Child Effects

	Parent Effects	Child Effects
Publication bias		
Moderation	✓	×
Egger's test	×	×
Sensitivity analysis	✓	✓
Continuous moderators		
Household income	×	×
Parents' education	×	×
Age at parenting's assessment	×	✓
Age at EC's assessment	✓	✓
Time difference between parenting and EC	×	✓
Categorical moderators		
Child sex	×	✓
Race and Ethnicity	✓	×
SES	×	×
Family structure	×	✓
Special population	×	×
Parent sex	×	✓
Type of parenting behaviors	✓	✓
Type of Children's EC	✓	×
Parenting's measure	×	×
EC's measure	×	✓
Similarity of methods	✓	✓
Consistency of informants	✓	✓

Note. ✓ = significant result of publication bias test or moderation analyses was found; × = significant result of publication bias test or moderation analyses was not found.

APPENDIX B

CODEBOOK

CODEBOOK

Variable	Description (If anything is not reported, then code as 999)
Article characteristics	
Article_Title	
Article Number (ID_A)	Record the ID number of the article. Coder 1 starts with 1001, Coder 2 starts with 2001, and Coder 3 starts with 3001
Authors (NAME)	Record the first author's last name.
Year of Report (YEAR)	Record the year the journal article was published. If article is unpublished (e.g., dissertation), record its acceptance date.
Year of data collection	Record the start year that data was collected if reported by authors. If not reported, code as 999.
Journal	Journal of publication; code 999 for dissertations and theses
Name_dataset	The name of the dataset used in the study (for example, "Add Health" or "TRAILS"). If the dataset was only used in one study, leave it blank
Independent_Study	Number of included independent studies, 1 = independent study , 2 = public used dataset / multiple used dataset. For example, multiple studies use 'Add Health' data.
ID of the dataset (ID_DATA)	leave it blank
Publication Status (PUB_STS)	1 = Publication, peer reviewed; 2 = Unpublished data (e.g., dissertations, conference presentations, thesis); 3 = In press; 4 = Manuscript (in progress)
Study_Type	1 = correlational study; 2 = intervention study
Sample characteristics	
Percent_Male	Record the proportion of males/boys up to two decimals (i.e., proportion of males out of the total sample, .54) within the study sample. If a number is given rather than a proportion, then divide the total number of males by total sample size.
Child_Gender (GENDER)	Record child gender according to the proportion of boys and girls included in the sample (coded categorically, 1 = overall balanced (the percentage of boys or girls of the sample ranging between 40% and 60%), 2 = >60% boys, 3 = >60% girls)
Country_of_Sample (COUNTRY)	Country of sample collection
Ethnicity	Code the category of ethnicity, 1 = balanced (i.e., no ethnicity exceeded 60% of the sample), 2 = the sample consisted of more than 60% non-Hispanic White, 3 = the sample consisted of more than 60% African or Black people in other countries, 4 = the sample consisted of more than 60% Asian or Asian in other

	countries, 5 = the sample consisted of more than 60% Hispanic, 6 = other (specify))
Percent_Race	Record the percentage of the major race and ethnicity who exceeded 60% up to two decimals (i.e., proportion of Asian out of the total sample, .78)
Income	Record the mean or median household annual income (by the actual number) of the sample. If a range of annual income is provided, take the midpoint of the reported range. For instance, add the upper and lower values of the reported range and divide by two.
Income_unit	The nuit of income (e.g., dollor, euro, pound, yuan, yen, and etc.)
Parent_Education (EDU)	Record the mean/median education level of parents (in years; e.g., 13) 5 years = graduation from primary school, 8 years = graduation from middle school; 12 years = graduation from high school; 16 years = graduation from college. If both parents' education were provided, caculate the average level between mothers and fathers. If a range of years completed is provided, take the midpoint of the reported range. For instance, add the upper and lower values of the reported range and divide by two
Parent_Occupation (OCCU)	The mean/median occupation or occupation level of parents (for levels, please also write down the system of the level they used)
SES	Record the socioeconomic status composition of the sample. For instance, authors will say if the sample of the study is mostly low-income or affluent. If the authors mention that the sample is diverse in terms of social class, status, income, education, or occupation, or if the authors refer to the sample as a community or nationally representative sample then this would be considered 3 = mixed socioeconomic status. Also, if percentages are reported for the distribution of income, education, or socioeconomic status and it appears that there are both high and low values (high and low income, or high and low education levels), then code as 3 = mixed. 1 = Low (e.g., low-income, socioeconomic disadvantaged) 2 = High (e.g., affluent, upper class) 3 = Mixed (e.g., middle-income, diverse, or income levels varied) 4 = Not reported
Family_Structure (STRUCTURE)	Code the category, 1= >60% two-parent household, 2 = balanced proportion, 3 = >60% single-parent household
Percent_mother	Record the percentage without % of mothers in the sample up to two decimals (i.e., proportion of Mothers out of the total

	parents, .89); If a number is given rather than a proportion, then divide the total number of mothers by total number of parents.
Parent_Gender	Studies were coded as to whether the parenting referred specifically to children's mothers or fathers. 1 = greater proportion of mothers (> 60% of the sample), 2 = greater proportion of fathers (> 60% of the sample), 3 = both parents, no clear proportion.
Special	Write down other characteristics about the family (families with parents who were veterans? depressed mothers? chidren low birth weight? children with developmental delayed? and etc...)
Clinical_target (CLIN)	1 = none of parents or children were clinical/sepcial population; 2 = only some or all children were clinical/sepcial population; 3 = only some or all parents were were clinical/sepcial population; 4 = both some or all parents and chidlren were clinical/sepcial population
Clinical_Percent_child	Record percent of children who meet the clinical diagonosis or have other special charateristics up to two decimals (i.e., proportion of depressed children of the total sample, .48) (if you code CLIN as 1, please code 999)
Clinical_Percent_parent	Record percent of parents who meet the clinical diagonosis or have other special charateristics up to two decimals (i.e., proportion of depressed mothers of the total sample, .48) (if you code CLIN as 1, please code 999)
Parent effect(s)	
Parent_Effect	Did researchers examine parent effect? (1 = yes; 2 = no)
Age_Parenting (AGE_PAR)	Age of children when parenting was assessed (in months)
Age_EC	Age of children when EC was assessed (in months)
Gap_assessments	Gap between assessments of parenting behavior and EC (in months)
Parenting_Term	Parenting term as mentioned in the paper
Parenting_Components	Components of parenting. If there is only one component, it is the same as Parenting_Term
Parenting_Measure	Measure to assess parenting (e.g., CCNES, HOME); provide the full name like Coping with Children's Negative Emotions Scale (CCNES)
Parenting_Measure_Category	1 = questionnaire only, 2 = observational task only, 3 = questionnaire and observational task combined
Parenting_Informant	Parenting informant as mentioned in the paper
Parenting_Spec	Parenting categories as mentioned in included paper, 1 = monitoring, 3 = support, 4 = authoritative, 5 = nurturing,

	responsive discipline, 7 = warmth, 8 = autonomy support , 9 = supervision, 10 = positive control, 11 = negative control, 12 = acceptance, 13 = parental sensitivity, 14a = parental positive expressivity, 14b = parental negative expressivity, 15 = family cohesion, 16 = conflict , 17 = authoritarian, 18 = harsh, 19 = hostility, 20 = permissive, 21 = coercion, 22 = rejection , 23 = withdrawal , 24 = abuse, 25 = involvement, 26 = intrusiveness, 27 = composite of positive parenting, 28 = composite of negative parenting, 29 = punishment, 30 = mind-mindedness, 31 = ignoring/neglect, 32 positive socialization, 33 = negative socialization
EC_Term	Term for self-control as mentioned in included papers (e.g., effortful control / self-regulation / executive functionning / etc.)
EC_Components	Components of EC. If there is only one component, it is the same as EC_Term
EC_Category	Record the category of EC terms, 1 = EC, 2 = self-regulation/self-control, 3 = emotion regulation, 4 = executive function(ing)/executive control, 5 = attention control / focusing / shifting / persistence 6 = inhibitory control / inhibition / delay of gratification 7 others
EC_Measure	Measure to assess EC (e.g., CBQ, ECBQ, EC battery); provide the full name like The Children's Behavior Questionnaire (CBQ)
EC_Measure_Category	1 = questionnaire only, 2 = observational task or behavioral task only, 3 = questionnaire and observational task
EC_Informant	EC informant as mentioned in the paper
Consistency	If the measures of parenting, EC, or both are observational / behavioral, code 999. If both measures are questionnaires, based on more detailed information of the informants, we code whether the parenting and EC measures were assessed by the same informant to assess reporting informant consistency (coded categorically, 1 = consistent, 2 = inconsistent)
Effect_Size_ID (ID_EFFECT)	Effect size ID, every effect size has a unique effect size ID (Coder 1 starts with 11, Coder 2 starts with 21, and Coder 3 starts with 31)
Raw_Effect_Size (RAW_EFFECT)	Effect size as retrieved from the paper
Effect_Size_Type (TYPE_EFFECT)	type of effect size (1 = Person's r, 2 = Cohen's d, 3 = Hedge's g, 4 = Odds Ratio)
Absolute_Size (ABSOLUTE)	absolute value of effect size used for the analyses recoded if 1) parenting pertained to negative dimensions, and 2) EC was

	measured using a scale of 'lack of EC', or 'low EC'); transfer other types of effect size as r.
Sample_Size (N)	Sample size of the effect
Fisher_Z (leave it blank)	Fisher Z transformation of Effect_Size (in Excel use function Fisher() function)
Variance (leave it blank)	Variance of the effect size (use formula (1/ (n-3))
Child effect(s)	
Child_Effect	Did researchers examine parent effect? (1 = yes; 2 = no)
Age_Parenting (AGE_PAR)	Age of children when parenting was assessed (in months)
Age_EC	Age of children when EC was assessed (in months)
Gap_assessments	Gap between assessments of parenting behavior and EC (in months)
Parenting_Term	Parenting term as mentioned in the paper
Parenting_Components	Components of parenting. If there is only one component, it is the same as Parenting_Term
Parenting_Measure	Measure to assess parenting (e.g., CCNES, HOME); provide the full name like Coping with Children's Negative Emotions Scale (CCNES)
Parenting_Measure_Category	1 = questionnaire only, 2 = observational task only, 3 = questionnaire and observational task combined
Parenting_Informant	Parenting informant as mentioned in the paper
Parenting_Spec	Parenting categories as mentioned in included paper, 1 = monitoring, 2 = responsiveness, 3 = support, 4 = authoritative, 5a = nurturing, responsive discipline, 5b = inconsistent, poor discipline, 6 = inductive reasoning, 7 = warmth, 8 = autonomy support , 9 = supervision, 10 = positive control, 11 = negative control, 12 = acceptance, 13 = parental sensitivity, 14a = parental positive expressivity, 14b = parental negative expressivity, 15 = directiveness, 16 = conflict , 17 = authoritarian, 18 = harsh, 19 = hostility, 20 = permissive, 21 = coercion, 22 = rejection , 23 = withdrawal , 24 = abuse, 25 = involvement, 26 = intrusiveness, 27 = composite of positive parenting, 28 = composite of negative parenting, 29 = punishment, 30 = mind-mindedness, 31 = ignoring/neglect, 32 positive socialization, 33 = negative socialization, 34 = scaffolding/teaching
EC_Term	Term for self-control as mentioned in included papers (e.g., effortful control / self-regulation / executive functioning / etc.)
EC_Components	Components of EC. If there is only one component, it is the same as EC_Term

EC_Category	Record the category of EC terms, 1 = EC, 2 = self-regulation/self-control, 3 = emotion regulation, 4 = executive function(ing)/executive control, 5 = attention control / focusing / shifting / persistence 6 = inhibitory control / inhibition / delay of gratification 7 others
EC_Measure	Measure to assess EC (e.g., CBQ, ECBQ, EC battery); provide the full name like The Children's Behavior Questionnaire (CBQ)
EC_Measure_Category	1 = questionnaire only, 2 = observational task or behavioral task only, 3 = questionnaire and observational task
EC_Informant	EC informant as mentioned in the paper
Consistency	If the measures of parenting, EC, or both are observational / behavioral, code 999. If both measures are questionnaires, based on more detailed information of the informants, we code whether the parenting and EC measures were assessed by the same informant to assess reporting informant consistency (coded categorically, 1 = consistent, 2 = inconsistent)
Effect_Size_ID (ID_EFFECT)	Effect size ID, every effect size has a unique effect size ID (Coder 1 starts with 11, Coder 2 starts with 21, and Coder 3 starts with 31)
Raw_Effect_Size (RAW_EFFECT)	Effect size as retrieved from the paper
Effect_Size_Type (TYPE_EFFECT)	type of effect size (1 = Person's r, 2 = Cohen's d, 3 = Hedge's g, 4 = Odds Ratio)
Absolute_Size (ABSOLUTE)	absolute value of effect size used for the analyses recoded if 1) parenting pertained to negative dimensions, and 2) EC was measured using a scale of ‘lack of EC’, or ‘low EC’); transfer other types of effect size as r.
Sample_Size (N)	Sample size of the effect
Fisher_Z (leave it blank)	Fisher Z transformation of Effect_Size (in Excel use function Fisher() function)
Variance (leave it blank)	Variance of the effect size (use formula (1/ (n-3))