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Parenting and Self-Control Across Early to Late Adolescence: A Three-Level Meta-Analysis

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Abstract

Self-control plays a significant role in positive youth development. Although numerous self-control challenges occur during adolescence, some adolescents control themselves better than others. Parenting is considered a critical factor that distinguishes adolescents with good self-control from those with poor self-control, but existing findings are inconsistent. This meta-analysis summarizes the overall relationship between parenting and self-control among adolescents aged 10 to 22 years. The analysis includes 191 articles reporting 1,540 effect sizes ($N = 164,459$). The results show that parenting is associated with adolescents' self-control both concurrently ($r = .204, p < .001$) and longitudinally ($r = .157, p < .001$). Longitudinal studies also reveal that adolescents' self-control influences subsequent parenting ($r = .155, p < .001$). Moderator analyses show that the effect sizes are largely invariant across cultures, ethnicities, age of adolescents, and parent and youth gender. Our results point to the importance of parenting in individual differences in adolescent self-control and vice versa.

Keywords

parenting, parent–child relationship, self-control, adolescence, meta-analysis

Adolescence is a distinct and pivotal period of life with significant changes and growth at every level of functioning. What happens during adolescence has profound and long-lasting implications for youth's trajectories of economic security, health, well-being, and development into later life (Patton et al., 2016). It is also a sensitive period featured by the increasing prevalence of risk behaviors jeopardizing youth's physical and psychological functioning across their life course (Arnett, 1992, 1999; Casey, Jones, & Hare, 2008; Steinberg, 2004). Consequently, numerous studies investigated what factors counteract adolescents' problem behaviors, and self-control is found to be such a factor (Caspi et al., 2016; Moffitt et al., 2011). Self-control—defined as one's ability to alter dominant responses to abide by social values and moral norms and to support the pursuit of long-term goals (Baumeister, Vohs, & Tice, 2007; Tangney, Baumeister, & Boone, 2004)—plays a key role in positive youth development

and is widely studied across disciplines such as criminology, economics, public health, and neuroscience (Caspi et al., 2016; Figner et al., 2010; Hare, Camerer, & Rangel, 2009). It helps adolescents get through a stage marked by a range of normative biological and social challenges (Crone & Dahl, 2012), increases in risk taking and social reward-seeking behavior (Boyer, 2006; Smetana,

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Campione-Barr, & Metzger, 2006), and heightened emotional turmoil (Steinberg & Morris, 2001).

For example, adolescents with higher levels of self-control use less drugs and alcohol (Vazsonyi, Trejos-Castillo, & Huang, 2006), experience fewer emotional and behavioral problems (Finkenauer, Engels, & Baumeister, 2005; J. B. Li, Delvecchio, Lis, Nie, & Di Riso, 2015; Situ, Li, & Dou, 2016; Vazsonyi & Belliston, 2007), show more prosocial behavior (Nie, Li, & Vazsonyi, 2016; Padilla-Walker & Christensen, 2011), and are more likely to do better academically than adolescents with lower levels of self-control (Duckworth & Seligman, 2005; Galla & Duckworth, 2015). Self-control generally continues to improve throughout adolescence in terms of neural and psychological development (Casey et al., 2008; Giedd, 2004; Romer, Duckworth, Sznitman, & Park, 2010); however, some adolescents show better self-control than others. To enhance our understanding of how these individual differences in self-control come about during the unique period of adolescence, we sought through the current meta-analysis to examine the relation between parenting and self-control across adolescence by considering the joint contribution of adolescents and parents to adolescent development.

Theorists agree that parenting is an important factor associated with individual differences in self-control (Bridgett, Burt, Edwards, & Deater-Deckard, 2015; Gottfredson & Hirschi, 1990; Kochanska, 1993; Kopp, 1982; Sameroff, 2010). More specifically, prior studies have found that positive parenting (e.g., monitoring, consistent discipline, parental warmth and support, positive control, authoritative parenting) and a strong parent-child relationship (e.g., secure attachment, close parent-child bonding, high quality of relationship) are related to better self-control. Conversely, negative parenting (e.g., inconsistent discipline, harsh parenting, coercive parenting, physical punishment, negative control, authoritarian parenting) and a weak parent-child relationship are associated with lower self-control in early and middle childhood (see Davis, Bilms, & Suveg, 2017; Karreman, van Tuijl, van Aken, & Deković, 2006; Pallini et al., 2018). However, studies extending this work to adolescence yield mixed findings. Whereas some studies have reported robust cross-sectional and longitudinal associations between parenting and self-control throughout adolescence (Hay, 2001; Hope, Grasmick, & Pointon, 2003; Özdemir, Vazsonyi, & Çok, 2013; Vazsonyi & Belliston, 2007), others have reported only significant concurrent associations (Baardstu, Karevold, & von Soest, 2017; Craig, 2016; Moilanen, Rasmussen, & Padilla-Walker, 2015; Pallini et al., 2018). Moreover, some studies have found significant associations for some parenting dimensions but not others (Finkenauer et al., 2005; Vazsonyi, Jiskrova, Ksinan, & Blatny, 2016). Thus, previous findings regarding the magnitude and direction of the

association between parenting and self-control in adolescence are not conclusive.

These inconsistent findings might be explained by the notion that parenting is most strongly associated with self-control during early and middle childhood and less in other developmental periods (Gottfredson & Hirschi, 1990; Hay & Meldrum, 2016; Kochanska, 1993; Kopp, 1982; Meldrum, Young, Hay, & Flexon, 2012; Vazsonyi & Jiskrova, 2017). During early and middle childhood, children rely mostly on their parents for decision making, behavior guidance, and emotion regulation, and parents support children with their self-regulatory capacities by providing an environment in which they assist their children in regulating inner feelings and behaviors (Kopp, 1982; Sameroff, 2010). When entering the teenage years, adolescents transit into a phase with relative independence as they gradually desire more autonomy from parents: Adolescents interact less with parents and more with peers and are more likely to negotiate with parents about social customs and/or conventions instead of merely following parents' guidance (Steinberg & Silk, 2002). Thus, in the teenage years the influence of parenting on the development of self-control may decrease (Farley & Kim-Spoon, 2014; Hay & Meldrum, 2016; Tiberio et al., 2016).

However, although adolescents may feel they are independent and responsible individuals, parents generally remain important figures adolescents turn to for emotional and financial support when needed (Buist, Deković, Meeus, & van Aken, 2002; J. B. Li, Delvecchio, Miconi, Salcuni, & Di Riso, 2014). These social changes and developmental transitions in adolescence yield an important question: Is parenting still important for self-control during adolescence? Asking this question is all the more important because scientists increasingly recognize that developmental and growth processes that have their beginning in early adolescence continue into the 20s (Sawyer, Azzopardi, Wickremarathne, & Patton, 2018). In addition, as societal changes lead to delays in adopting adult roles (e.g., life expectancy, longer educational trajectories), research calls for extending our conceptualization of adolescence as ranging from early adolescence to the early 20s (Arroyo, Payne, Brown, & Manning, 2013; Sawyer et al., 2018). In light of these considerations, researchers have pointed out that the adolescent period covers "a greater proportion of the life course with greater relevance for human development than ever before" (Patton et al., 2018, p. 458). Thus, it is crucial to take stock of the empirical findings and inform the field about the association between parenting and self-control across the course of adolescence.

The current meta-analysis adds to previous meta-analyses in several important ways. Previous meta-analyses regarding the association between parenting and self-control have focused either on young children

(Davis et al., 2017; Karreman et al., 2006) or on specific parenting practices or indicators such as parent-child synchrony (Davis et al., 2017) and attachment-security status (Pallini et al., 2018). Moreover, existing meta-analyses have failed to take possible reciprocal effects of self-control on subsequent parenting into account (Sameroff, 2010). It is especially important during adolescence to consider the effects of adolescent self-control on parenting, which may play a particularly important role in promoting and maintaining its continuity across adolescence. Indeed, it may well be that self-control in early adolescence evokes responses from parents that reinforce the child's tendencies over time (e.g., Caspi & Roberts, 2001). Finally, existing studies have not applied three-level analyses, a novel technique that better distinguishes variance at the sample, within-study, and between-study levels to provide a more accurate estimate of the results (Assink & Wibbelink, 2016), such as taking into account dependency between different effect sizes extracted from the same study without losing the rich information of a study that contains multiple effect sizes (M. W. L. Cheung, 2014; Van den Noortgate, López-López, Marín-Martínez, & Sánchez-Meca, 2013).

To our knowledge, a comprehensive review synthesizing empirical studies on the association between broad types of parenting and self-control among adolescents is still lacking. This is crucial because the interplay between individuals and their social environments is at the core of the development of self-control, especially across the adolescent period. Adolescents increasingly become active agents of their own development, and their levels of self-control are likely to evoke responses from their parents, generating a reciprocal influence of persons and environments (Eisenberg et al., 2005; Sameroff, 2010; Tiberio et al., 2016). We wanted to clarify whether parenting is associated with self-control across adolescence and to identify factors that influence this association; consequently, this pre-registered meta-analysis¹ aims to answer (a) whether parenting is important to the self-control of adolescents aged 10 to 22 years,² (b) whether adolescents' self-control influences subsequent parenting, and (c) whether theoretical (e.g., types of parenting, age, culture, parent and adolescent gender) and methodological (e.g., report informant, consistency of report informant, and study design) factors included in previous meta-analyses about self-control moderate the magnitude of the association between parenting and self-control in adolescence. Investigating these questions allows us to aggregate diverse individual study results to identify the overall mean effect and examine the role of possible moderators on the magnitude of this effect. Doing so generates insights about self-control development over the course of adolescence

and elucidates gaps that should be given attention in future research aiming to understand individual differences in this important capacity.

Conceptualization of Self-Control

Research on self-control spans the social and behavioral sciences (Duckworth & Steinberg, 2015). The nomenclature of self-control varies by theoretical tradition, with social psychologists and criminologists referring more often to self-control (e.g., Gottfredson & Hirschi, 1990; Tangney et al., 2004) and developmental psychologists referring to concepts such as self-regulation and effortful control (e.g., Bridgett et al., 2015; Eisenberg et al., 2003; Eisenberg et al., 2005; Kopp, 1982).

Although there is considerable dissent in the literature about how to label or define self-control, existing theories and findings generally agree that self-control, self-regulation, and effortful control tap into the same capacity. The common thread running through these concepts is the involvement of voluntary self-governance, an ability one consciously uses to manage one's cognition, emotion, and behavior (Bridgett et al., 2015; Duckworth & Kern, 2011; Nigg, 2017). Evidence from various aspects supports this view. First, studies applying factor-structure analyses combining tasks attributed to different conceptualizations of self-control are best presented by a single-factor model (Allan, Hume, Allan, Farrington, & Lonigan, 2014; Allan & Lonigan, 2011). Second, a meta-analysis that summarized the convergence of a number of self-control measures derived from different theories, perspectives, and approaches revealed that these measures are moderately convergent (Duckworth & Kern, 2011). In addition, neuroscientific research showed overlapping neural substrates associated with these concepts (Fan, Flombaum, McCandliss, Thomas, & Posner, 2003; Garavan, Ross, Murphy, Roche, & Stein, 2002). Therefore, in this study, we included self-control as well as these analogous terms, referring to them overall as "self-control," as done by prior meta-analyses on self-control (Davis et al., 2017; De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Karreman et al., 2006; Pallini et al., 2018; Vazsonyi, Mikuška, & Kelley, 2017).

The Association Between Parenting and Self-Control

Parenting is a multifaceted construct containing various terms reflecting different aspects of parenting processes. In this research, we mainly focused on three broad dimensions of parenting (i.e., positive parenting practices, negative parenting practices, and parent-child relationships) in relation to adolescent self-control.

Positive parenting refers to parental behaviors that reflect positive control and warmth, such as parental warmth, monitoring, supervision, consistent discipline, parental support, and authoritative parenting (Darling & Steinberg, 1993; T. G. O'Connor, 2002). Negative parenting refers to behaviors that reflect negative control and hostility, such as harsh parenting, inconsistent discipline, coercive punishment, authoritarian parenting, and permissive parenting (Darling & Steinberg, 1993; T. G. O'Connor, 2002). Parent-child relationships refer to children's emotional bonds with their parents (Cassidy, 1994); this construct is also often labeled *parent-child attachment* (Bowlby, 1969) or *parent-child bonding* (Gottfredson & Hirschi, 1990) across the literature.

The reasons we concentrate on these three broad types of parenting are threefold. First, the parenting literature has primarily focused on two broad categories of parenting, namely parenting behavior and practices (Darling & Steinberg, 1993), which is further divided into positive and negative parenting practices (T. G. O'Connor, 2002), and emotional relationships or bonds between parents and children (Belsky, 1984; Bowlby, 1969). Second, these three parenting categories correspond to existing theories from various disciplines. For example, the general theory of crime postulates that self-control is nurtured by positive parenting practices (monitoring, consistent discipline) and a close parent-child relationship, whereas negative parenting practices (excessive punishment, permissive parenting) and a weak parent-child relationship undermine self-control development (Gottfredson & Hirschi, 1990). The process model (Belsky, 1984) also suggests that parenting and parent-child relationships are different constructs within the family system that affect child development (Belsky, 1984). Third, as shown in Table 1, we have identified a host of specific parenting terms, with some (e.g., conflict, monitoring, authoritative) much more frequently used to examine the parenting-self-control association than others (e.g., neglect, overprotection, alienation). An advantage of focusing on the three broad types of parenting dimensions is that it allows us to group many relevant studies together, ensuring sufficient statistical power. If we focused on each specific term separately, it would not be possible to conduct moderation analyses because many terms would appear in the literature only a few times (e.g., neglect, overprotection, alienation) and statistical power would be low. Hence, in this study we focused on the three types of parenting dimensions, a strategy adopted by prior meta-analyses on parenting and child outcomes (e.g., Davis et al., 2017; Karreman et al., 2006; Pallini et al., 2018; Slagt, Dubas, Deković, & van Aken, 2016).

Table 1. Details on Parenting Dimension

Parenting term	Number of effect sizes ($N = 1,540$)		
	Positive parenting	Negative parenting	Parent-child relationship
Authoritative	139		
Monitoring	137		
Support	133		
Responsive discipline	95		
Warmth	81		
Supervision	53		
Positive control	46		
Involvement	33		
Positive expressivity	25		
Sensitivity	24		
Acceptance	21		
Autonomy	17		
Cohesion	6		
Conflict		117	
Authoritarian		97	
Psychological negative control		81	
Harshness		78	
Permissive		44	
Abuse		26	
Rejection		23	
Hostility		16	
Withdrawal		14	
Negativity		10	
Coercion		7	
Attachment			108
Relationship			47
Bond			21
Closeness			16
Communication			12
Trust			8
Alienation			5

Note: The associations between these dimensions and self-control are presented in Table S1 in the Supplemental Material available online.

The influence of parenting on self-control

Parents who use positive parenting strategies provide clear standards for behavior (Sroufe, 1996), monitor and discipline their children's undesirable behavior timely and consistently (Gottfredson & Hirschi, 1990), and guide them to work through problems themselves (Putnam, Spritz, & Stifter, 2002; Strand, 2002), all of which help them gradually internalize others' rules and expectations of what are appropriate behaviors and may foster the development of self-control in adolescents. Many studies linked positive parenting with youth's self-control, generally finding that positive parenting relates to good self-control development in

adolescents (e.g., Finkenauer et al., 2005; Hay, 2001; Hope et al., 2003; Özdemir et al., 2013; Vazsonyi & Belliston, 2007). However, it warrants attention that some inconsistent findings have emerged in terms of significance and magnitude. For example, Baardstu et al. (2017) found no significant longitudinal associations between positive parenting and self-control over the course of early adolescence.

Parents who use negative parenting strategies are likely to deprive youths of opportunities to figure out self-control strategies independently (Grolnick, McMenemy, & Kurowski, 1999), provide youths with little or no guidance to self-regulate when needed (Baumrind, 1991), monitor and discipline youths' undesirable behavior inconsistently or ineffectively (Gottfredson & Hirschi, 1990), and create a stressful family environment that jeopardizes children's internalization of social rules (Kochanska, Aksan, & Koenig, 1995; Silverman & Ragusa, 1990). Negative parenting therefore provides a context that hampers the development of self-control in adolescence. Consistent with this suggestion is prior research that has generally found that negative parenting is related to low self-control (e.g., Brody & Ge, 2001; N. W. T. Cheung & Cheung, 2010; Feldman & Wentzel, 1990; Hallquist, Hipwell, & Stepp, 2015; Simons, Simons, Chen, Brody, & Lin, 2007). Again, however, the evidence is inconsistent. For instance, prior research found that mothers' authoritarian and permissive parenting style and fathers' authoritarian and permissive parenting style were not significantly related to their adolescent children's self-control (Jabagchourian, Sorkhabi, Quach, & Strage, 2014).

For parent-child relationships, parents who successfully establish close bonds help children to develop better emotional regulation ability, which lays the foundation for the further development of self-control (Bowlby, 1969; Cassidy, 1994; Kopp, 1982; Pallini et al., 2018). A close parent-child relationship (in some studies defined as secure parent-child attachment)³ during adolescence serves as the foundation for parents to monitor, recognize, and discipline adolescents' behavior (Gottfredson & Hirschi, 1990) and, in turn, encourages children to share information about their daily activities with their parents (Kerr & Stattin, 2000; Parke, 2004). A close parent-child relationship thereby provides a context that is conducive to parental scaffolding and the teaching of self-control. Consistent with this suggestion are numerous studies that have found that secure attachment is associated with better self-control (e.g., Alvarez-Rivera & Fox, 2010; J. B. Li et al., 2015; Nie et al., 2016; Wills, Gibbons, Gerrard, Murry, & Brody, 2003; You & Kim, 2016). Nevertheless, the strength of the association varied considerably. Some studies found that the relation between parent-child relationships and

self-control was close to zero (e.g., Jones, Lynam, & Piquero, 2015), some found the relation to be significant but small (e.g., Walters & DeLisi, 2013), and some found the relation to be significant with a medium effect size (e.g., Watts & McNulty, 2016).

The influence of self-control on parenting

Adolescents are not passive recipients to parenting behaviors. Over the course of adolescence, their behaviors increasingly influence parenting behaviors. As such, adolescent development can be understood as a transactional or reciprocal process in which environmental factors (e.g., parenting) affect the development of adolescents (e.g., self-control) while an adolescent's behavior can also evoke certain reactions from his or her environment (for details, see the transactional model of development, Sameroff, 2010; social cognitive theory of personality, Bandura, 1999; genotype-environment correlation, Plomin, DeFries, & Loehlin, 1977; and ecological-systems theory, Bronfenbrenner, 1979).

In parent-child dyads, parenting behaviors (e.g., parental trust and warmth) are related to parents' knowledge about their children (Kerr, Stattin, & Trost, 1999). When parents know their children can exert self-control, resist temptations, and regulate their own behavior, parents are likely to trust their children, grant more autonomy, and respond positively to their behavior (Buyukcan-Tetik, Finkenauer, Siersema, Vander Heyden & Krabbendam, 2015). Prior studies involving adolescents and parents have found that adolescents with high levels of self-control elicit trust and warmth from their parents (Bradley & Corwyn, 2007; Buyukcan-Tetik et al., 2015; Tiberio et al., 2016). However, longitudinal research conducted among adolescents reveals nonsignificant effects of self-control on parenting over time (Eisenberg et al., 2005; Moilanen et al., 2015).

Likewise, children with good self-control are less impulsive and restless and engage in more socially desirable behavior, which may facilitate parents' relationship with them (Meldrum, Young, Hay, & Flexon, 2012). Although some studies have supported this relation in adolescents (Bradley & Corwyn, 2007; Otterpohl & Wild, 2015), other studies failed to find such associations in adolescent samples (Meldrum et al., 2012). Conversely, adolescents with poor self-control are likely to engage in delinquent behavior and succumb to temptation, which may spur parents to assert their power by using harsh or coercive practices to teach their children a lesson and ostensibly prevent the occurrence of the behavior in the future (Karreman et al., 2006; Kochanska et al., 1995; Silverman & Ragusa, 1990). For instance, prior research has found that adolescents with poor

self-control are likely to elicit harsh parenting 1 year after baseline (Brody & Ge, 2001). However, inconsistent findings also emerge: Moilanen et al. (2015) found that adolescents' self-control negatively predicts mothers' but not fathers' authoritarian parenting.

Potential Moderators

As shown above, the findings of the association of adolescent self-control and parenting are not consistent. This implies that the association between parenting and adolescent self-control may be moderated by several other factors, such as culture, age, and gender. A number of potential moderators are listed below.

Theoretical moderators

Type of parenting. Parenting is commonly categorized as positive and negative in terms of control and warmth (Darling & Steinberg, 1993; T. G. O'Connor, 2002), suggesting that positive and negative parenting include both emotional (e.g., affection, warmth) and behavioral (e.g., monitoring and control) components. A close relationship refers to emotional bonding and thus seems to solely represent the emotional component. Although a close emotional bond is important to the development of self-control, it is not enough to instill children with self-control without consistent discipline and appropriate monitoring (Gottfredson & Hirschi, 1990). This implies that the three categories of parenting may play a different role in the development of adolescent self-control. Therefore, in this study, we explored whether the three types of parenting relate differently to self-control over the course of adolescence.

Age. As adolescents develop, they become more independent, gain more autonomy from parents, negotiate more about social conventions, and become less attached to their family (Steinberg & Silk, 2002), suggesting that the association of parenting and self-control is likely to decrease over the course of adolescence. Recent research examined the influence of parenting on effortful control from early childhood to early adolescence, revealing that the effects of parenting practices (both positive and negative practices) decreased as children grew older (Tiberio et al., 2016). Moreover, in the study by Vazsonyi and Belliston (2007), the associations between positive parenting (i.e., closeness, support, monitoring) and low self-control were lower among U.S. college students ($r = -.104, -.166, \text{ and } -.117$, respectively) than those among U.S. urban ($r = -.212, -.248, \text{ and } -.219$, respectively) and rural ($r = -.185, -.326, \text{ and } -.132$, respectively) high school students. These findings, coinciding with theories

on the development of autonomy in adolescence (e.g., Collins & Steinberg, 2006), led us to hypothesize that the association between parenting and self-control would diminish as adolescents become older.

Culture. Prior research has revealed cross-cultural differences in parenting. For instance, Chinese parents are thought to use a more authoritarian style (or harsh parenting) than Western parents (Chao, 1994; Ng, Pomerantz, & Deng, 2014). However, scholars argue that parenting is closely dependent on cultural contexts and therefore any type of parenting, no matter whether it is positive or negative, should be effective in socializing children in a given culture (Fu & Markus, 2014; for an overview, see Smetana, 2017). Some cross-cultural studies directly compared the association between parenting and self-control in adolescents from different cultural and ethnical backgrounds but yielded mixed evidence. For instance, Vazsonyi and colleagues found that the association between positive parenting (e.g., closeness and monitoring) was significantly related to self-control in Swiss, Dutch, and Hungarian adolescents but not in Slovenian or Japanese (for monitoring only) adolescents and concluded such inconsistencies might be due to cultural differences in parenting (Vazsonyi & Belliston, 2007; Vazsonyi et al., 2006). In a study performed among Czech adolescents, Vazsonyi et al. (2016) found a positive relation between parental monitoring and self-control for Roma but not for non-Roma adolescents. Conversely, J. B. Li and colleagues (2015) found that the association between attachment to parents and self-control was largely invariant between Chinese and Italian adolescents. Given these findings, we explored whether culture moderates the parenting–self-control relation.

Culture contains multiple dimensions, and individualism is one of the most frequently used variables to define cultures (Oyserman, Coon, & Kimmelmeier, 2002). According to Hofstede (2001), some countries are more individualistic than others; thus, he developed an “individualism index” to reflect the levels of individualism of a country. In this sense, culture is treated as a continuum instead of a dichotomous category (e.g., Eastern vs. Western; independent vs. dependent). Moreover, we were aware that a number of studies on self-control and parenting involved several ethnicities within their own country that may be not entirely mapped onto a country's levels of individualism (e.g., Asians residing in the United States). Thus, we used both Hofstede's individualism score and ethnicity to capture the role of culture. In this study, we explored whether the individualism score of the country in which the samples were recruited and adolescent ethnicities would moderate the parenting–self-control association.

Adolescent gender. Research on gendered socialization (Gerson, 1985; Hagan, Simpson, & Gillis, 1987; Hayslett-McCall & Bernard, 2002) suggests that the processes shaping self-control may differ by gender. For instance, parents may tolerate certain behaviors (e.g., hanging out with friends at night) from boys that would be quickly curtailed if displayed by girls. This suggests that the influence of parenting on self-control could differ between boys and girls. Some studies have found that the associations between parenting and self-control were larger for girls than for boys (e.g., Evans, Simons, & Simons, 2012; Larsen et al., 2012; Mandara & Pikes, 2008). However, another line of work suggests that although parents may use different strategies to educate boys and girls, the effectiveness of parental socialization on children's development of self-control is comparable (Beaver, Wright, & DeLisi, 2007; Chapple, Vaske, & Hope, 2010; J. B. Li et al., 2015; Lynskey, Winfree, Esbensen, & Clason, 2000). In this study, we explored whether the association between parenting and self-control differed as a function of the proportions of boys and girls in the study sample.

Parent gender. Mothers are traditionally considered to be the main caregiver in the home and the most important socialization agent (Buist et al., 2002; Munroe, Munroe, Westling, & Rosenberg, 1997; Song, Thompson, & Ferrer, 2009). Yet some theories suggest that fathers and mothers are equally important to the socialization of children (Gottfredson & Hirschi, 1990; Lamb, 2010). Moreover, it is theorized that despite the traditional role of mothers in the family, fathers also play a significant role in children's adjustment, including helping children develop control of their misbehavior (Lamb & Tamis-LeMonda, 2004). However, empirical evidence for these suggestions is mixed. In some studies, the association between parenting and self-control appears stronger for maternal parenting (Intravia, Jones, & Piquero, 2012; Patock-Peckham, Cheong, Balhorn, & Nagoshi, 2001) or for paternal parenting (Feldman & Wentzel, 1990; Morris & Age, 2009), whereas some studies find a similar magnitude for both maternal and paternal parenting (e.g., J. B. Li et al., 2015; Nie et al., 2016; Özdemir et al., 2013). Given such disparities, we explored whether the parenting–self-control association varied as a function of the proportions of mothers and fathers in the study sample.

Methodological moderators

Report informants. Studies use a variety of methods to examine the relationship between parenting and self-control. Some studies use self-report measures, some use other informants (e.g., parent-report, teacher-report), and others even use observational and behavioral methods. Results on the parenting–self-control association may

vary across informants because family members as well as teachers and observers may have different experiences or views regarding parent–child interactions and adolescent self-control (Duckworth & Kern, 2011; Lanz, Scabini, Vermulst, & Gerris, 2001). In the current study, we explored whether the relation between parenting and self-control was different among different report informants.

Consistency of report informants. We further examined whether the consistency of report informants across constructs may moderate the link between parenting and self-control. Hypothetically, when the two constructs are assessed by the same informant (especially using self-report measures), their correlation is likely to be higher than when the two constructs are assessed by different informants (Willems et al., 2018). In addition, research has found that the correlation between self-reports and other-reports on personality questionnaires is higher than the correlation between self-reports and behavioral tests (Duckworth & Kern, 2011; Harden et al., 2017; Meyer et al., 2001). In light of this evidence, we explored whether the association between parenting and self-control is stronger when the two constructs were assessed using the same (i.e., consistent) rather than different (i.e., inconsistent) informants.

Study design. Both cross-sectional and longitudinal designs are used to test the association between self-control and parenting, but differences in the magnitude of concurrent versus longitudinal associations are not well quantified. Such comparisons have been done in other meta-analyses focusing on the link between self-control and deviance, with some studies revealing larger effect sizes for cross-sectional than for longitudinal study designs (Pratt & Cullen, 2000) but others finding no significant differences between designs (Vazsonyi et al., 2017). In this meta-analysis, we tested whether the association between parenting and self-control would be different in magnitude for cross-sectional versus longitudinal studies. Using longitudinal studies, we also explored whether the influence of parenting on later self-control differed from the influence of adolescent self-control on later parenting. This examination allowed us to pit the effect of parenting on self-control and the effect of self-control on parenting against each other.

Method

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist (Moher et al., 2015) was used as a guideline for the setup of this meta-analysis. Furthermore, to facilitate transparency (Lakens, Hilgard, & Staaks, 2016), the aim and hypotheses of this meta-analysis were preregistered at AsPredicted (<https://>

aspredicted.org). Our full coding sheet, including all of the obtained effect sizes, moderating variables, and R analysis scripts, can be found in the Supplemental Material available online.

Search of studies

Articles were retrieved through a computerized literature search of the electronic databases of the Education Resources Information Center (ERIC), PsychINFO, PubMed, and the Web of Science. A literature search was conducted for studies published up to November 2016 with three categories of key phrases used to search (a) key words containing variables concerning parenting or parent–child relationships (*parent** or *mother** or *father** or *parental* or *maternal** or *attachment** or *family** or *bond**); (b) key words regarding self-control (*self-control* or *self control* or *self-regulation* or *self regulation* or *self-discipline* or *self discipline* or *effortful-control* or *effortful control*¹); and (c) key words focusing on adolescents⁵ (*adolescent** or *adolescence* or *teen** or *youth** or *child** or *student** or *undergraduate* or *emerging adult** or *young adult**).

Inclusion criteria

Studies were eligible for this meta-analysis when they met the following criteria. First, the study had to assess the relationship between any type of parenting (e.g., parental warmth, parental harshness) or the parent–adolescent relationship (e.g., parental attachment, parental bond) and self-control. Specifically, the study had to report on self-control or interrelated concepts such as self-regulation, effortful control, or domain-specific forms of control such as impulse regulation. If no correlations were reported in the article, we contacted the corresponding author.

Second, the study had to focus on community-based samples, excluding clinical populations with psychological (e.g., cognitive impairments, autism) and/or physical (e.g., traumatic brain injury, diabetes, asthma) symptoms and/or criminal offenders. We are interested in the general population, and clinical groups may influence the magnitude or direction of effect sizes (Rothbaum & Weisz, 1994).

Third, the mean age of the participants in the study had to fall within the age range of the adolescent period used in the current study (i.e., 10–22 years). The age range of adolescence is commonly considered to be between 12 and 18 years. However, we decided to broaden this range for two reasons. First, the beginning age of adolescence is related to puberty, and the World Health Organization (2017) has considered that the age of 10 years can be seen as the starting age of

adolescence because of the earlier onset of puberty than in the past. Second, we consider the age of 22 years as the upper bound of adolescence because in this new era, youths have more time to develop instead of rushing to reproduce or make a living (National Research Council, 2015). In addition, a recent study suggests that 21 to 22 years can be seen as the cutoff age when adolescents become adults in terms of brain maturity (A. O. Cohen et al., 2016). In the case of longitudinal designs, the study had to assess at least one of the constructs (i.e., parenting or self-control) during adolescence. For example, in a longitudinal study that assessed parental warmth and self-control at the ages of 8, 12, and 14 years, the concurrent and longitudinal correlations within and between the ages of 12 and 14 years were included. Longitudinal correlations between the ages of 8 and 12 years and between 8 and 14 years were also included, but concurrent correlations at the age of 8 years were excluded.

Fourth, the study had to be published in English in a peer-reviewed journal, with the full text available for download. We did not include unpublished work, review articles, book chapters, dissertations, and conference abstracts, as findings in these forums are often subsequently published in peer-reviewed journals. The inclusion of only peer-reviewed articles has been widely accepted in prior meta-analyses (e.g., Karreman et al., 2006; Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Slagt et al., 2016). Moreover, research has shown that meta-analyses that include unpublished studies are just as likely to find evidence for publication bias as those that do not (Ferguson & Brannick, 2012).

Selection procedure

The initial search in the databases yielded 6,792 hits after removing duplicates. The first two authors screened all abstracts independently, selecting articles for full-text reading. This resulted in 814 potentially relevant articles. These articles were carefully screened to determine whether they met the inclusion criteria. A number of articles were excluded because they did not include an appropriate measure of parenting and/or self-control ($k = 252$); the study consisted of a clinical population or a population in the wrong age range ($k = 94$); no full text in English was available ($k = 76$); the article was not published as a journal article ($k = 69$); or no correlation table was available ($k = 156$). For the latter 156 articles, the corresponding authors were contacted by e-mail to request additional information. Some authors declined our invitation because they no longer had access to the data (6%), some authors could not be contacted because no valid e-mail address was found (12%), and others provided us with the necessary

correlations (15%, yielding 24 additional articles to include). Most of our e-mails remained unanswered (67%). Finally, 191 studies met the selection criteria and were included in the meta-analysis. See Figure 1 for the PRISMA flowchart depicting the full search and inclusion process.

Coding of the studies

We developed a detailed coding scheme based on guidelines proposed by Lipsey and Wilson (2001), recording study descriptors and study characteristics potentially moderating the relation between parenting and self-control in adolescence. Study descriptors included basic information for all studies, such as author names, year of publication, article title, details on data collection, and sample size. Study characteristics possibly moderating the relation between parenting and self-control in adolescence were grouped into two moderator categories: moderators of theoretical interest and methodological characteristics.

Theoretical moderators

Type of parenting. To assess possible moderating effects of parenting types, we divided parenting practices and parenting characteristics into the three categories (Davis et al., 2017; Doyle & Markiewicz, 2005; Gallarin & Alonso-Arbiol, 2012; Hoeve et al., 2009; Karavasilis, Doyle, & Markiewicz, 2003; Karreman et al., 2006; Slagt et al., 2016): positive parenting, including supervision, support, autonomy sensitivity, involvement, monitoring, authoritative parenting, warmth, and positive expression; negative parenting, including harsh parenting, neglect, rejection, negative expressions, authoritarian parenting, and permissiveness; and parent-child relationships, including social bonds, closeness, attachment, and security. Studies were coded as follows: 1 = positive parenting, 2 = negative parenting, or 3 = relationship, respectively. See Table 1 for a detailed overview of the subdivision of parenting types.

Age. We coded age continuously. Some studies did not report age but school grade. If this was the case, we took the average age of that grade. For example, children in Grade 6 in the United States are on average between the ages of 11 and 12 years, and we therefore considered 11.5 years the mean age for this sample.

Culture. As mentioned above, we used the individualism index and ethnicity to represent culture. We coded the level of individualism of the country in which the data were collected according to Hofstede's individualism score (www.hofstede-insights.com). The score is a

continuous index, with higher scores for more individualistic societies (e.g., an index of 91 for the United States) and lower scores for more collectivistic societies (e.g., an index of 17 for Taiwan). Regarding ethnicity, we coded the ethnicity of adolescents in the sample as follows: 1 = balanced (i.e., no ethnicity exceeded 60% of the sample), 2 = > 60% White, 3 = > 60% African or African American, 4 = > 60% Asian or Asian American, 5 = > 60% Hispanic, or 6 = other.

Adolescent gender. We coded adolescent gender categorically according to the percentage of boys and girls included in the sample as 1 = overall balanced (the percentage of boys and girls in the sample ranged between 40% and 60%), 2 = > 60% boys, or 3 = > 60% girls.

Parent gender. Studies were coded for whether the parenting referred specifically to adolescents' mothers or to adolescents' fathers. Often, however, parenting measures assessed parenting in general and did not specifically mention whether the measure focused on mothers, fathers, or both parents. As a result, we categorized the variable as follows: 1 = greater percentage of mothers (> 60% of the sample), 2 = greater percentage of fathers (> 60% of the sample), or 3 = both parents, no clear percentage.

Multilevel analysis allows researchers to include multiple effect sizes from one study while simultaneously taking dependency into account. Thus, categories of positive and negative parenting and parent-child relationships were not mutually exclusive, with studies contributing effect sizes to multiple categories. Likewise, studies contributed to multiple ages if the design of the study was longitudinal and to parent gender if the effects of parenting on adolescent self-control were given separately for mothers and fathers. Nevertheless, the multilevel analyses allowed us to diminish the bias caused by the studies that provide multiple inputs.

Methodological characteristics

Report informant. Studies were coded for the informant of the parenting and self-control measures, respectively, as follows: 1 = adolescent self-report, 2 = other-report (e.g., parent, mother, father), 3 = observation, or 4 = composite (combining measures of multiple informants or assessment modalities).

Consistency report informant. To assess report informant consistency, we coded whether the parenting and self-control measures were assessed by the same informant as 1 = consistent or 2 = inconsistent. Attention was paid to the elements that made up the composite score. For example, if parenting and self-control were both

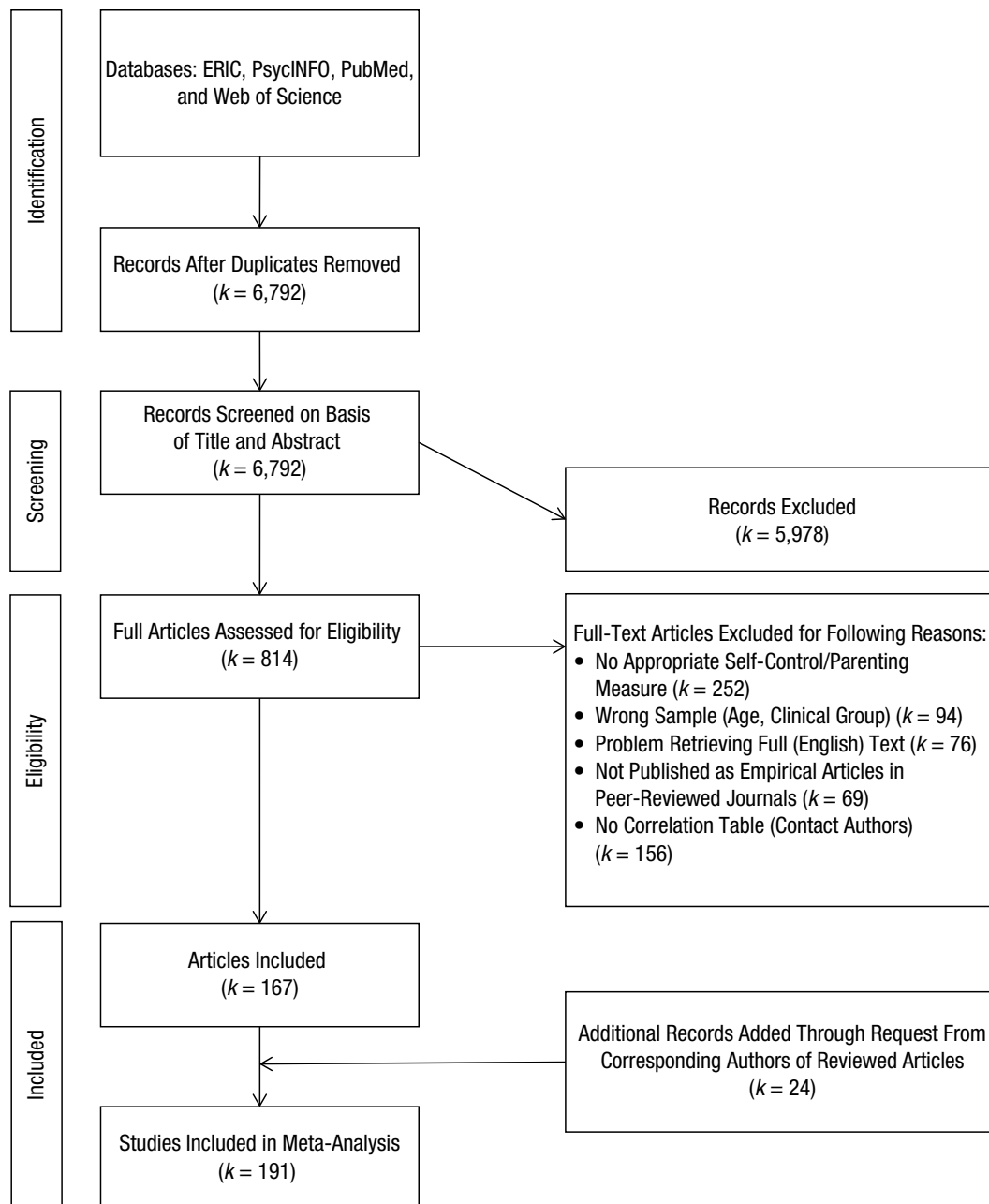


Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart used to identify studies for detailed analysis of parenting and self-control. ERIC = Education Resources Information Center.

composite scores combined from the self-report and mother-report, then we considered the informant as consistent. If one composite score was combined from the self-report and mother-report whereas the other combined the self-report and teacher-report, we considered the informant as inconsistent.

Study design. Study design was coded as a categorical variable, including whether the effect size between parenting and self-control was derived from cross-sectional

or longitudinal studies (1 = cross-sectional, 2 = longitudinal). For longitudinal studies we also included effect sizes for which parenting was measured first and self-control was measured some time later (i.e., $P \rightarrow SC$). Likewise, we included effect sizes for which self-control was measured first and parenting was measured some time later ($SC \rightarrow P$). As a result, we coded whether the effect size referred to the influence of parenting on self-control or the influence of self-control on parenting as follows: 1 = $P \rightarrow SC$ or 2 = $SC \rightarrow P$.

Interrater agreement

Of the 814 eligible articles, 20% were randomly selected to be double-coded by the first two authors. Intraclass correlation (for continuous variables) and Cohen's κ (for categorical variables) were calculated. Intraclass correlations for continuous variables were high, ranging from .78 (for age) to 1.00 (for individualism score). Cohen's κ for the categorical variables ranged from .91 (for including or excluding studies) to 1.00 (for study design, effect-size direction, and informant parenting). We resolved disagreement by in-depth reading and discussion based on the content of the article. Together, these results showed good interrater reliability, reflecting a good agreement for the study characteristics between the two independent raters.

Effect sizes

To investigate the magnitude of the relationship between parenting and self-control, we obtained Pearson's correlation coefficients obtained for all included studies (Lipsey & Wilson, 2001). Zero-order correlation coefficients are bivariate estimates typically obtained from each empirical study's correlation matrix or requested from the authors if none was provided in the full text. To ensure a similar direction of effects, we recoded effect sizes if (a) parenting pertained to negative dimensions and (b) self-control was measured using a scale of *lack of self-control* or *low self-control*. We used Fisher's *r*-to-*z* transformation (Fisher, 1921), converting the effect-size estimate from each association into an ES_z score to correct for skewness in the sampling distribution of *r* (Lipsey & Wilson, 2001). This ES_z score is assumed to approach normality, which is necessary for the accurate determination of mean effect-size estimates and for unbiased tests of statistical significance. As a result, ES_z scores were included in the analyses and transformed back to Pearson's *r* for interpretation purposes (Field, 2001; Lipsey & Wilson, 2001).⁶ For moderator analyses, categorical variable categories were transformed to $k - 1$ dummy variables through binary coding (Assink & Wibbelink, 2016; Lipsey & Wilson, 2001).

Publication bias

Previous research has consistently shown that nonsignificant studies are more likely to be rejected for publication or remain unsubmitted by authors (Lipsey & Wilson, 2001; Torgerson, 2006). This publication bias may result in inflated effect sizes and a restricted range of values in meta-analyses (Rosenthal, 1979). Therefore, it is important to statistically assess the possible

influence of publication bias before interpreting the final results. In the current study, we handled this problem by applying a funnel plot, plotting the distribution of each individual study's effect size on the horizontal axis against its precision expressed in standard errors on the vertical axis (Torgerson, 2006). If a publication bias affects the data, an asymmetrical funnel plot is to be expected (Begg, 1994). In addition, Egger's test was applied to test the significance of the asymmetry of the plot, providing more precise information on the possible presence of publication bias (Egger, Smith, Schneider, & Minder, 1997). When this test yielded significant results, sensitivity analyses were conducted by applying the trim-and-fill method, correcting for the asymmetric plots by imputing missing effect sizes through a number of iterations (Duval & Tweedie, 2000a, 2000b). Imputing nonexistent effect sizes, however, is controversial, and effect sizes produced by the trim-and-fill analyses should be interpreted with caution (Sutton, Duval, Tweedie, Abrams, & Jones, 2000).

Data analyses

All analyses were conducted in the *metafor* package (Viechtbauer, 2010) for the R software environment (Version 3.4.2; R Core Team, 2017). Most studies reported on multiple effect sizes. For example, some studies included longitudinal data (yielding effect sizes for different time points), different raters (resulting in effect sizes separately for the mother-report and father-report), and effect sizes separately for boys and girls. It is likely that these effect sizes from the same study are more similar than effect sizes from different studies because they rely on the same sample, data collection, and sampling methods. When using nested effect sizes, however, the assumption of traditional meta-analyses that observations are independent and error terms are uncorrelated is violated (Lipsey & Wilson, 2001; Rosenthal, 1984). Not taking into account this dependency can result in a biased result, as it may create artificially narrow confidence intervals and shrunken standard errors favoring statistical significance (Hox, Moerbeek, & van de Schoot, 2010).

Strategies applied to handle this dependency problem include selecting one effect size from each study, averaging effect sizes within studies, or simply ignoring the dependency of effect sizes (Lipsey & Wilson, 2001). However, more recently the multilevel meta-analysis has been suggested as a more preferable tool, as it takes into account dependency while including all available effect sizes, resulting in maximum information and greater statistical power (Assink & Wibbelink, 2016; Hendriks et al., 2017; Hox et al., 2010; Van den Noortgate et al., 2013). Three-level models apply when

groups are nested within clusters and thus are not independent from one another. In our case, we have variance at the effect-size level (Level 1) that is nested within a sample (Level 2; e.g., effect sizes based on the National Longitudinal Study of Adolescent to Adult Health, or Add Health, data set; Harris et al., 2009), with variance also between studies (Level 3; taking into account that effect sizes vary between studies). Incorrectly modeling this dependency in the data will likely result in biased standard errors, leading to incorrect inferences about the relationships being studied (Viechtbauer, 2010).

Accordingly, we applied a three-level model to account for the three sources of variance: Level 1 takes into account the sampling variance of the effect sizes; Level 2 takes into account the variance between effect sizes from the same sample, allowing effect sizes to vary within studies; and Level 3 takes into account the variance between studies, allowing effect sizes to vary between studies (Hox et al., 2010; Van den Noortgate et al., 2013). In addition, because parameter estimates from different levels of analyses are not independent in this multilevel approach, no greater weight will be placed on studies with more effect sizes. Thus, a study that, for example, includes 10 effect sizes will not contribute 10 times more to the mean effect size than a study that has only one effect size (Van den Noortgate et al., 2013). Overall, multilevel modeling allows including effect sizes on the basis of the same sample, providing more precision in estimating mean effect sizes while simultaneously modeling the nestedness of the data (Cheung, 2014; Van den Noortgate et al., 2013).

The current three-level analysis was conducted in three stages. First, the overall mean effect sizes were estimated to assess the strength of the association between parenting and self-control in adolescence. Second, we applied a likelihood-ratio test to assess between-study and within-study heterogeneity. It is important to note that the level of “study” entails the data set. For example, multiple papers are based on the Add Health data set. Accordingly, for the multilevel analyses, we gave studies using the same data set (e.g., all published studies using Add Health data) the same study ID, clustering them as if they were all from one published study. This allowed us to take into account this dependency, referring to the included studies as the number of independent studies.

Third, if there was evidence for heterogeneity in effect sizes (presented as a Q_E that, when significant, indicated heterogeneity among effect sizes), moderation analyses were conducted for moderators of theoretical interest and methodological characteristics. To obtain reliable results, we conducted moderator analyses only if each category contained at least five studies

(parameter estimates are poor when the number of studies is very small; Weisz et al., 2017).

The three-level analyses were conducted according to the three-level random-effects model guidelines formulated by Assink and Wibbelink (2016). The analyses used the restricted maximum-likelihood procedure for parameter estimation and were performed with the metafor package for R. Moreover, we used G*Power (Version 3.1.9.2; Faul, Erdfelder, Lang, & Buchner, 2007) to calculate the sample size needed for future research to obtain the mean correlation found in this research. Sample sizes for obtaining four levels of power (i.e., .80, .90, .95, and .99) with an alpha level of .05 were recommended.

Results

Descriptive statistics

The current meta-analysis included 191 articles reporting on 159 independent studies and comprising 1,540 effect sizes. The overall sample size⁷ was $N = 164,459$, with study sample sizes ranging from $N = 47$ (Samuelson, Krueger, & Wilson, 2012) to $N = 19,810$ (Barnes & Morris, 2012), and a mean age of 13.92 years. The publication year of the included studies ranged from 1990 to 2016; the number of studies published annually is given in Figure 2. Most studies included both boys and girls (80%); some studies focused specifically on boys (7%), some focused specifically on girls (9%), and some studies did not specify gender (4%). Some studies focused on parenting in general without differentiating between mothers and fathers (44%), some specifically focused on maternal parenting (40%), and a few studies specifically focused on paternal parenting (16%). Of all included effect sizes, 53% focused on positive parenting, 33% focused on negative parenting, and 14% focused on parent-child relationships (for details on parenting dimensions, see Table 1).

Table 1 presents the details on parenting categories. It shows that positive parenting predominantly comprises authoritative parenting, monitoring, and support, whereas negative parenting comprises conflict, authoritarian parenting, psychological negative control, harsh parenting, and, to a lesser degree, coercion and withdrawal. Finally, parent-child relationships mostly comprise attachment, whereas alienation and trust from the attachment scale make up the smallest percentage of this category.

Studies were conducted worldwide, including in Australia, Canada, China, India, and Mexico, with most effect sizes retrieved from the United States (62%), South Korea (10%), Switzerland (6%), and the Netherlands (4%; for a graphical representation of the countries represented in the current meta-analysis, see Fig. 3). Hofstede's

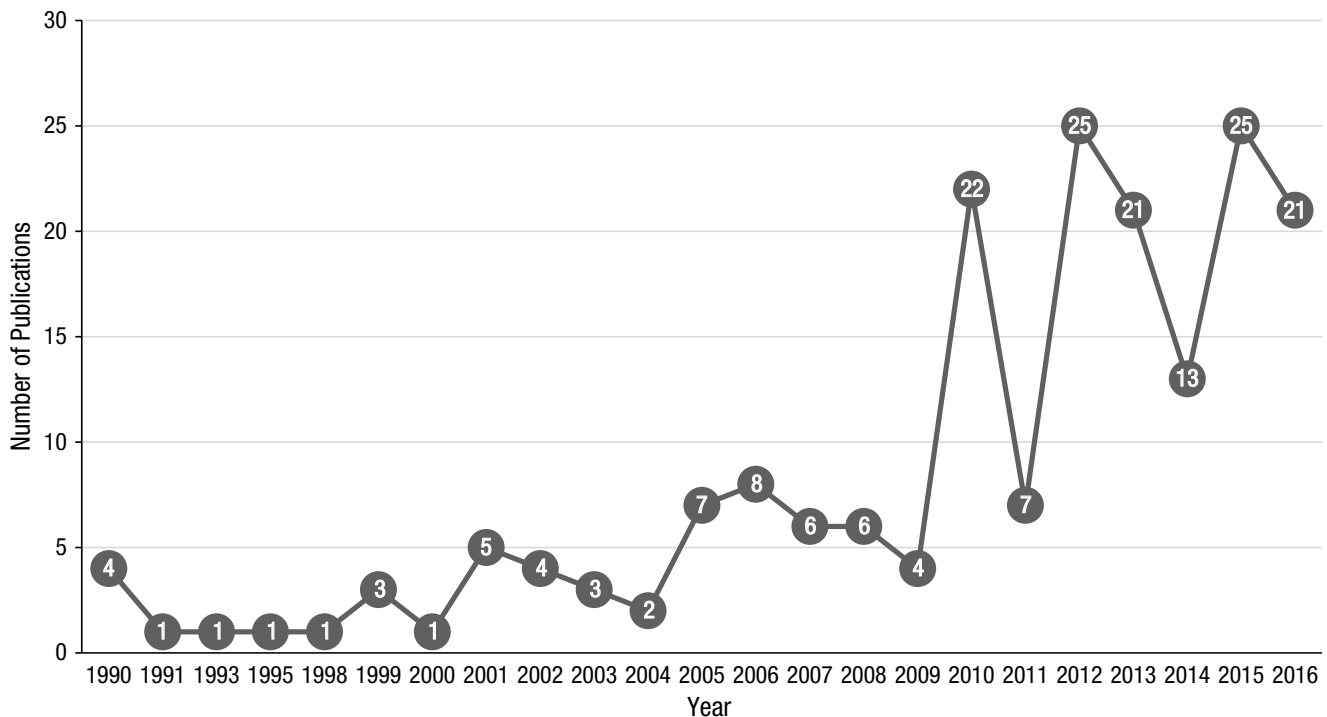


Fig. 2. Number of included studies published annually.

individualism index ranged between 17 (Taiwan)/18 (South Korea) and 90 (Australia)/91 (United States), with $k = 28$ independent studies reporting on countries with an individualism score < 50 and $k = 129$ studies reporting on countries with an individualism score > 50 .

The current meta-analysis included both cross-sectional (57%) and longitudinal (43%) effect sizes. Of the longitudinal effects, 56% measured parenting first and self-control some time later ($P \rightarrow SC$), and 44% measured self-control first and parenting some time later ($SC \rightarrow P$). Longitudinal studies ranged from 1 month to 13 years; most studies reported on a 0- to 1-year time lag (57%) or a 1- to 2-year time lag (23%), and others reported on a 2- to 3-year time lag (5%), 3- to 4-year time lag (13%), 4- to 5-year time lag (2%), and > 5 -year time lag (16%). Thus, the current meta-analysis included (a) cross-sectional effect sizes; (b) longitudinal $P \rightarrow SC$ effect sizes, where parenting predicted subsequent self-control; and (c) longitudinal $SC \rightarrow P$ effect sizes, where adolescent self-control predicted subsequent parenting. These three groups describe different patterns of effects and should be treated individually. Therefore, we assessed the overall effects of these three groups separately, followed by statistical analyses testing whether these effects statistically differed. Of the 1,540 effect sizes, 876 concerned cross-sectional associations, 373 concerned longitudinal $P \rightarrow SC$ associations, and 291 concerned longitudinal $SC \rightarrow P$ associations.

Overall effects

Cross-sectional association. The overall effect size of cross-sectional studies was statistically significant, $ES_z = 0.207$, $SE = 0.010$, $t = 20.165$, $p < .001$, 95% confidence interval (CI) = [0.187, 0.227], with substantial heterogeneity, $Q_E(875) = 13,140.584$, $p < .001$. Using an inverse version of Fisher's r -to- z formula, we transformed this effect size back to Pearson's r for interpretation purposes. We found that the cross-sectional association between parenting and self-control in adolescence was $r = .204$, 95% CI = [.185, .223].

Longitudinal associations: $P \rightarrow SC$. The overall effect size of longitudinal $P \rightarrow SC$ was also statistically significant, $ES_z = 0.158$, $SE = 0.015$, $t = 10.238$, $p < .001$, 95% CI = [0.128, 0.188], with substantial heterogeneity, $Q_E(372) = 3,349.047$, $p < .001$. We found that the longitudinal association for which parenting was measured first and self-control later was $r = .157$, 95% CI = [.127, .186].

Longitudinal associations: $SC \rightarrow P$. For longitudinal $SC \rightarrow P$, the overall effect size was also statistically significant, $ES_z = 0.156$, $SE = 0.022$, $t = 7.123$, $p < .001$, 95% CI = [0.113, 0.199], with substantial heterogeneity, $Q_E(290) = 2,293.718$, $p < .001$. The longitudinal association for which self-control was measured first and parenting later was $r = .155$, 95% CI = [.113, .196].

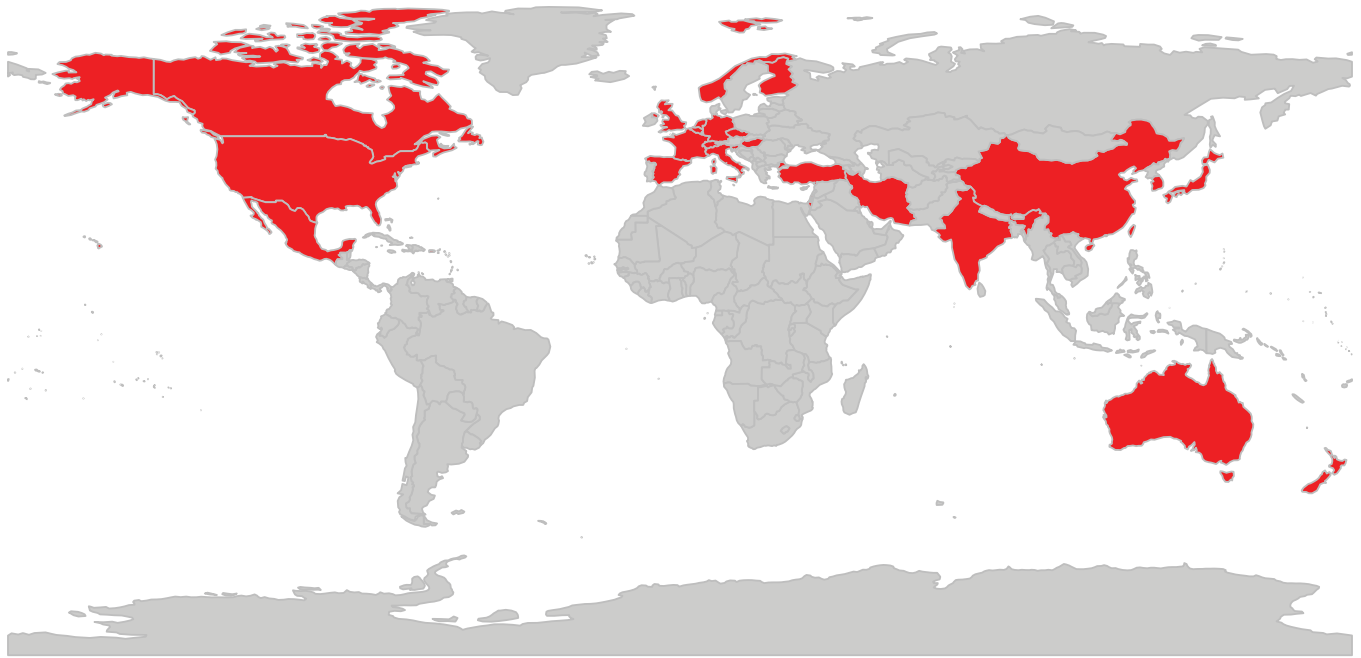


Fig. 3. Graphical representation of countries represented in the meta-analysis.

Comparison between cross-sectional and longitudinal effect sizes. As reported above, there were some observed differences in the effect sizes between cross-sectional and longitudinal studies, and therefore we tested whether this difference was statistically significant. Applying three-level analyses, we found an overall significant difference between the three groups, $F(2, 1537) = 26.136$, $p < .001$, and significant heterogeneity in effect sizes, $Q_E(1537) = 18,783.349$, $p < .001$. As shown in Table 2, the associations for longitudinal $P \rightarrow SC$ were significantly smaller than cross-sectional associations. Likewise, associations for longitudinal $SC \rightarrow P$ were also significantly smaller than cross-sectional associations. Results showed no significant difference in the associations between longitudinal $P \rightarrow SC$ and $SC \rightarrow P$.

Analyses for these three groups were then conducted separately. First, a random-effects model was used to calculate variance at the sampling, within-study, and between-study levels. Second, multiple potential moderators were tested individually. Third, a multiple-moderator model including all the significant moderators was performed to control for the associations among moderators. Finally, we also checked publication bias using the funnel plot (Egger et al., 1997).

Cross-sectional studies

Variance of the overall effect size. The variance at the within-study level (estimate = .010, $p < .001$) and the between-study level (estimate = .011, $p < .001$) were both

significant. Follow-up analyses found that variance at the sampling, within-study, and between-study levels was 5.13%, 45.11%, and 49.76%, respectively. Hunter and Schmidt (1990) proposed that heterogeneity can be considered as substantial if less than 75% of the variance can be attributed to the sampling variance and that in this case examination of the moderating effects of the study and/or effect-size characteristics on the overall effect can be fruitful. In our study, only 5.13% of the variance was explained by the samples, indicating that the continuous exploration of potential moderators was meaningful.

Moderator analyses. Considering the large statistical power, we were confident in assessing potential moderators of theoretical and methodological interest (see Table 3). Regarding the moderators of theoretical interest, the only significant moderator was type of parenting, $Q_E(873) = 12,763.277$, $p < .001$, $F(2, 873) = 3.483$, $p = .031$. None of the other moderators of theoretical interest, including cultural characteristics (ethnicity, Hofstede's individualism), parent gender (i.e., whether the effect refers to mother or father), adolescent gender (i.e., whether the effect refers to boys and girls), or age of adolescents,⁸ was significant.

Pertaining to the moderators of methodological interest, all three moderators in this category were significant: report informant of parenting measure, $Q_E(871) = 13,034.230$, $p < .001$, $F(3, 871) = 5.172$, $p = .002$, report informant of self-control measure, $Q_E(872) = 12,859.772$, $p < .001$, $F(3, 872) = 5.068$, $p = .002$, and consistency

Table 2. Comparison of Cross-Sectional and Longitudinal Effect Sizes

Pairwise comparison	ES_z	SE	t	95% CI	p
Δ Slope cross-sectional (vs. P \rightarrow SC)	-0.050	0.008	-6.228	[-0.066, -0.034]	< .001
Δ Slope cross-sectional (vs. SC \rightarrow P)	-0.052	0.009	-6.058	[-0.068, -0.035]	< .001
Δ Slope P \rightarrow SC (vs. SC \rightarrow P)	-0.002	0.009	-0.174	[-0.019, 0.016]	.862
Q_E (df)			18,783.349 (1537), $p < .001$		
Omnibus test			$F(2, 1537) = 26.136, p < .001$		
Variance within study			.008, $p < .001$		
Variance between studies			.010, $p < .001$		
Number of ESs			1,540		

Note: CI = confidence interval; ES = effect size; P = parenting; SC = self-control.

of the report informant of the parenting and self-control measures, $Q_E(873) = 13,104.212, p < .001, F(1, 874) = 15.043, p < .001$.

Significant moderators. A follow-up comparison based on the significant moderators found above was conducted, and the results are summarized in Table 4. Regarding the type of parenting, we found that the effect sizes for the associations between positive parenting and self-control, between negative parenting and self-control, and between parent-child relationship and self-control were all significant. Results of further comparison suggested that the relationship for negative parenting was significantly smaller than that for positive parenting.

Regarding the informant of parenting measure, we found that the effect sizes of the relationship between parenting and self-control were all significant when parenting was measured using adolescent self-report, other-report, observation, and composite measures. Results of a further comparison indicated that effect sizes for studies using composite measures were significantly larger than those using self-report, other-report, and observation and that effect sizes for studies using observation measures to assess parenting were

significantly lower than those using adolescent self-report and other-report.

With respect to the informant of self-control measures, we found that effect sizes of the relationship between parenting and self-control were all significant when self-control was assessed using adolescent self-report, other-report, observation, and composite measures. A follow-up comparison indicated that effect sizes of studies using composite measures to assess self-control were significantly larger than those using adolescent self-report, other-report, and observation and that effect sizes of studies using observation measures to assess self-control were significantly lower than those using adolescent self-report.

For the consistency of the report informant on parenting and self-control measures, effect sizes were both significant for studies using consistent and inconsistent report informants. Results of a follow-up comparison showed that effect sizes of studies using inconsistent report informants were significantly lower than those using consistent report informants.

Multiple-moderator model. According to Hox et al. (2010), moderators may be interrelated, possibly causing

Table 3. Cross-Sectional Associations: The Q_E Statistics Testing Residual Heterogeneity and the Omnibus to Test the Effect of the Moderators

Moderator	Q_E (df)	p	Omnibus test	p
Theoretical moderators				
Age	10,420.319 (830)	< .001	$F(1, 830) = 1.632$	.202
Ethnicity of adolescents	9,503.564 (722)	< .001	$F(5, 722) = 1.286$	.268
Hofstede's individualism	12,883.360 (862)	< .001	$F(1, 862) = 0.300$	.584
Type of parenting	12,763.277 (873)	< .001	$F(2, 873) = 3.483$	.031
Parent gender	13,035.444 (865)	< .001	$F(2, 865) = 2.743$	.065
Adolescent gender	10,777.295 (840)	< .001	$F(2, 840) = 1.443$	.237
Methodological moderators				
Report informant of parenting measure	13,034.230 (871)	< .001	$F(3, 871) = 5.172$	.002
Report informant of self-control measure	12,859.772 (872)	< .001	$F(3, 872) = 5.068$	.002
Consistency of informants	13,104.212 (874)	< .001	$F(1, 874) = 15.043$	< .001

Table 4. Cross-Sectional Associations: Significant Moderators

Moderator	Number of ESs	ES_z	SE	t	95% CI (ES_z)	p	r	95% CI (r)
Type of parenting	876							
Positive	446	0.213	0.011	18.826	[0.191, 0.235]	< .001	.210	[.189, .231]
Negative ^a	290	0.188	0.013	14.864	[0.163, 0.212]	< .001	.186	[.162, .209]
Parent-child relationship	140	0.220	0.016	13.676	[0.188, 0.252]	< .001	.217	[.162, .209]
Δ Slope of positive (vs. negative)		-0.025	0.010	-2.444	[-0.045, -0.005]	.015		
Δ Slope of positive (vs. parent-child relationship)		0.007	0.016	0.458	[-0.024, 0.038]	.647		
Δ Slope of negative (vs. parent-child relationship)		0.032	0.017	1.907	[-0.001, 0.066]	.057		
Report informant of parenting measure	875							
Adolescent self-report	622	0.206	0.011	19.041	[0.185, 0.228]	< .001	.203	[.183, .224]
Other-report	123	0.199	0.016	12.264	[0.167, 0.231]	< .001	.196	[.165, .227]
Observation	46	0.114	0.032	3.574	[0.051, 0.176]	< .001	.114	[.051, .174]
Composite	84	0.276	0.030	9.060	[0.216, 0.336]	< .001	.269	[.213, .324]
Δ Slope of adolescent self-report (vs. other-report)		-0.007	0.015	-0.490	[-0.036, 0.021]	.625		
Δ Slope of adolescent self-report (vs. observation)		-0.093	0.032	-2.867	[-0.156, -0.029]	.004		
Δ Slope of adolescent self-report (vs. composite)		0.070	0.032	2.185	[0.007, 0.132]	.029		
Δ Slope of other-report (vs. observation)		-0.086	0.034	-2.536	[-0.152, -0.019]	.011		
Δ Slope of other-report (vs. composite)		0.077	0.034	2.259	[0.010, 0.143]	.024		
Δ Slope of observation (vs. composite)		0.162	0.042	3.906	[0.081, 0.244]	< .001		
Report informant of self-control measure	876							
Adolescent self-report	546	0.203	0.011	18.667	[0.182, 0.224]	< .001	.200	[.180, .220]
Other-report	251	0.188	0.017	11.161	[0.155, 0.221]	< .001	.186	[.154, .217]
Observation	23	0.121	0.039	3.092	[0.044, 0.198]	.002	.120	[.044, .195]
Composite	56	0.297	0.029	10.291	[0.240, 0.353]	< .001	.289	[.235, .339]
Δ Slope of adolescent self-report (vs. other-report)		-0.015	0.017	-0.918	[-0.048, 0.017]	.359		
Δ Slope of adolescent self-report (vs. observation)		-0.082	0.039	-2.08	[-0.159, -0.005]	.038		
Δ Slope of adolescent self-report (vs. composite)		0.094	0.030	3.145	[0.035, 0.152]	.002		
Δ Slope of other-report (vs. observation)		-0.067	0.038	-1.736	[-0.142, 0.009]	.083		
Δ Slope of other-report (vs. composite)		0.109	0.033	3.313	[0.044, 0.173]	< .001		
Δ Slope of observation (vs. composite)		0.176	0.048	3.635	[0.081, 0.270]	< .001		
Consistency of report informant	875							
Consistent	537	0.223	0.011	19.785	[0.201, 0.245]	< .001	.219	[.198, .240]
Inconsistent	338	0.168	0.015	11.475	[0.139, 0.196]	< .001	.166	[.138, .194]
Δ Slope of consistent report informant (vs. inconsistent)		-0.056	0.014	-3.903	[-0.084, -0.028]	< .001		

Note: The 95% confidence interval (CI) for r was calculated using Fisher's z -to- r formula based on the lower and upper bounds of the 95% CI (ES_z). ES = effect size.

^aTo ensure a similar direction of effects, ES s were recoded if (a) parenting pertained to negative dimensions and (b) self-control was measured using a scale of lack of self-control or low self-control. As such, correlations appear positive for the negative parenting dimensions but reflect a negative correlation between negative parenting and self-control.

Table 5. Cross-Sectional Association: Results for the Multiple Moderator Model

Moderator variables	β (SE)	95% CI	<i>t</i>	<i>p</i>
Intercept	0.221 (0.013)	[0.196, 0.246]	17.389	< .001
Type of parenting: negative parenting (vs. positive parenting)	-0.028 (0.010)	[-0.048, -0.007]	-2.675	.008
Type of parenting: parent-child relationship (vs. positive parenting)	0.005 (0.016)	[-0.026, 0.036]	0.305	.760
Report informant of parenting: other-report (vs. self-report)	-0.008 (0.015)	[-0.037, 0.021]	-0.557	.578
Report informant of parenting: observation (vs. self-report)	-0.058 (0.034)	[-0.125, 0.009]	-1.713	.087
Report informant of parenting: composite (vs. self-report)	0.050 (0.034)	[-0.017, 0.117]	1.465	.143
Report informant of self-control: other-report (vs. self-report)	0.013 (0.017)	[-0.021, 0.047]	0.754	.451
Report informant of self-control: observation (vs. self-report)	-0.079 (0.041)	[-0.158, 0.001]	-1.936	.053
Report informant of self-control: composite (vs. self-report)	0.126 (0.033)	[0.061, 0.191]	3.829	< .001
Consistency of report informant: inconsistent (vs. consistent)	-0.069 (0.016)	[-0.099, -0.038]	-4.422	< .001
Omnibus test		$F(9, 865) = 6.157, p < .001$		
Variance within study		.009, $p < .001$		
Variance between studies		.011, $p < .001$		
Number of ESs		875		

Note: CI = confidence interval; ES = effect size.

multicollinearity problems in the analyses. To overcome these problems, we constructed a multiple-moderator model that included all significant moderators found in the individual moderation test above. The results of this model are summarized in Table 5. An omnibus test showed significant results, $F(9, 865) = 6.157, p < .001$, suggesting that at least one of the regression coefficients of the moderators significantly deviated from zero. These results indicated that negative parenting (vs. positive parenting), composite measures of self-control (vs. adolescent self-reports), and inconsistent report informants (vs. consistent report informants) had unique moderating effects on the relationship between parenting and self-control.

Publication bias. Considering our large sample size, and that, for numerous studies, the association between parenting and self-control was not the primary research interest, we assumed little influence of publication bias. To statistically check this assumption, we inspected funnel plots using Fisher's z transformations (see Figs. 4–6) and applied Egger's regression test (Egger et al., 1997; Torgerson, 2006). Results of the regression test for funnel-plot asymmetry showed that there was no significant asymmetry ($z = -1.506, p = .132$), suggesting that no significant publication bias was detected for the results found above.

Longitudinal $P \rightarrow SC$ studies

Variance of the overall effect size. The variance at the within-study level (estimate = .006, $p < .001$) and between-study level (estimate = .007, $p < .001$) were both significant. Follow-up analyses found that variance at the sampling, within-study, and between-study levels was

7.01%, 44.29%, and 48.69%, respectively, indicating that the continuous exploration of potential moderators was meaningful.

Moderator analyses. Similar to cross-sectional analyses, moderators of theoretical and methodological interest were tested in the longitudinal data and are summarized in Table 6. Moderator analyses were conducted only if each category contained at least five studies (parameter estimates are poor when the number of studies is very small). As a result, we could not test the moderating effect of adolescent gender and report informant of self-control. Regarding the moderators of theoretical interest, the only significant moderator was parent gender, $Q_E(366) = 3,188.953, p < .001, F(2, 366) = 6.150, p = .002$. None of the other moderators of theoretical interest, including type of parenting (positive, negative, relationship) or cultural characteristics (ethnicity, Hofstede's individualism), was significant.

To analyze the moderators of methodological interest, we tested informants of parenting measures and the consistency of informants. Both report informants of parenting measures, $Q_E(360) = 3,132.167, p < .001, F(3, 360) = 3.770, p = .011$, and the consistency of informants, $Q_E(371) = 3,186.385, F(1, 371) = 6.562, p = .011$, yielded significant results.

Significant moderators. Follow-up analyses were conducted to analyze the aforementioned significant moderators. The results are presented in Table 7. Regarding parent gender, we found significant associations for maternal parenting-self-control, paternal parenting-self-control, and both parents' parenting-self-control. Results of further comparison suggested that the association was

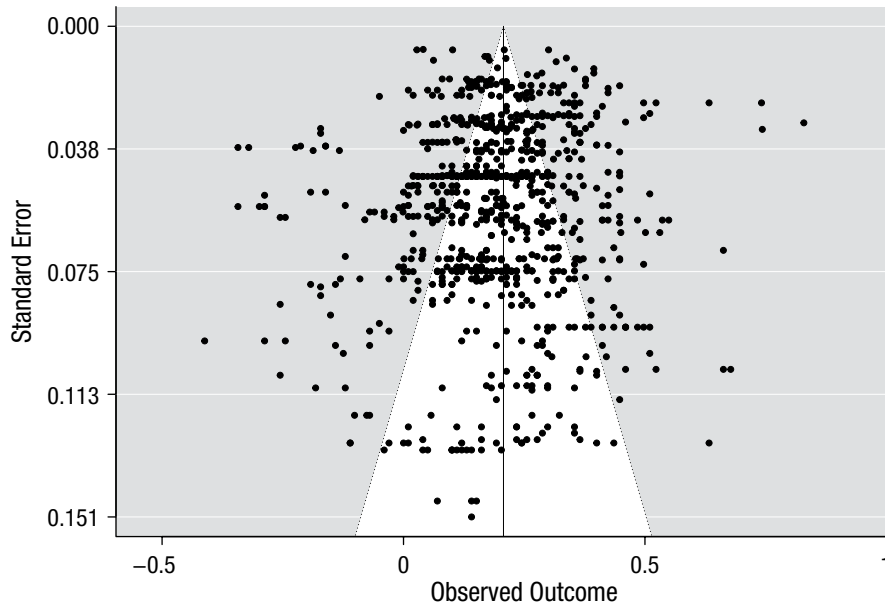


Fig. 4. Funnel plot for the associations between parenting and self-control in cross-sectional studies.

significantly smaller for both parents' parenting than for either maternal or paternal parenting. The association between parenting and self-control was not significantly different for mothers and fathers.

With respect to the report informant of parenting measures, we found that effect sizes of the relationship between parenting and self-control were all significant when parenting was assessed using adolescent

self-report, other-report, observation, and composite measures. A follow-up comparison indicated that effect sizes of studies using composite measures to assess parenting were significantly larger than those using self-report, other-report, and observation.

For the consistency of the report informant of parenting and self-control measures, effect sizes were both significant for studies using consistent and inconsistent

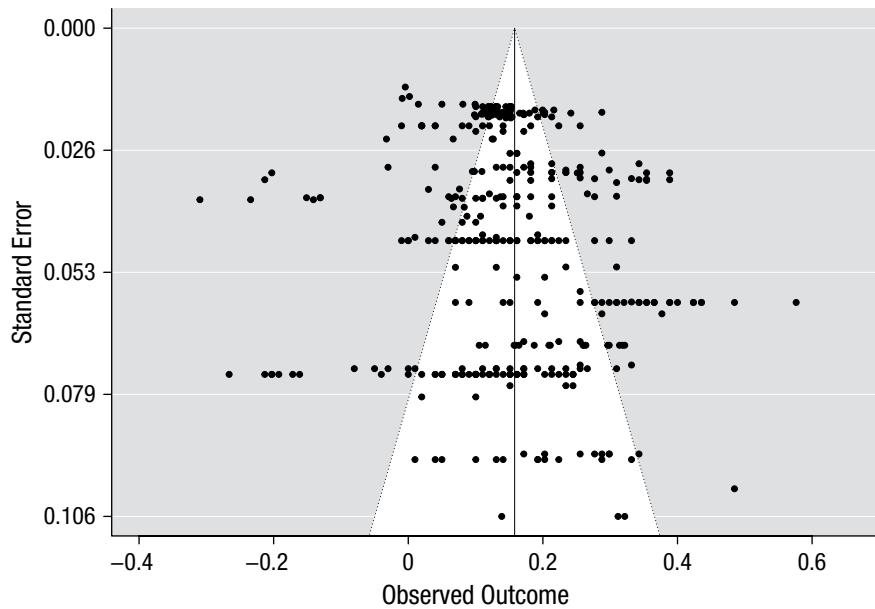


Fig. 5. Funnel plot for the associations between parenting and self-control for longitudinal studies in which parenting was measured first and self-control was measured some time later.

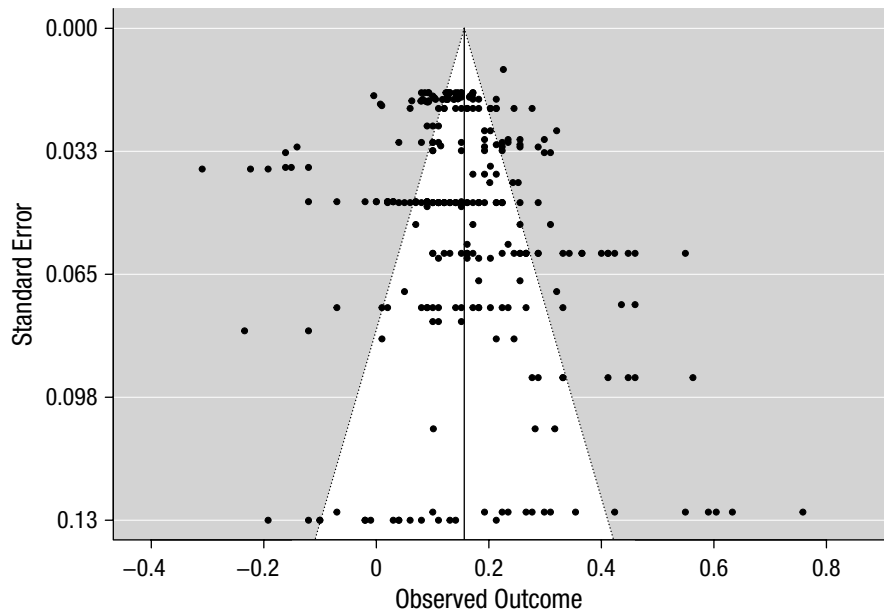


Fig. 6. Funnel plots for the associations between parenting and self-control for longitudinal studies in which self-control was measured first and parenting was measured some time later.

report informants. Results of a follow-up comparison showed that effect sizes of studies using inconsistent report informants were significantly larger than those using consistent report informants.

Multiple-moderator model. For the multiple-moderator model, all significant moderators illustrated in Table 8 were included into one single model to test their robustness. The results suggested that at least one of the regression coefficients of the moderators significantly deviated from zero, $F(6, 353) = 4.278, p < .001$. These results indicated that parent gender (both vs. mother) and informant reports (inconsistent vs. consistent) had unique moderating effects on the relationship between parenting and self-control.

Publication bias. The funnel plot is illustrated in Figure 5. The results of the regression test suggest significant asymmetry ($z = 2.389, p = .017$), which indicates that there is publication bias for longitudinal studies on the association between parenting and self-control. A trim-and-fill procedure was applied to take publication bias into account, resulting in an adjusted effect size of $ES_z = 0.106, SE = 0.007, 95\% CI = [0.092, 0.119], p < .001, r = .105, 95\% CI = [.092, .118]$.

Longitudinal SC → P

Variance of the overall effect size. The variance at the within-study level (estimate = .005, $p < .001$) and the between-study level (estimate = .012, $p < .001$) were both

Table 6. Longitudinal Associations for Parenting Measured First and Self-Control Measured Later: The Q_E Statistics Testing Residual Heterogeneity and the Omnibus to Test the Effects of the Moderators

Moderator	$Q_E (df)$	p	Omnibus test	p
Theoretical moderators				
Ethnicity of adolescents	2,623.127 (319)	< .001	$F(5, 319) = 0.233$	.948
Hofstede's individualism	3,345.279 (371)	< .001	$F(1, 371) = 0.422$	.516
Type of parenting	3,243.333 (370)	< .001	$F(2, 370) = 1.303$	.273
Parent gender	3,188.953 (366)	< .001	$F(2, 366) = 6.150$	.002
Methodological moderators				
Report informant of parenting measure	3,132.167 (360)	< .001	$F(3, 360) = 3.770$	.011
Consistency of informants	3,186.385 (371)	< .001	$F(1, 371) = 6.562$	.011

Table 7. Longitudinal Associations Parenting Measured First and Self-Control Measured Later: Significant Moderators

Moderator	Number of ESs	ES_z	SE	t	95% CI (ES_z)	p	r	95% CI (r)
Gender of parent	369							
Mother	129	0.194	0.018	10.967	[0.159, 0.229]	< .001	.192	[.158, .225]
Father	47	0.181	0.023	7.803	[0.135, 0.227]	< .001	.178	[.134, .223]
Both	193	0.129	0.017	7.590	[0.096, 0.163]	< .001	.129	[.096, .162]
Δ Slope of mother (vs. father)		-0.013	0.018	-0.705	[-0.048, 0.023]	.481	-.013	[-.048, .023]
Δ Slope of mother (vs. both)		-0.064	0.018	-3.494	[-0.101, -0.028]	< .001	-.060	[-.101, -.028]
Δ Slope of father (vs. both)		-0.052	0.024	-2.127	[-0.100, -0.004]	.034	-.050	[-.100, -.004]
Report informant of parenting measure	364							
Adolescent self-report	171	0.152	0.018	8.554	[0.117, 0.187]	< .001	.151	[.116, .185]
Other-report	62	0.150	0.021	7.013	[0.108, 0.192]	< .001	.149	[.108, .190]
Observation	44	0.112	0.032	3.538	[0.050, -0.175]	< .001	.110	[.050, -.173]
Composite	87	0.218	0.025	8.881	[0.169, 0.266]	< .001	.215	[.167, .260]
Δ Slope of adolescent self-report (vs. other-report)		-0.002	0.021	-0.102	[-0.044, 0.040]	.919	.000	[-.044, .040]
Δ Slope of adolescent self-report (vs. observation)		-0.040	0.034	-1.188	[-0.106, 0.026]	.236	.040	[-.106, .026]
Δ Slope of adolescent self-report (vs. composite)		0.065	0.023	2.874	[0.021, 0.110]	.004	.065	[.021, .110]
Δ Slope of other-report (vs. observation)		-0.038	0.033	-1.159	[-0.102, 0.026]	.247	-.038	[-.102, .026]
Δ Slope of other-report (vs. composite)		0.068	0.028	2.377	[0.012, 0.124]	.018	.068	[.012, .123]
Δ Slope of observation (vs. composite)		0.105	0.037	2.853	[0.033, 0.178]	.005	-.105	[.033, .176]
Consistency of report informant	373							
Consistent	155	0.138	0.017	8.259	[0.105, 0.170]	< .001	.137	[.105, .168]
Inconsistent	218	0.179	0.017	10.610	[0.146, 0.212]	< .001	.177	[.145, .209]
Δ Slope of consistent report informant (vs. inconsistent)		0.041	0.016	2.562	[0.010, 0.072]	.011	.041	[.010, .072]

Note: The 95% confidence interval (CI) for r was calculated using Fisher's z -to- r formula based on the lower and upper bounds of the 95% CI (ES_z). ES = effect size.

Table 8. Longitudinal Association for Parenting Measured First and Self-Control Measured Late: Results for the Multiple Moderator Model

Moderator variables	β (SE)	95% CI	<i>t</i>	<i>p</i>
Intercept	0.179 (0.021)	[0.138, 0.221]	8.514	< .001
Gender parent: father (vs. mother)	-0.016 (0.018)	[-0.051, 0.019]	-0.900	.369
Gender parent: both (vs. mother)	-0.061 (0.020)	[-0.100, -0.022]	-3.068	.002
Report informant of parenting measure: other report (vs. self-report)	-0.022 (0.023)	[-0.067, 0.022]	-0.985	.325
Report informant of parenting measure: observation (vs. self-report)	-0.067 (0.037)	[-0.0140, 0.005]	-1.835	.067
Report informant of parenting measure: composite (vs. self-report)	0.030 (0.026)	[-0.021, 0.081]	1.461	.253
Consistency of report informant: inconsistent (vs. consistent)	0.043 (0.020)	[0.004, 0.081]	2.188	.029
Omnibus test		$F(6, 353) = 4.278, p < .001$		
Variance within study		.006, $p < .001$		
Variance between studies		.005, $p < .001$		
Number of ESs		360		

Note: CI = confidence interval; ES = effect size.

significant. Follow-up analyses found that variance at the sampling, within-study, and between-study levels was 5.46%, 26.29%, and 68.26%, respectively, indicating that the continuous exploration of potential moderators was meaningful.

Moderator analyses. Similar to longitudinal P → SC analyses, the moderating effect of adolescent gender and informant on self-control could not be tested because these categories did not contain enough studies. Results are presented in Table 9. Regarding the moderators of theoretical interest, none of them was significant, including type of parenting (positive, negative, relationship), cultural characteristics (ethnicity, Hofstede’s individualism), and parent gender (maternal parenting, paternal parenting, both parents).

In relation to the moderators of methodological interest, when including the report informant of parenting measure and consistency of informants, only the report informant of parenting measure yielded significant results, $Q_E(286) = 1,999.973, p < .001, F(3, 286) = 7.075, p < .001$.

Significant moderators. Follow-up analyses were conducted to further analyze the significant moderators. The results are summarized in Table 10. With respect to the report informant of parenting measure, we found that effect sizes of the relation between self-control and parenting were all significant when parenting was assessed using adolescent self-report, other-report, observation, and composite measures. A follow-up comparison indicated that effect sizes of studies using composite measures to assess parenting were significantly larger than those using self-report, other-report, or observation. Effect sizes of studies using self-report were significantly larger than those using other-report. No multiple moderator analyses were applied because only one moderator was significant.

Publication bias. A funnel plot (illustrated in Fig. 6) and regression test indicated publication bias ($z = 3.694, p < .001$). Accordingly, the trim-and-fill procedure was applied to take publication bias into account, resulting in an adjusted effect size of $ES_z = 0.153, SE = 0.007, 95\% CI = [0.139, 0.167], p < .001, r = .152, 95\% CI = [.138, .165]$.

Table 9. Longitudinal Association for Self-Control Measured First and Parenting Measured Later: The Q_E Statistics Testing Residual Heterogeneity and the Omnibus to Test the Effect of the Moderators

Moderator	Q_E (df)	<i>p</i>	Omnibus test	<i>p</i>
Moderators of theoretical interest				
Ethnicity of adolescents	1,881.894 (246)	< .001	$F(5, 246) = 1.303$	.263
Hofstede’s individualism	2,253.226 (289)	< .001	$F(1, 289) = 0.323$	.570
Type of parenting	2,263.721 (288)	< .001	$F(2, 288) = 0.122$	.885
Gender of parents	2,264.139 (287)	< .001	$F(2, 287) = 2.354$	.097
Methodological characteristics				
Report informant of parenting measure	1,999.973 (286)	< .001	$F(3, 286) = 7.075$	< .001
Consistency of informants	2,231.286 (289)	< .001	$F(1, 289) = 1.100$	.295

Table 10. Longitudinal Associations for Self-Control Measured First and Parenting Measured Later: Significant Moderators

Moderator	Number of ESs (<i>N</i> = 290)	<i>ES_z</i>	<i>SE</i>	<i>t</i>	95% CI (<i>ES_z</i>)	<i>p</i>	<i>r</i>	95% CI (<i>r</i>)
Report informant of parenting measure								
Self-report	128	0.154	0.024	6.478	[0.107, 0.201]	< .001	.153	[.107, .198]
Other report	34	0.096	0.026	3.626	[0.044, 0.148]	< .001	.096	[.044, .147]
Observation	37	0.113	0.034	3.331	[0.046, 0.180]	< .001	.113	[.046, .178]
Composite	91	0.232	0.035	6.684	[0.164, 0.300]	< .001	.228	[.163, .291]
Δslope self-report (vs. other report)		-0.058	0.018	-3.303	[-0.093, -0.024]	.001	-0.058	[-.093, -.024]
Δslope self-report (vs. observation)		-0.041	0.036	-1.130	[-0.112, 0.030]	.260	-0.041	[-.112, .030]
Δslope self-report (vs. composite)		0.078	0.039	1.994	[0.001, 0.154]	.047	.078	[.011, .153]
Δslope other-report (vs. observation)		0.018	0.037	0.478	[-0.055, 0.090]	.633	.018	[-.055, .090]
Δslope other-report (vs. composite)		0.136	0.040	3.418	[0.058, 0.214]	< .001	.135	[.058, .211]
Δslope observation (vs. composite)		0.118	0.038	3.113	[0.044, 0.193]	.002	.117	[.044, .191]
Omnibus test				<i>F</i> (3, 286) = 7.075, <i>p</i> < .001				
Variance within study				.004, <i>p</i> < .001				
Variance between studies				.010, <i>p</i> < .001				

Note: The 95% confidence interval (CI) for *r* was calculated using Fisher's *z*-to-*r* formula based on the lower and upper bounds of the 95% CI (*ES_z*). *ES* = effect size.

Table 11. Summary of Overall Effects and Results of Moderation Analyses Based on Multiple Moderator Tests

Moderator	Cross-sectional	Longitudinal P → SC	Longitudinal SC → P
Overall association (<i>r</i>)	.204	.157	.155
Theoretical moderators			
Ethnicity of adolescents	n.s.	n.s.	n.s.
Hofstede's individualism	n.s.	n.s.	n.s.
Type of parenting	Positive > negative parenting	n.s.	n.s.
Parent gender	n.s.	Both parents assessed < later	n.s.
Adolescent gender	n.s.	Not enough information	Not enough information
Age	n.s.	Not applicable	Not applicable
Methodological moderators			
Report informant of parenting measure	n.s.	n.s.	Composite effect size > other three informants
Report informant of self-control measure	Composite > self-report	Not enough information	Not enough information
Consistency of informants	Consistent > inconsistent	Inconsistent > consistent	n.s.

Note: P = parenting; SC = self-control. For longitudinal studies in which self-control was measured first and parenting was measured some time later (SC → P), the summary is based on the results of individual moderation tests; no multiple-moderator test was run because there was a single significant moderator.

Summary of results

To let readers have a straightforward view of the results, we have summarized the overall cross-sectional and longitudinal associations and the significance of theoretical and methodological moderators in Table 11.

Auxiliary analyses

Effect size for the association between specific parenting dimensions and self-control. Although we subcategorized our parenting dimensions into the categories positive parenting, negative parenting, and parent-child relationships, we realize that the investigation of subcategories of parenting presented in Table 1 could be of interest to the field. We therefore provide free online access to our data, with details on specific parenting dimensions and analytic scripts. These data include detailed explanations so that researchers can easily add their data and/or further analyze the association between specific parenting dimensions and self-control and potential moderators influencing this association. Exploratory analyses between specific parenting dimensions (e.g., authoritative, supervision, negative control, attachment) and self-control from cross-sectional and longitudinal associations are presented in Table S1 in the Supplemental Material. As shown in the table, effect sizes of most subcategories of parenting were significantly related to self-control with few exceptions (e.g., longitudinal association from positive expressivity or conflict to self-control). In addition, the magnitudes of these effect sizes vary to some extent. For instance, “relationship” is the parenting subcategory related to self-control with the largest effect sizes in both cross-sectional and longitudinal associations,

whereas “harshness” and “conflict” had the smallest effect sizes for cross-sectional and longitudinal associations, respectively. For the longitudinal effect of self-control on parenting, relationship and harshness are most and least likely to be affected by adolescents’ previous levels of self-control, respectively.

Power analysis. Table 12 displays the sample size needed to detect the average correlation found by this study at different levels of statistical power. For instance, the power analysis indicated that, to detect an effect size (*r*) of .204 at an α level of .05, a sample size of 186 participants was required for the study to have .80 power, 248 participants were required for .90 power, 306 participants were needed for .95 power, and 432 participants were needed for .99 power.

Discussion

Parenting has long been considered to be important to the development of self-control (Eisenberg et al., 2003; Eisenberg et al., 2005; Gottfredson & Hirschi, 1990; Kochanska et al., 1995; Kopp, 1982; Sameroff, 2010). The current three-level meta-analysis is the first to synthesize the relation between broad types of parenting (i.e., positive parenting, negative parenting, and parent-child relationships) and self-control of adolescents aged 10 to 22 years. Analyses were based on 191 studies from 4 continents and included 1,540 effect sizes from a sample size of $N = 164,459$. Our results showed that (a) parenting is concurrently and longitudinally associated with self-control throughout adolescence; (b) adolescent self-control significantly predicts subsequent parenting, and the predictive effect of parenting on

Table 12. Recommendation of Sample Size

Design	Power			
	.80	.90	.95	.99
1. Cross-sectional design ($r = .204$)	186	248	306	432
2. Longitudinal design: parenting measured first and self-control measured later ($r = .157$)	316	422	521	736
3. Longitudinal design: self-control measured first and parenting measured later ($r = .155$)	324	433	535	755

Note: In all cases, α was set at .05 with a two-tailed test. G*Power (Version 3.1.9.2; test family: exact; statistical test: correlation: bivariate normal model).

self-control and the one of self-control on parenting show similar magnitude; and (c) the relations between parenting and self-control (for both directions) are largely equal across cultures, ethnicities, parent and adolescent gender, and age, whereas the associations are moderated by a few methodological factors, such as report informant consistency. These findings provide a rich description of whether and how self-control and parenting are related across the entire period of adolescence.

Despite the changes that occur in adolescence such as eminent independence from parents and more investment in peer and romantic relationships (Connolly, Craig, Goldberg, & Pepler, 2004; Nickerson & Nagle, 2005; Song et al., 2009), our results showed that parenting was related to self-control in adolescence both concurrently and longitudinally. Speaking to the robustness of our findings, the effect sizes for the parent-child relationship-self-control association were similar to those reported in a recent meta-analysis focusing on the attachment security status and its relation with effortful control in children and adolescents up to the age of 18 years (Pallini et al., 2018).

Beyond the influence of parenting on self-control, our findings based on longitudinal studies also revealed a significant effect of adolescent self-control on subsequent parenting. Previous research has assumed an evocative effect from child's outcomes to parenting (e.g., Kochanska et al., 1995; Silverman & Ragusa, 1990; Sameroff, 2010), but existing findings were inconsistent (e.g., J. Lee, Yu, & Choi, 2012; Meldrum, Young, Hay, & Flexon, 2012; Moilanen et al., 2015). The current findings, based on 291 effect sizes, provide support for the notion that adolescent self-control at a given time point does affect subsequent parenting behaviors, such that high self-control leads to more positive parenting, less negative parenting, and a better positive parent-adolescent relationship. Low self-control, in contrast, is linked to diminished use of positive parenting (e.g., warmth, support) and increased use of negative parenting (e.g., physical and coercive punishment) and gives rise to a more negative parent-child relationship. We

did not find a significant difference in the magnitude of the effect of parenting on adolescent self-control and the effect of adolescent self-control on parenting, which is consistent with developmental theories underpinning the importance of bidirectional interactions between adolescents and their (parental) environment for adolescent development (Bandura, 1999; Bronfenbrenner, 1979; Sameroff, 2010; Plomin et al., 1977). The current results revealed that, throughout adolescence, parenting continues to affect the development of adolescent self-control and adolescent self-control continues to affect parenting.

The associations tested were found to be moderated by a few—mainly methodological—factors (see summary in Table 11). However, moderators for cross-sectional studies did not necessarily extend to longitudinal studies (e.g., type of parenting) and vice versa (e.g., parent gender). Moreover, for some moderators, there was not enough information to detect their effects (e.g., adolescent gender for longitudinal studies). Some moderators (e.g., consistency of report informants) even showed contradictory moderating effects for cross-sectional and longitudinal studies. For example, in cross-sectional studies effect sizes were larger for studies using consistent rather than inconsistent report informants, but in longitudinal studies (SC \rightarrow P) effect sizes were larger for studies using inconsistent rather than consistent report informants.

On the basis of cross-sectional studies, which made up more than half of the total effect sizes, the relation between parenting and self-control tended to be stronger when parenting was positive than when parenting was negative, when self-control was measured using multiple report informants compared with a single report informant, and when informants of parenting and self-control were consistent.

Given the small moderating effects, our results suggest that the inconsistent findings regarding the association between parenting and self-control in the past may be largely due to methodological artifacts rather than theoretical misspecifications. In addition, we found a

publication bias in longitudinal but not in cross-sectional studies, which may be a reason why moderators between cross-sectional and longitudinal studies were not entirely consistent, given that publication bias may also influence the estimates of between-study variance (Jackson, 2006).

Theoretical implications

The current results bear several theoretical implications. First, a number of theories and theoretical perspectives (e.g., attachment theory, the general theory of crime, the development of self-control and conscience, the unified theory of development) propose that good parenting is a crucial source of self-control in children (Bowlby, 1969; Gottfredson & Hirschi, 1990; Kochanska, 1993; Kopp, 1982; Sameroff, 2010). The current findings imply that this proposition extends to adolescence and show that positive parenting and good parent-child relationships continue to play an essential role in shaping the individual differences in self-control from early to late adolescence; conversely, negative parenting and poor parent-child relationships continue to hamper adolescents' self-control. Second, the importance of parenting on adolescent self-control is largely equivalent across different cultures, ethnicities, and adolescent and parent gender. This suggests that the abovementioned theories and viewpoints regarding the influence of parenting on self-control are generally applicable across different demographic backgrounds, thus demonstrating their cross-cultural validity. Third, these theories and perspectives mainly focus on the parental effect on adolescents' self-control and disregard the examination of the evocative effect, as pointed out by some scholars (Lerner, 2002; Tiberio et al., 2016; Vazsonyi & Huang, 2010). The current results demonstrated both parent and child effects regarding the relations between parenting and self-control, which suggests that the existing theories may need to take both parent and child effects into consideration to better capture the dynamic relation between parenting and self-control in adolescents.

Limitations

The current findings should be interpreted with caution. First, the sample size for the cross-sectional analyses was much larger than the sample size for the longitudinal analyses, resulting in more powerful analyses for the former. Because of this power issue, not all moderators could be tested in the longitudinal analyses.

Second, our meta-analysis included only community-based adolescent samples, and its results may not be generalized to clinical samples (e.g., diagnosed with

attentional disorder and hyperactivity disorder, autism spectrum disorder, diabetes) or samples with specific characteristics proposed to be related to self-control (e.g., prisoners, drug addicts).

Third, we acknowledge that the results based on the longitudinal studies refer to lagged associations or effects but not to changes in self-control or parenting because we did not control for the baseline levels of these constructs for two reasons. Conceptually, most longitudinal studies control not only for baseline levels of self-control or parenting but also for other covariates (e.g., child gender, age). This makes the β coefficients noncomparable across studies. Methodologically, although we are aware that some new techniques, such as metaSEM (M. W. L. Cheung, 2015), have the potential to control for the target construct in a meta-analysis, the current version of such techniques is not as able to deal with dependency problems as a multilevel meta-analysis (the one applied in the current study). Not dealing with dependency problems possibly sacrifices much information, reduces statistical power, and even leads to biased results (Hox et al., 2010; Van den Noortgate et al., 2013). Nevertheless, we encourage scholars in the future to revisit this issue when more sophisticated statistical approaches evolve.

Last, the "similar effect size" for the longitudinal effect of parenting on adolescent self-control and the one of adolescent self-control on parenting refers to the effect sizes *before* adjusting for publication bias. After taking publication bias into account, the magnitudes of the two effect sizes appeared different. However, the trim-and-fill approach is controversial because it imputes nonexistent effect sizes (Sutton et al., 2000), and effect sizes as a result of such analyses cannot be convincingly compared. Therefore, this result should be interpreted with caution and take publication bias and the limitation of the trim-and-fill approach into consideration.

Future Direction

The current study bears important implications for future research. First, the included studies came from several continents, and the sample size was large (> 160,000). However, a majority of the effect sizes (62%) were retrieved from studies conducted in the United States, and no or few eligible effect sizes were based on studies from African, South American, Southeastern Asian, Central Asian, and Eastern European regions. To further strengthen the current findings, we encourage scholars to integrate findings published in a wider variety of languages into our open-access data set. Doing so will eventually accumulate more effect sizes from a more varied population, which allows scholars to test

a wider range of moderators and to achieve results with greater generalizability and higher robustness. Considering the fact that our data and scripts are freely accessible online, extending our results with international data is feasible. This also provides opportunities for other scholars who have different theoretical preferences to categorize parenting such as warmth, behavioral control, and autonomy support (e.g., Prinzie, Stams, Deković, Reijntjes, & Belsky, 2009) to analyze our data for different research questions and facilitates an update of the meta-analysis in the future. Second, among the studies included in this meta-analysis, many assessed parenting in general without separately referring to mothers or fathers. Although mothers' parenting and fathers' parenting often show medium-to-high correlations (e.g., J. B. Li et al., 2015; Ng-Knight, Shelton, Frederickson, McManus, & Rice, 2018; Nie et al., 2016; Özdemir et al., 2013), examining parenting for mothers and fathers separately would be promising. It may allow researchers to identify the similarities and differences between maternal and paternal influences on adolescent self-control. Future research regarding this issue may want to separately explore the effect of mothers and fathers.

Third, the magnitude of the effect sizes suggests that adolescent self-control is influenced by multiple socialization agents. For example, peers and teachers are also potential socializing agents steering adolescents' self-control (e.g., Alvarez-Rivera & Fox, 2010; Meldrum, 2008; Turner, Piquero, & Pratt, 2005). A recent meta-analysis shows that the heritability of self-control is 60%, highlighting that individual differences in self-control are the result not only of socializing factors but also of biological factors (Willems, Boesen, Li, Finkenauer, & Bartels, 2019). However, much of the literature to date evaluates the development of self-control as a result of environmental socialization. Incorporating biological studies is necessary to paint a more complete picture of individual differences in self-control. Future studies applying genetically sensitive designs are particularly promising, as these allow researchers to investigate whether the association between parenting and self-control is genetically based, environmentally based, or a combination of these (Willems, de Zeeuw, et al., 2019).

Last, this meta-analysis provided overall effect sizes for cross-sectional and longitudinal associations between parenting and self-control. This knowledge on the average effect size allows us to provide additional recommendations for future research. Specifically, it provides information on the number of participants necessary to detect the current findings. Doing so will allow researchers to gauge the appropriate level of conservatism or liberalism they prefer when recruiting

participants and helps researchers make the most of their time and resources. Table 12 summarizes sample sizes to achieve the correlation coefficients transformed back from effect sizes at four levels of power with an alpha level of .05. It should be noted that these sample sizes are estimated for bivariate correlations. If researchers wish to conduct other statistical analyses in future studies, they may need to recalculate the sample size on the basis of the effect sizes found in this study. However, this can be easily implemented in G*Power or using other approaches (e.g., Monte Carlo simulation).

Concluding Remarks

Ill decisions and reckless behaviors due to low self-control in adolescence are at the cost of individual physical and psychosocial functioning as well as social security, both concurrently and longitudinally (Caspi et al., 2016; Moffitt et al., 2011). The current study suggests that parenting significantly contributes to self-control in adolescents aged 10 to 22 years. It also suggests that adolescent self-control shows a significant lagged effect on subsequent parenting. These relationships are largely equal across cultures, ethnicities, parent and child gender, and age of adolescents, and only a few (mainly methodological) factors moderate this relationship. Our findings provide further evidence for the importance of considering the continuous and dynamic interplay of the development of self-control and environment (parenting or parent-child relationship) across the adolescent period.


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Author Contributions

J.-B. Li and Y. E. Willems contributed equally to this manuscript and are co-first authors. All of the authors approved the final manuscript for submission.

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Supplemental Material

Additional supporting information can be found at <http://journals.sagepub.com/doi/suppl/10.1177/1745691619863046>

Notes

1. We preregistered this research at <https://aspredicted.org/gS2zj.pdf>.
2. Adolescence is a period connecting early childhood and emerging adulthood. Although the adolescent period is considered to begin around the age of 10 years, characterized by the onset of puberty (United Nations Children's Fund, 2011), the end of this developmental period receives less consensus. Recent neuroscientific research has suggested that 21 to 22 years of age could be the cutoff when adolescents become adults (A. O. Cohen et al., 2016). Thus, this study focuses on early adolescence to late adolescence ranging from 10 to 22 years.
3. Attachment during adolescence is usually understood or measured as a close parent-child relationship and can be considered as the continuum of childhood attachment rather than the attachment dimensions as by Bowlby & Ainsworth (Armsden & Greenberg, 1987). In this study we therefore used the term "parent-child relationship" instead of "parent-child attachment," but in the literature search and coding we categorized relationship and attachment as the same subtype, namely "parent-child relationship."
4. In the preregistration, we did not include the search term *effortful control* because we expected our initial terms to yield articles on effortful control. However, during an initial trial of our search, we noticed that important effortful-control articles were missing. As a result, we repeated the search including *effortful* and *control* as separate search terms to make our search more inclusive. In addition, M. Deković and M. Bartels were added as co-authors of the article considering their invaluable insights and collaborations later in the project. Given that we included existing data sets, we did not seek ethical approval in the current work.
5. Key words such as *child* and *youth* were included in the search to ensure the inclusion of longitudinal studies focusing on early or middle childhood but possibly also including longitudinal correlations up to adolescence.
6. The Fisher's transformation of r was done using the following formula: $ES_{Zr} = \frac{1}{2} \log_e \left[\frac{1+r}{1-r} \right]$. Any ES_{Zr} can be transformed

back into standard correlation form using the inverse of the ES_{Zr}

transformation using the following formula: $r = \frac{e^{2ES_{Zr}} - 1}{e^{2ES_{Zr}} + 1}$ (see Field, 2001; Lipsey & Wilson, 2001).

7. The overall sample size was calculated by summing the largest sample size within unique samples when more than one effect size was collected.
8. We were also interested to see whether age could show a nonlinear pattern. To this end, we checked whether the squared and/or cubical age served as a significant moderator. However, our results showed no significant quadratic, $Q_E(830) = 10,384.754, p < .001, F(1, 830) = 1.698, p = .193$, or the cubic pattern, $Q_E(830) = 10,361.892, p < .001, F(1, 830) = 1.693, p = .194$.

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