



ELSEVIER

Contents lists available at ScienceDirect

Developmental Review

journal homepage: www.elsevier.com/locate/dr

Maternal emotion and cognitive control capacities and parenting: A conceptual framework

AliceAnn Crandall ^{a,*}, Kirby Deater-Deckard ^{b,c}, Anne W. Riley ^a

^a Department of Population, Family and Reproductive Health, Johns Hopkins University School of Public Health, 615 N. Wolfe St., Baltimore, MD 21205, USA

^b Department of Psychology, Virginia Tech, Blacksburg, VA 24061, USA

^c Department of Psychiatry, Virginia Tech – Carilion School of Medicine, Roanoke, VA 24061, USA

ARTICLE INFO

Article history:

Received 24 May 2014

Revised 23 January 2015

Available online

Keywords:

Parenting

Cognitive control

Emotion regulation

Executive function

Self-regulation

ABSTRACT

Purpose: Emerging evidence suggests that maternal emotion and cognitive control capacities are critical to the development and maintenance of parenting practices and may be related to parents' ability to seek and use parenting help. The purpose of this paper is to present a cohesive conceptual framework on the intersection of maternal emotion and cognitive control capacities and parenting based on a review of literature.

Methods: We conducted a comprehensive literature review of articles published between 2000 and February 2014 that addressed maternal emotion and cognitive control and parenting. The 35 articles identified were assigned a methodological quality score.

Results: Low maternal emotion and cognitive control capacity is associated with increased risk of engaging in child maltreatment, whereas higher maternal emotion and cognitive regulation is associated with sensitive, involved parenting. Contextual factors, such as SES and household organization, play a complex and not clearly understood role on the association between maternal

¹ A. Crandall is now at Emory University Rollins School of Public Health, Hubert Department of Global Health, Claudia Nance Rollins Building, 1518 Clifton Rd NE, Atlanta, GA 30322, USA.

* Corresponding author. Hubert Department of Global Health, Emory University Rollins School of Public Health, Claudia Nance Rollins Building, 1518 Clifton Rd NE, Atlanta, GA 30322, USA. Fax: 404-727-4590.

E-mail address: aliceann.crandall@emory.edu (A. Crandall).

<http://dx.doi.org/10.1016/j.dr.2015.01.004>

0273-2297/© 2015 Elsevier Inc. All rights reserved.

Please cite this article in press as: AliceAnn Crandall, Kirby Deater-Deckard, Anne W. Riley, Maternal emotion and cognitive control capacities and parenting: A conceptual framework, *Developmental Review* (2015), doi: [10.1016/j.dr.2015.01.004](https://doi.org/10.1016/j.dr.2015.01.004)

cognitive control and parenting. A conceptual framework was developed based on the results of the literature review.

Conclusions: The conceptual framework developed can be used to inform future research and practice. Longitudinal studies that assess the temporal relationship of maternal emotion and cognitive control and parenting are necessary to establish causality. Research that addresses how maternal emotion regulation and cognitive control capacities are related to mothers' enrollment and participation in parenting and early intervention programs is an important next step to strengthening policy and intervention work.

© 2015 Elsevier Inc. All rights reserved.

Parents take pride in the accomplishments of their children. Almost without exception, they want to be good parents and they want the best outcomes for their children. Unfortunately, this desire to parent well does not always translate into actual practice. For example, in a nationally representative sample of 0–17 year olds in the United States, 10.2% reported experiencing some form of child maltreatment in the previous year (Finkelhor, Turner, Ormrod, & Hamby, 2009), with parents being the perpetrators of abuse in the majority (80%) of cases (United States Government Accountability Office, 2011). While most parents do not abuse or neglect their children, many struggle to engage in warm, responsive caregiving (referred to generally in this paper as positive parenting) and to form healthy attachments with their children.

Multiple parent skills training and home visiting programs have been implemented that are designed to help parents strengthen positive parenting skills. Despite the demonstrated success of several of these programs (Gross et al., 2009; Olds et al., 1997; Prinz, Sanders, Shapiro, Whitaker, & Lutzker, 2009), none has been successful with all parents (Duggan et al., 1999; Nievar, van Egeren, & Pollard, 2010). Given the availability of effective interventions, understanding the factors that help explain why some parents do not master positive parenting skills or fail to maintain skills when learned is critical for advancing child abuse prevention as well as reducing child and adolescent behavioral and emotional problems and disorders.

A promising but new area of research that goes beyond the oft-cited 'lack of motivation' and 'chaotic family' explanations is that of parents' emotion and cognitive control capacities. Emerging evidence from various fields suggests that emotion control and cognitive control capacities are critical in the development and maintenance of parenting practices (Deater-Deckard, Wang, Chen, & Bell, 2012; Sonuga-Barke, Daley, & Thompson, 2002). Moreover, aspects of these cognitive control deficits can be managed and even improved in adults (Melby-Lervag & Hulme, 2013; Shipstead, Redick, & Engle, 2012).

The current review comes at a time when there is increasing interest in parental executive functioning and other emotion and cognitive control capacities. This review builds on an overview of the neurobiology of parenting by Barrett and Fleming (2011) and a review of maternal ADHD and self-regulation and their impact on parenting (Johnston, Mash, Miller, & Ninowski, 2012). The available research literature pertaining to parental emotion and cognitive control capacity and caregiving is informative but lacks an organizing framework that is necessary for researchers and practitioners to fully understand the implications of the results and build on them. Thus, **the intent of this review is to critically synthesize this research into a cohesive framework that will highlight the important role that maternal emotion and cognitive control capacities have on day-to-day parenting, their influence on intervention uptake, and the malleability of these capacities in adults.** We have chosen to focus on mothers rather than fathers because the majority of research on parent emotion control and cognitive control has focused on the mother. Many of the results discussed in this paper are likely to be applicable to fathers, although there are sufficient differences in the ways that fathers approach parenting that this hypothesis should be fully tested.

Background

Defining emotion and cognitive control capacities

Emotion and cognitive control capacities refer to the ability to plan, make decisions, hold pertinent information in short-term memory, pay attention, avoid distractions, set priorities, regulate emotion, and control impulses. These capacities are known in different disciplines as executive functions, effortful control, self-control, and self-regulation. There are nuanced differences between these terms, but all are processes of the prefrontal cortex (PFC) (Beaver, Wright, & Delisi, 2007; Hofmann, Schmeichel, & Baddeley, 2012; Rueda, Posner, & Rothbart, 2005; Zhou, Chen, & Main, 2012). This review encompasses all of these terms, but it is worthwhile to acknowledge definitional distinctions.

Differences in terminology

Self-control is a construct often used in the context of social influences, although biological factors have been examined in some research (Beaver et al., 2007). *Effortful control* and *executive functions* both include attention and inhibitory control. Effortful control is a broad measure of temperament and is usually measured using parent-reported or self-reported questionnaires. Executive functions are a set of cognitive capacities typically measured with tasks (Zhou et al., 2012). Empirical work has shown that there is a strong overlap between the two constructs (Bridgett, Oddi, Laake, Murdock, & Bachmann, 2013). Executive function and effortful control measures are sometimes used interchangeably with *self-regulation* but are subservient to it, with self-regulation being the broader construct (Hofmann et al., 2012; Rueda et al., 2005).

In adults, emotion and cognitive control processes are intertwined (Zelazo, Qu, & Kesek, 2010). Emotions help to narrow and prioritize cognitive process options (Lemerise & Arsenio, 2000). "Top-down" emotional control processes are housed with other cognitive control capacities in the prefrontal lobe (Ochsner & Gross, 2008). For example, the dorsolateral and posterior PFC directs the brain's attention to emotional appraisal stimuli and helps the individual keep reappraisal goals in mind; at the same time it also directs working memory and attention-shifting (Ochsner, Silvers, & Buhle, 2012). The ventrolateral PFC houses inhibitory control. This area of the brain also helps an individual to deliberately select new emotional reappraisal responses (Ochsner et al., 2012). While there is debate in the literature as to whether emotion regulation is an executive function, following in the vein of Blair, Ochsner, and others (Blair, Zelazo, & Greenberg, 2005; Ochsner & Gross, 2008; Ochsner et al., 2012; Schroeder & Kelley, 2010) we have included emotion regulation as part of our overall construct in recognition that emotion regulation and executive functioning intersect in important ways and use similar pathways in the brain (Ochsner et al., 2012). In the parenting literature, it is typical to study either maternal emotion control or other cognitive control components, but not both components in the same study. Results from this review of literature will be instructive as to any differences in association between emotion regulation and parenting and other cognitive control capacities and parenting.

As part of our overview of these capacities, we have also included studies of maternal ADHD because of the strong relationship between ADHD and executive dysfunction (Barkley & Murphy, 2011; Nigg et al., 2005) and emotion dysregulation (Reimherr et al., 2005). For example, adolescents with ADHD perform more poorly on inhibitory control and attention-shifting tasks than healthy controls (Qian, Shuai, Chan, Qian, & Wang, 2013). Among adults, those with ADHD also perform more poorly on general executive functioning tasks than adults without ADHD (Nigg et al., 2005) and this executive dysfunction results in impairment in daily life activities important to parenting including managing time, organizing and problem-solving, self-discipline, and more (Barkley & Murphy, 2011). Multiple studies have linked adult ADHD to emotional dysregulation (Reimherr et al., 2005, 2007; Rösler et al., 2010), with the potential to undermine effective parenting.

There is much discussion regarding the relationship between cognitive control capacities and general intelligence. Emotion and cognitive control capacities are a form of fluid intelligence, but they may actually predict parenting behavior more than general intelligence can because they support parents' ability to use what they know rather than simply reflecting one's knowledge (Galinsky, 2010). While cognitive control capacities appear to be related to general measures of intelligence (Engle & Kane, 2004; Sanz de Acedo Lizarraga, Sanz de Acedo Baquedano, & Villanueva, 2012), they are not the same

– individuals may score high on intelligence tests and low on executive functioning tasks (Cornoldi, Giofrè, Calgaro, & Stupiggia, 2013). However, in order to isolate the effects on parenting of emotion and cognitive control capacities from those of general intelligence, it is important to estimate effects that overlap with and are independent from variance in fluid intelligence.¹

Relationship between maternal emotion and cognitive control and parenting

All mothers face a variety of parenting demands, but these demands may be particularly challenging for mothers with emotion and cognitive control deficits. Emotion and cognitive regulatory capacities are vital for supporting parents' ability to be perceptive, responsive, and flexible (Kienhuis, Rogers, Giallo, Matthews, & Treyvaud, 2010). Parents call upon these capacities as they plan and change behavior, respond appropriately to cues, regulate emotion in the face of stress and challenging child behavior, problem solve, and make decisions (Barrett & Fleming, 2011; Kienhuis et al., 2010).

Cognitive control capacities, particularly emotion control, are especially important for parents in stressful situations (Deater-Deckard, 2014). Stressful situations include contextual factors such as unsafe neighborhood environments, adverse life events, household chaos, lower family socioeconomic status (e.g., poverty, non-normal working hours, unemployment, low parental schooling attainment), inadequate social support, or poor couple relationship quality. Parents with effective emotion control are more flexible, adaptable, and better able to cope with stress, remaining calm or shifting to strong affect according to circumstances (e.g., if a young child is crossing the street without the parent, strong affect may be warranted), while parents who are not able to emotionally self-regulate tend to be more emotionally reactive in response to stressors (Skowron & Friedlander, 1998). For example, if a child is stressed, an emotionally reactive parent is more likely to react negatively to the child's distress rather than enacting soothing behaviors that can calm the child.

Methods

To accomplish our purpose of developing a conceptual framework, we conducted a comprehensive review of the literature. We searched PsycINFO, PubMed, Scopus, JSTORE, Cinahl Plus, Academic Search Complete, Web of Science, and Sociological Abstracts for empirical studies published between 2000 and February 2014 that specifically included measures of any aspect of maternal emotion regulation and cognitive control along with parenting behaviors. Search term and keyword combinations (with Boolean connections) included: cognitive control, executive function, task switching, working memory, inhibitory control, impulsivity, emotion control, set-shifting, emotion regulation, self control, effortful control, self regulation, parenting, and attachment. The reference lists for articles that fit inclusion criteria were reviewed to identify articles that did not appear in the initial searches. Only peer reviewed, English-language articles were eligible for inclusion. Thirty-five articles were identified, reviewed, and given a methodological quality score (MQS). Table 1 includes the MQS criteria. Scores ranged from 6 to 14 points (out of a possible maximum score of 18).

The 35 articles included 15 studies of maternal ADHD, 7 studies of emotion control, and the remaining 13 studies focused on multiple or individual cognitive control components such as working memory, inhibitory control, etc. A variety of instruments were used to measure maternal emotion and

¹ The issue of controlling for intelligence in studies where cognitive control capacities are independent variables is controversial. Some argue that controlling for intelligence overcorrects (e.g., Dennis et al., 2009). Others argue that it is necessary in order to address the portion-of-variance problem inherent with cognitive control capacity tasks (e.g., Daniels et al., 2006). If the dependent and independent variables are spuriously related to intelligence, then it would be important to include maternal intelligence as a covariate (Dennis et al., 2009). However, few researchers have examined maternal fluid intelligence as it relates to parenting so little is known about the relationship. One study from 1998 suggests that maternal intelligence is related to the quality of the home environment, which is an aspect of parenting (Bacharach & Baumeister, 1998). Deater-Deckard, Wang, et al. (2012) reported a significant relationship between maternal verbal intelligence and maternal report of harsh parenting. While we acknowledge the controversy, we recommend that researchers estimate effects with and without maternal fluid intelligence score as a covariate in order to estimate the distinct statistical effects of emotion and cognitive control capacities, as well as potential overlapping effects with fluid intelligence, on parenting.

Table 1
Methodological quality score (MQS) criteria.

MQS criteria	Points
Study design	Cross-sectional (1 point); longitudinal: 2 time points (2 points); longitudinal: >2 time points (3 points)
Sample size	<30 (0 points) 30–100 (1 point); 100–300 (2 points); >300 (3 points)
Emotion and cognitive control capacity measurement	Self-report (1 point); task/observational (2 points); combination self-report and observation (3 points)
Parenting or child behavior measurement	Self-report (1 point); task/observational (2 points); combination self-report and observation (3 points)
Data analysis	Univariate statistics/descriptive (0 points); bivariate/ANOVA (1 point); logistic regression/ANCOVA (2 points); multiple linear regression, SEM, MANCOVA (3 points)
Study controls for potential confounders	No controls or stratification (0 points); controls for individual-level factors: mother and child age, child gender, psychopathology (1 point); control for either maternal fluid intelligence (IQ) or controls for SES (includes parent education, occupation, income, marital status), family stress, household chaos (2 points); control group or have controls for both maternal fluid intelligence and SES/family stress/household chaos (3 points)
Total	Possible scores can range from 4 to 18 points

cognitive control capacity; there was very little consistency across studies in its measurement. Of the 35 studies, only one study measured maternal cognitive control using both self-report and tasks. Another six studies used only tasks/observation measures of emotion and cognitive control. The remaining 28 studies relied on self-report (occasionally combined with the report of a family member). Given this diversity in measurement, we determined it would be premature to conduct a meta-analysis. We instead opted to conduct a synthesis of existing literature in an effort to move the field toward a set of measures and constructs to make a meta-analysis more feasible in the future.

In terms of outcomes, both observation and self-report measures of parenting were used in six studies, five used observation only, and the remainder used self-report only. Due to the potential confounders such as fluid intelligence (IQ) and family SES (maternal education, household income, parent occupational status, and marital status) and stress, it is important that studies of maternal emotion and cognitive control capacity assess the potential confounding influence of maternal IQ and household sociodemographic characteristics or have an adequate control group.² Approximately a quarter of the studies (nine of the 35) in this review controlled for both maternal IQ and an aspect of household sociodemographics or included a control group. Another 14 studies accounted for household sociodemographics but not maternal fluid intelligence. None of the studies on maternal emotion regulation controlled for maternal fluid intelligence. See Table 2 for a complete listing of empirical studies that measured maternal emotion and cognitive control capacity and parenting, their MQS rating, and study outcomes.

State of the science: maternal emotion and cognitive control capacities and parenting

This section is based on the review of the 35 studies on maternal emotion and cognitive control capacities and parenting outcomes and is organized by the outcomes studied, positive and negative parenting. We define negative parenting as parenting behaviors that are harsh, punitive, or inconsistent. Positive parenting is more than just the absence of harsh, reactive parenting, but includes parental sensitivity and warmth, monitoring, involvement, and consistency. In this section we also look at the intersection of contextual factors with maternal emotion and cognitive control capacities and parenting outcomes.

² IQ and sociodemographic characteristics are correlated and therefore it could be argued that either IQ or sociodemographic characteristics, but not both, should be controlled for. We suggest running analyses with no controls, then each control individually, and finally with both controls in order to assess the potential confounding roles of each control variable as well as to adequately control for, but not overcontrol for, these characteristics.

Table 2
Studies included of maternal emotion and cognitive control capacity (ECCC) and parenting.

Article	MQS	Maternal ECCC measured	Tool(s)	Parent/child outcomes measured	Results
Emotion control					
Hughes and Gullone (2010)	10	Emotion regulation (ER)	Emotion Regulation Questionnaire	Supportive and non-supportive responses to child emotions	In bivariate analyses, mother's ER was positively correlated with supportive responses and negatively correlated with non-supportive responses to children's emotions; in multiple regression mother's ER was negatively associated with non-supported responses only
Lorber and O'Leary (2005)	8	Positive/negative emotion and emotion appraisal	Maternal self-report of emotions during observation	Overreactive discipline, attribution bias	The relationship between negative emotion experience and overreactive discipline mediated by negative appraisal bias
Lorber (2012)	9	Emotion regulation	Emotion Regulation Questionnaire; Parental Emotion Regulation Inventory	Overreactive and lax discipline	Lax discipline associated with lower maternal global reappraisal but not discipline specific reappraisal; overreactive discipline associated with global reappraisal and discipline specific reappraisal and suppression
Martini et al. (2004)	9	Emotion regulation	Vignettes on maternal suppression of hostile and non-hostile emotions	Authoritarian parenting	Higher authoritarian parenting scores associated with lower ER scores for both hostile and non-hostile emotions; mothers with higher SES more likely to control hostile emotions
Sarıtaş et al. (2013)	9	Emotion regulation	Difficulties in Emotion Regulation Scale	Maternal rejection, maternal warmth	Lower maternal ER related to more maternal rejection and less maternal warmth for both parent and adolescent report of parenting; maternal rejection in turn related to child ER
Skowron et al. (2010)	7	Emotional reactivity and distancing	Differentiation of Self Inventory	Child maltreatment	High emotional reactivity/distancing associated with high risk of child maltreatment; low maternal reactivity/distancing associated with low risk of child maltreatment
General executive functioning (EF) measures (including inhibitory control, working memory, attention control)					
Chen and Johnston (2007)	11	Inattention, impulsivity, and hyperactivity	Current Symptom Scale–Self-Report Form and CAARS	Overreactive and inconsistent discipline; parent involvement, positive reinforcement, and responsiveness	Maternal hyperactivity not related to parenting outcomes; maternal impulsivity (but not inattention) inversely related to positive reinforcement; maternal inattention related to poor parent involvement and inconsistent discipline; in hierarchical regression, neither inattention nor impulsivity significantly accounted for overreactive discipline
Chico et al. (2014)	12	Working memory, attention control	Spatial working memory task; ID/ED derived from Wisconsin Card Sort	Maternal sensitivity and vocalizations	In adult moms, lower maternal working memory associated with less time attending to infants; in teen moms, lower maternal attention-shifting associated with lower maternal sensitivity and fewer vocalizations in teen moms; age moderated relationship between attention shifting and parenting – relationship stronger in teen moms

Table 2 (continued)

Article	MQS	Maternal ECCC measured	Tool(s)	Parent/child outcomes measured	Results
Deater-Deckard et al. (2010)	13	Working memory	Forward and backward digit span from WAIS-III	Harsh reactive parenting	Poor maternal working memory negatively associated with harsh reactive parenting in the face of child challenging behavior
Deater-Deckard, Wang, et al. (2012)	12	Executive function (working memory, inhibitory control, attention control, problem solving)	Wisconsin Card Sort, Color-word Stroop, Tower of Hanoi, Backward Digit Span Task	Harsh parenting and child conduct problems	In calm households only, lower EF related to higher harsh parenting and child conduct problems; in high chaotic households, EF not significantly related to harsh parenting
Fontaine and Nolin (2012)	10	Hot executive function (decision making with emotions; perspective-taking/empathy)	Iowa Gambling Task	Potential for abuse	Physical abuse group performed significantly lower on decision-making and perspective-taking than the control group; results for neglectful group were not significantly different from other two groups but showed a general trend to be "in-between" the abusers and control groups
Gonzalez et al. (2012)	11	Attention control, spatial working memory	Attention control derived from Wisconsin Card Sorting Task; Spatial Working Memory Task	Maternal sensitivity	Early life experiences impact maternal sensitivity via the pathway of maternal working memory (but not via attention)
Musser et al. (2012)	8	Emotion regulation, inhibitory control, goal-directed behavior, general executive functioning	Functional imaging	Maternal sensitivity versus intrusiveness	Sensitive moms were more likely (than moms who were intrusive) to activate areas of the brain associated with ER, inhibitory control, decision-making, and other higher order processes associated with goal directed behavior
Turner et al. (2008)	7	Executive function (inhibitory control, attention control, working memory)	Hayling and Brixton Tests and Color Trails tests	Maternal bonding and recognition of infant cues	EF was not significantly correlated with bonding or recognition of infant emotion cues; maternal depression associated with lower EF
Self-control Boutwell and Beaver (2010)	12	Self-control	Abbreviated Dickman's Impulsivity Scale	Child self-control; maternal involvement	Low maternal self-control associated with less maternal involvement and also low child self-control
Henschel et al. (2013)	9	Self-control	Self-Control Scale Questionnaire	Child abuse potential	Maternal self-control inversely associated with child abuse potential; in hierarchal regression, maternal self-control mediated relationship between maternal history of abuse and child abuse potential and it explained an additional 15% of variance in model for child abuse potential

Table 2 (continued)

Article	MQS	Maternal ECCC measured	Tool(s)	Parent/child outcomes measured	Results
Nofziger (2008)	12	Self-control	Mom's smoking status and use of alcohol; difficulty maintaining stable job; difficulty maintaining stable relationships; engaging in early sex and not using measures to prevent unwanted pregnancy	Parental supervision; parental punishment; child self-control	Relationship between mom's self-control and more monitoring was marginally significant ($p < 0.10$); moms with low self-control more likely to ignore a tantrum, isolate, and take away privileges (but not related to spanking)
Effortful control Bridgett et al. (2011)	10	Effortful control	Adult Temperament Questionnaire	Maternal time in infant care (e.g., reading to child, holding, feeding, etc.)	Maternal effortful control at infant age 4 months predictive of more time spent on care giving activities at child age 6 months and better child orienting and regulating at 18 months
Bridgett, Laake, et al. (2013)	12	Effortful control	Adult Temperament Questionnaire	Negative parenting construct: laxness, overreactivity, ineffective verbal communication	Maternal effortful control predictive of less negative parenting over time – and negative parenting related to less infant smiling and laughter
Valiente et al. (2007)	10	Effortful control	Adult Temperament Questionnaire	Parent positive and negative reactions to child negative emotion	Parent effortful control positively related to their positive reactions and inversely related to their negative reactions; parent's effortful control correlated with less household chaos
Attention deficit and hyperactivity disorder (ADHD) Babinski et al. (2012)	10	Inattention and impulsivity/hyperactivity	Barkley Adult ADHD scale	Parent-adolescent conflict; parental monitoring, parental knowledge, consistent discipline, ineffective discipline	Moms with ADHD (compared to moms without) reported more parent-adolescent conflict, less parental knowledge, monitoring, and consistent discipline, and more ineffective discipline. No differences emerged regarding effective discipline and involvement
Banks et al. (2008)	6	ADHD	ADHD Behavior Checklist for Adults and CAARS	Parent self-esteem (efficacy and dissatisfaction); locus of control measures (PLOC); lax discipline; overreactive discipline	When compared with the low ADHD group, mothers in the high ADHD group scored significantly lower on parenting efficacy and significantly higher on parenting dissatisfaction. On the PLOC scales, mothers in the high ADHD group scored higher (than the low ADHD group) on negative parental efficacy, belief in fate/chance, and parent lacks control; mothers in the high ADHD group scored significantly higher on laxness and overreactivity compared to mothers in the low ADHD group.

Table 2 (continued)

Article	MQS	Maternal ECCC measured	Tool(s)	Parent/child outcomes measured	Results
Chronis-Tuscano, Seymour, et al. (2008)	8	Inattention and impulsivity/hyperactivity	CAARS and CGI-S	Corporal punishment, inconsistent discipline, positive parenting	As ADHD symptoms decreased (with optimal dose of meds), corporal punishment and inconsistent discipline decreased; no association between decrease in ADHD symptoms and positive parenting
Chronis-Tuscano, Raggi, et al. (2008)	10	Inattention and impulsivity	CAARS	Positive parenting, involvement, inconsistent discipline, negative parenting	Self-report measures: maternal ADHD symptoms associated with lower levels of positive parenting/involvement and higher levels of inconsistent discipline; observational measures: maternal ADHD positively related to negative parenting, negatively associated with positive parenting, lower levels of parent involvement; maternal ADHD not predictive of inconsistent discipline
Chronis-Tuscano et al. (2010)	10	ADHD	Structured Clinical Interview for DSM-IV (and verified by other collateral informants)	Positive and negative parenting	Medication reduced ADHD symptoms but no impact on parenting behaviors
Chronis-Tuscano et al. (2011)	13	ADHD	CAARS and SCID and K-SADS and collateral informants	Negative parenting	Mothers with higher ADHD symptoms reported attenuated effects of parent training on children's disruptive behavior symptoms; maternal ADHD predicted observed negative parenting during free play and homework; moms with ADHD had more difficulty in reducing negative parenting behaviors when enrolled in parent training
Harvey et al. (2003)	11	Inattention & Impulsivity	Adult Attention Deficit Disorders Evaluation Scale	Lax and overreactive parenting	Maternal inattention associated with lax parenting; moderate inattention linked with repetitive arguing behavior before parent training but largest decrease after training (high levels of inattention showed little change after parent training)
Mokrova et al. (2010)	11	Attention, planning, problem solving, inhibitory control	Adult ADHD Rating Scale-IV	Monitoring, inconsistent discipline, parent involvement, and positive parenting, responsiveness to negative affect	Maternal ADHD positively related to nonsupportive responsiveness and inconsistent discipline, inversely associated with involvement; home chaos mediates the link between ADHD symptoms and maternal inconsistent discipline and nonsupportive responses
Murray and Johnston (2006)	8	ADHD	CAARS-S: SV and interview	Parental monitoring, inconsistent discipline, and problem solving	Moms with ADHD (inattentive type and all types) monitored children less; moms were less consistent in discipline if had ADHD, and quality and planning of problem solving was lower for moms with ADHD on some measures; positive parenting did not differ by ADHD status

Table 2 (continued)

Article	MQS	Maternal ECCC measured	Tool(s)	Parent/child outcomes measured	Results
Ninowski et al. (2007)	9	Inattention, impulsivity, overall ADHD	CAARS and ABCA	Prenatal maternal expectations, maternal self-efficacy in nurturing role;	Parental inattention and parental impulsivity were both correlated with less positive parent expectations; maternal self-efficacy inversely correlated with inattention and impulsivity
Psychogiou et al. (2007)	9	ADHD	Adult ADHD Rating Scale	Positive involved parenting (PIP), negative parenting (NP)	PIP inversely correlated with maternal ADHD symptoms; NP positively correlated with ADHD symptoms
Psychogiou et al. (2008)	12	ADHD	Adult ADHD Rating Scale	Negative parenting; emotion expressivity	Maternal ADHD associated with increased negative parenting and negative emotional expressivity; when both mother and child had ADHD, mother response to child with ADHD was more positive than when mother did not have ADHD
Sonuga-Barke et al. (2002)	11	Inattention and impulsivity	Adult AD/HD Rating Scale	Child ADHD and oppositional/defiance symptoms; child behavior and emotional problems; parental sense of competence	Moms with lowest ADHD had highest satisfaction and efficacy at baseline; mothers with high ADHD symptomology had more child problems at baseline; parent training had little to no effect on child outcomes in times 2 and 3 in moms with high levels of ADHD, but did positively affect child outcomes in mothers with low and moderate levels of ADHD
Watkins and Mash (2009)	9	ADHD	CAARS	Maternal self-efficacy, parenting satisfaction, perceived parental impact, and maternal hostile-reactive behaviors	ADHD did not predict self-efficacy or social network size and support but did predict lower ratings of parent satisfaction (especially in inattention sub-types), lower perceived parental impact, and hostile reactive behaviors
Wietecha et al. (2012)	13	ADHD	CAARS-INV: SV and CGI-ADHD-S	Parent involvement, positive parenting, poor monitoring/supervision, inconsistent discipline, corporal punishment	Among moms with ADHD receiving treatment (compared to controls), at 8 weeks of treatment, positive impact on display of parent expression of affect; parent sense of confidence was higher among moms receiving treatment compared to controls; found stress reduction in the treatment group

Negative parenting

In the literature on maternal emotion and cognitive control capacities and parenting, negative parenting is one of the most studied outcomes. Relationships between low maternal emotion/cognitive control and high scores on negative parenting practices such as harsh and rigid discipline have been found in studies specifically looking at maternal emotion control, effortful control, executive functioning, and inattentive ADHD. Lower maternal emotion/cognitive control is associated with more ineffective discipline strategies (Babinski et al., 2012; Banks, Ninowski, Mash, & Semple, 2008; Chen & Johnston, 2007; Deater-Deckard, Sewell, Petrill, & Thompson, 2010; Deater-Deckard, Wang, Chen, & Bell, 2012; Harvey, Danforth, Eberhardt McGee, Ulaszek, & Friedman, 2003; Lorber, 2012; Lorber & O'Leary, 2005; Mokrova, O'Brien, Calkins, & Keane, 2010; Murray & Johnston, 2006), a more controlling parenting style (Martini, Root, & Jenkins, 2004), negative reactions to children's emotions (Valiente, Lemery-Chalfant, & Reiser, 2007), more maternal rejection (Sarıtaş, Grusec, & Gençöz, 2013), and general negative parenting (Bridgett, Laake, Gartstein, & Dorn, 2013; Chronis-Tuscano, Raggi, et al., 2008; Chronis-Tuscano et al., 2011). The relationship between low maternal emotion/cognitive control and increased negative parenting held true in studies in early childhood, middle childhood, and adolescence.

Of interest in this body of studies are two that assessed the impact of treatment (5 weeks of OROS Methylphenidate treatment) on maternal ADHD symptoms and parenting. Chronis-Tuscano, Seymour, et al. (2008) and Chronis-Tuscano et al. (2010) randomly assigned 23 mothers with ADHD of children 6–12 years old to receive treatment or to be in a no-treatment control group. In the 2008 study, treatment effectively reduced ADHD symptoms and mothers who received the treatment also reported using less corporal punishment ($d = 0.42$) and inconsistent discipline (0.71) at the follow-up compared to baseline. Medium to large medication effects were found for improvements in self-reported positive parenting. However, while the parent's perception of their parenting improved after ADHD treatment in the 2008 study, in the 2010 study which incorporated observational parenting measures, treatment reduced parent ADHD symptoms but was not significantly related to changes in observed parenting behavior.

Child maltreatment, including abuse and neglect, is an extreme form of negative parenting. Low emotion control and overall lower self-control (Henschel, Bruin, & Möhler, 2013) put a woman at greater risk for maltreating her children of all ages. In a study of mothers with children 5–14 years, Skowron, Kozlowski, and Pincus (2010) found that, after controlling for family SES, mothers with poor emotion regulation were at higher risk for engaging in child maltreatment. The reverse was also true; mothers scored low on child maltreatment risk if they had better emotion regulation. Fontaine and Nolin (2012) conducted a study of 'hot' executive functioning (operationalized as decision-making and perspective-taking) in parents who had been accused of child abuse or neglect and compared them to a control group of parents. The researchers found that parents who had been accused of child abuse had significantly lower decision-making and perspective-taking scores compared to the control group (Fontaine & Nolin, 2012).

Of the studies that included measures of negative parenting, 10 included both observational and self-report measures of parenting which is ideal for measuring parenting. However, most studies were cross-sectional; when they were longitudinal the follow-up periods provided only a short-term assessment and did not address long-term trends. One-third of these studies did not include sufficient controls (e.g., neither covariates for maternal fluid intelligence or family sociodemographic factors).

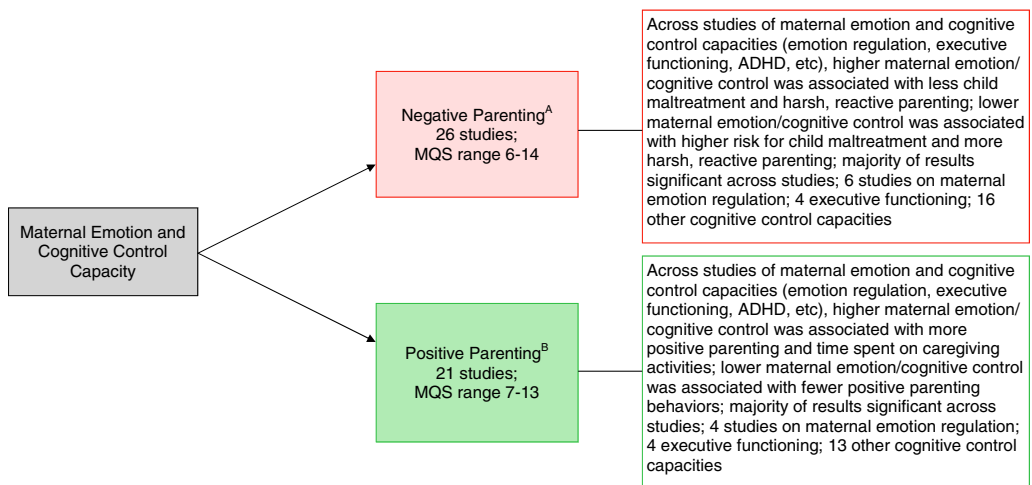
Positive parenting

In this section, we include 21 studies on aspects of positive parenting, whether the ultimate results were more positive (e.g. involved parenting) or less positive (e.g. distant or less-involved parenting). Several studies explored aspects of maternal emotion and cognitive control and a range of positive parenting measures. Across the life course of childhood, higher maternal emotion control and cognitive control is associated with supportive responses to child's negative emotion (Hughes & Gullone, 2010; Valiente et al., 2007), increased maternal sensitivity and warmth (Chico, Gonzalez, Ali, Steiner,

& Fleming, 2014; Gonzalez, Jenkins, Steiner, & Fleming, 2012), more affectional expression (Wietecha et al., 2012), more time spent on caregiving activities (Bridgett et al., 2011) and a higher sense of parenting confidence (Wietecha et al., 2012). On the other hand, lower maternal emotion and cognitive control is associated with less monitoring (Babinski et al., 2012; Murray & Johnston, 2006), less maternal involvement (Boutwell & Beaver, 2010; Chen & Johnston, 2007; Chronis-Tuscano, Raggi, et al., 2008; Mokrova et al., 2010), less parental satisfaction (Watkins & Mash, 2009), and less generally positive parenting (Chronis-Tuscano, Raggi, et al., 2008; Psychogiou, Daley, Thompson, & Sonuga-Barke, 2007). Of the studies that included positive parenting outcomes, about half of these studies did not include covariates for maternal fluid intelligence nor family sociodemographic factors such as maternal education and household income.

A functional imaging (fMRI) study of mothers' emotion/cognitive control and sensitivity to their toddlers demonstrates that different brain regions are activated in mothers who were coded as intrusive or sensitive to their infants' behaviors. Among mothers coded as sensitive, regions of the brain associated with emotion regulation, inhibitory control, and decision-making were activated in response to one's own infant's cry. Conversely, in mothers coded as intrusive, regions of the brain were activated that are associated with emotion recognition and empathy for others when witnessing pain. The authors concluded that the areas of brain activation indicate that sensitive mothers are more able to regulate their response to their children's cues while intrusive mothers are more reactive to their child's distress, leading to their over-involvement. Maternal depression was controlled for, but sociodemographic factors and fluid intelligence were not accounted for in this study (Musser, Kaiser-Laurent, & Ablow, 2012).

In summary, across the various components of maternal emotion and cognitive control capacity, the link with positive and negative parenting outcomes is similar. Mothers who have better emotion regulation and executive functioning are more likely to engage in positive parenting and less likely to engage in harsh parenting compared to mothers with poor emotion regulation and executive function deficits. See Fig. 1 for a summary of studies stratified by positive and negative parenting with MQS ranges.



^A Negative Parenting: Harsh, punitive, and inconsistent parenting; also includes child maltreatment

^B Positive Parenting: Positive parenting is more than the absence of harsh, reactive parenting but also includes maternal warmth, sensitivity, monitoring, and consistent discipline

Some studies include measures of both positive and negative parenting

Fig. 1. At-a-glance: studies of maternal emotion and cognitive control capacity and parenting.

Role of contextual factors in maternal emotion and cognitive control and parenting

Important to the discussion of maternal emotion and cognitive control capacities and parenting is their intersection with contextual factors, especially maternal education, household income, and household chaos. Deater-Deckard, Chen, Wang, and Bell (2012) found that maternal executive functioning and household chaos were negatively correlated in families with the most socioeconomic risks (single parent households, low maternal and paternal education, paternal unemployment, and living in a non-single family house). Maternal ADHD symptoms have also been linked with more home chaos and family conflict and less family cohesion (Biederman, Faraone, & Monuteaux, 2002; Mokrova et al., 2010). Chaos appears to exert its influence through the mechanisms of stress and distraction to reduce the efficiency and effectiveness of prefrontal lobe regulatory functions (Lupien, McEwen, Gunnar, & Heim, 2009; Wachs & Evans, 2010) so that even parents with normal to high emotion regulation and cognitive control may find that in the face of chaos and other stressors their capacity is diminished and their parenting quality compromised (Deater-Deckard, Wang, et al., 2012). This relationship is likely recursive in that poor maternal planning, problem-solving, decision-making, working memory, and general self-regulation are also associated with mothers' reports of higher household chaos (Bridgett, Burt, Laake, & Oddi, 2013). However, since studies have been cross-sectional it is impossible to determine causality.

The majority of studies included in this review controlled for contextual factors such as maternal education and maternal psychopathology in their analyses. Except as noted, however, few studies addressed how those personal and family-level factors mediated or moderated the association between maternal emotion regulation and cognitive control capacity and parenting. An important next step of research is to better 'situate' maternal emotion/cognitive control in overall family and individual contexts that influence effective parenting and household management. Additionally, none of the studies on maternal ADHD or maternal emotion regulation controlled for maternal fluid intelligence, though some studies addressing specific executive functions did. Future studies investigating the effects of maternal ADHD and emotion regulation on parenting should carefully consider the potential confounding effects of maternal IQ.

Plasticity of emotion and cognitive control capacities

Understanding the development and mechanisms of emotion and cognitive control capacities is important in order to ascertain when and how to intervene. Other relevant research avenues include exploring the factors that compromise optimal emotion and cognitive control functioning in adults, examining the mutability of these capacities in adults, and determining whether there are promising and feasible methods for modifying adult emotion and cognitive control.

Development of emotion and cognitive control capacities

The development of emotion and cognitive control capacities is complex and the timing of development varies between components. These capacities are primarily housed in the prefrontal cortex (PFC), which develops over the first three decades of life (Niendam et al., 2012). Emotion and cognitive control in childhood is predictive of adult emotion and cognitive control (Mandell & Ward, 2011; Murray et al., 2006). Higher order cognitive processes build on lower level processes (Knudsen, Heckman, Cameron, & Shonkoff, 2006). If brain circuits for lower level processes do not fully develop during sensitive periods, then the development of higher order brain circuits will be compromised (Knudsen et al., 2006). As the child develops, brain circuits are more difficult to modify and improvement becomes increasingly difficult in adulthood (Knudsen et al., 2006).

Brain imaging studies have mapped out a superordinate cognitive control network that includes the dorsolateral prefrontal cortex, parietal cortex, and anterior cingulate cortex, supporting all of the emotion and cognitive control capacities (Niendam et al., 2012). Neural communication between the different parts of the network may be as or more important to optimal emotion and cognitive control performance as the functioning and structure of the individual brain areas (Barbey et al., 2012; Niendam et al., 2012).

Genetics, the social environment, environmental toxins, brain injury and disease all influence emotion and cognitive control development. The PFC is an area of the brain that shows strong genetic influence on structure and function (Friedman et al., 2008; Thompson et al., 2001), and emotion and cognitive control capacities have been found to be among the most heritable of cognitive processes (Beaver et al., 2007; Friedman et al., 2008; Thompson et al., 2001). Individuals who are genetically at risk for poor cognitive control outcomes and who also are exposed to environmental stressors like harsh parenting, family chaos, and low SES are especially vulnerable for poor cognitive control functioning (Berry, Deater-Deckard, McCartney, Wang, & Petrill, 2013; Deater-Deckard, 2014; Hughes, 2011). Importantly, while emotion and cognitive control capacities are highly heritable, they are modifiable and there is increasing evidence of neural plasticity and neurogenesis in the frontal lobe of middle-age and older adults and even improvements in response to experience (Carlson et al., 2009; Dahlin, Nyberg, Backman, & Neely, 2008).

Intra-individual variability of emotion and cognitive control capacity

Various factors are associated with fluctuation in an individual's emotion and cognitive control capacities. Individuals may appear to have deficits when they are suffering from extreme stress (Luethi, Meier, & Sandi, 2009; Lupien et al., 2009), sadness or loneliness (Engle & Kane, 2004; Kanske & Kotz, 2012), fatigue and sleep deprivation (Engle & Kane, 2004; Horne, 2012), or when they are not physically or nutritionally fit (Blanton, Green, & Kretsch, 2013; Francis & Stevenson, 2013). Adele Diamond noted that the "prefrontal cortex is the first to suffer, and suffer disproportionately, if something is not right in your life" (Diamond, 2013, p. 153).

Fatigue is linked to impaired attention control (Engle & Kane, 2004; Horne, 2012). Stress is also a factor in emotion and cognitive control performance. Adults with normal to high cognitive control are better at coping with stress (Bakker, Ormel, Verhulst, & Oldehinkel, 2011). But when stress does arise, it has been shown to increase distractibility and reduce working memory and attention control (Luethi et al., 2009; Lupien et al., 2009). Adolescents' prefrontal cortex functions may be especially sensitive to the effects of stress (Lupien et al., 2009), putting adolescent parents at particular risk for impaired cognitive and emotional control functioning in high-stress situations (see Chico et al., 2014).

Can adult emotion and cognitive control capacity be modified?

Currently, we know little about the plasticity of emotion and cognitive control in adults other than that they are mutable to a degree. There is some evidence that cognitive behavioral training and possibly mindfulness training improve adult cognitive control (Diamond, 2013; Melby-Lervag & Hulme, 2013; Ochsner & Gross, 2008; Shipstead et al., 2012; Sibinga et al., 2011), but retraining neural systems is effortful and highly domain specific. Initial training gains often do not hold up in the long-term (Melby-Lervag & Hulme, 2013), and even with success in retraining one domain, it is difficult to generalize these gains to other domains and situations.

For adults with ADHD, treating the symptoms with medication has been shown to improve performance on executive functioning tasks (Faraone et al., 2005). However, improved parenting skills may not necessarily immediately follow improved cognitive control due to habits that have been developed over time or poor parenting knowledge (Chronis-Tuscano, Seymour, et al., 2008; Chronis-Tuscano et al., 2010). Parent skills training or other interventions may be necessary to improve parenting and ultimately child outcomes, but as suggested earlier, the failure of parenting programs to attend to underlying emotional and cognitive control capacities may contribute to their uneven effectiveness.

Based on the literature available at this time, intervention strategies that are most likely to succeed in parents with emotion regulation or executive function deficits are those that focus on reducing factors that negatively impact the day-to-day functioning of emotion and cognitive control combined with parent skills training that incorporates cognitive behavioral training.

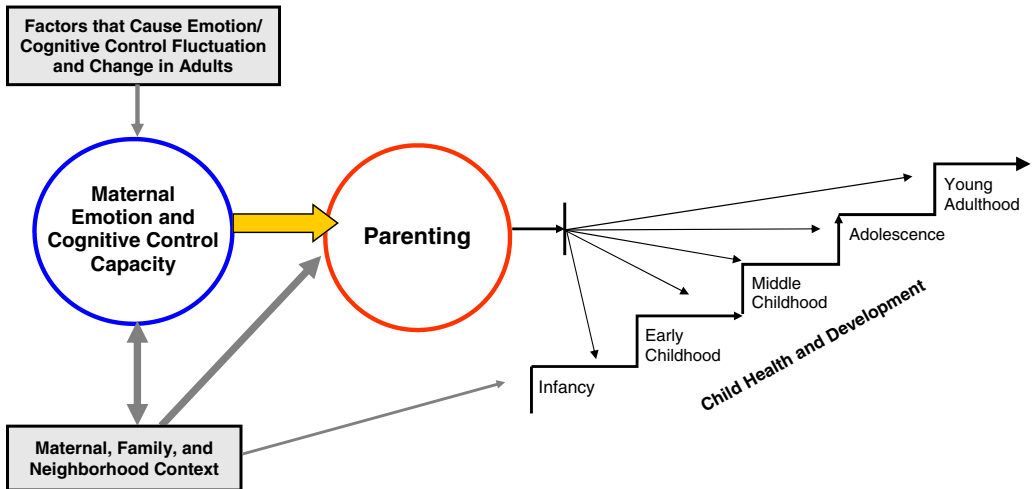


Fig. 2. Conceptual model of the multigenerational impact of maternal emotion and cognitive control capacity and parenting.

Conceptual model

Fig. 2, an intergenerational conceptual model of maternal emotion control and cognitive control capacities and parenting, helps to illustrate the knowledge summarized in this review of literature. In this model, maternal emotion and cognitive control capacities are shown to have a direct impact on parenting, which in turn impacts each stage of child health and development. Contextual factors, including characteristics of the household and neighborhood environments, influence and are influenced by maternal emotion and cognitive control capacities. These contextual factors influence parenting and child health directly and by intersecting with maternal capacities. Throughout the life course of parenting, external factors (e.g., cognitive behavioral training, psychotherapy for ADHD, environmental stressors, etc.) may modify a mother's emotion and cognitive control capacities, which may then impact her quality of parenting.

Implications for programs, policy, and research

Interventions to enhance child and family well-being often focus on families at “high risk” because of sociodemographic disadvantages, and the mothers in these families are more likely to have deficits in emotion regulation and cognitive control (Berry et al., 2013; Hughes, 2011; Sheridan, Sarsour, Jutte, D'Esposito, & Boyce, 2012). Parents with deficits in planning, attention control, and other cognitive control components may benefit less from these interventions because they may be more difficult to enroll and engage in programs, more distracted during training, or they may be less able to apply what is learned in the program to the home environment. Program outcomes may be substantially improved if deficits in emotion and cognitive control are taken into account when designing recruitment and enrollment strategies, compliance standards, and implementation methods.

Few empirical studies have been conducted on parental emotion and cognitive control capacity and intervention uptake, but it appears based on the results of two maternal ADHD studies that parents with lower cognitive control have more difficulty learning and maintaining positive parenting skills (Harvey et al., 2003; Sonuga-Barke et al., 2002).

When intervention strategies are introduced that specifically target improving a mother's emotion regulation and cognitive control capacity, parents are more likely to improve their parenting skills. In a home visiting study in which parents were randomly assigned to receive no intervention (control group), regular home visiting, or enhanced home visiting (which included strategies to improve

mother's problem-solving), mothers from the enhanced home visiting group were much less likely to engage in physical abuse during the first year following the study (4%) compared to parents in the control (26%) and regular home visiting (23%) groups (Bugental et al., 2002). In a follow-up study, parents who received a home visiting intervention with a cognitive component were less likely to use corporal punishment and also reported fewer child injuries compared to parents in the control and unenhanced home visiting groups (Bugental & Schwartz, 2009).

Some families may already have good parenting knowledge but live in such stressful circumstances that it is difficult for them to implement what they learn from parenting interventions (Wahler & Dumas, 1989). The capacity to hold relevant information in mind and manage multiple demands on attention is an essential skill for a mother, but in stressful circumstances this skill is usually diminished (Luethi et al., 2009; Lupien et al., 2009). To be effective, an intervention must not only balance teaching essential parenting skills, but also help parents to find ways to reduce stress in their lives so that they can better incorporate the positive parenting knowledge and skills they learn in these interventions.

Beyond interventions specific to parenting skills, recognition of the need some parents have for assistance in problem solving and planning is critical for all interventions designed to strengthen families. For example, in children's medical and school settings parents may need added support to resolve logistical challenges (i.e. transportation, childcare, managing schedules) so that they can attend appointments and manage medications. The millions of dollars spent on improving access to medical and other services (such as food stamps and health insurance supports like Medicaid) might be made more effective by reviewing and improving programs' enrollment and compliance procedures to ensure that families are not excluded because they cannot navigate the complexities of these programs' procedures.

Table 3 contains summary recommendations for program and policymakers as well as recommendations for research that will influence program and policy.

Table 3

Summary implications for policy, program, and research.

Summary implications for policy (adapted from Beaver et al., 2007)

- 1) Recognize that policies that address parent knowledge and skills without also addressing a parent's ability to plan, problem solve, control emotion, and other cognitive control skills will have limited success.
- 2) Keep program enrollment, procedures, and rewards systems simple, straight-forward, and consistent. Mothers with cognitive control deficits are the least likely to be able to navigate complex program enrollment procedures.
- 3) Rehabilitative treatment programs can positively impact cognitive functioning when coupled with parenting skills education. Cognitive behavioral therapies and mindfulness training may be the most effective.
- 4) Keep childhood poverty in mind in early childhood interventions. Poverty itself does not result in low emotion control and cognitive control capacity, but genetic vulnerability is more pronounced in high-risk environments.

Summary implications for parent interventions

- 1) Integrate learning about factors that may impact the expression of emotion and cognitive control such as couple relationship quality, co-parenting, family communication, family chaos, and family roles.
- 2) Address factors that may impact day-to-day functioning of emotion regulation and cognitive control and by extension the uptake of the parent training. Such factors include stress, fatigue, nutrition, psychopathology, and substance use.
- 3) For parents with ADHD, treatment for ADHD plus participation in a behavioral parenting intervention is likely necessary to see improved parenting.
- 4) Ensure that trainings are "hands-on." Parents who are easily distracted are more likely to stay engaged in hands-on classes that maintain their attention.
- 5) Incorporate at least some components of cognitive-behavioral therapy or mindfulness training into the intervention.

Summary implications for research

- 1) Measurement: develop and use instruments to measure emotion and cognitive control that are ecological and developmentally based.
- 2) Mechanisms: to assess mechanisms for how cognitive capacities impact parenting, researchers need to assess and model such factors as stress, allostatic load, psychopathology, and home/neighborhood contexts.
- 3) Methods: replicate and conduct rigorous research on parental emotion regulation and cognitive control and parenting in high-risk communities.
- 4) Evaluate: investigate the role of maternal emotion and cognitive control capacity in program uptake and program outcomes.

Gaps in the literature and future directions

There are several gaps in the existing literature that are necessary to address in future research in order to move the study of parental emotion and cognitive control forward and to enhance strategies for improving parenting. At the forefront of the discussion are measurement and methodological issues in existing studies, consensus on definitions between and across constructs, and the contexts in which studies have been conducted up to this point. Below we discuss each of these issues in more detail.

Measurement

Measurement of cognitive control capacities presents a challenge for interpreting studies. Correlations between tasks and self-report instruments, or between different tasks purportedly measuring the same construct, are generally modest (Toplak, West, & Stanovich, 2012; Decker, Hill, & Dean, 2007; see Westmann et al., 2013 for an exception to this in the measurement of inhibitory control and Belendiuk, Clarke, Chronis, & Raggi, 2007 for a discussion of correlation in measurement of adult ADHD). For example, self-report instruments can be problematic because those with higher executive dysfunction may be less attuned to their own emotion and cognitive control capacity and they may self-rate their emotion and cognitive control capacity as high but perform poorly on neuropsychological tasks (Sølsnes, Skranes, Brubakk, & Løhaugen, 2014). Thus, the use of self-report alone may mask the true impact of emotion and cognitive control capacities on parenting and other outcomes. On the other hand, most tasks used to measure cognitive control capacities are not ecologically-based and may not reflect “real world” functioning (Barkley & Murphy, 2011; Torralva, Gleichgerrcht, Lischinsky, Roca, & Manes, 2013). As an example, some studies of ADHD patients have indicated that the subjects perform within the normal range on classic executive functioning tasks but have real-life difficulty with emotion and cognitive control (Torralva et al., 2013). This may be partly because the very nature of classic executive functioning tasks may take some of the executive functioning itself out of the task due to the very regulated way the tasks are administered (i.e. the assessor provides the structure, organization, and guidance for how to complete the task; Daniels, Toth, & Jacoby, 2006). There is also a lack of clarity about what is actually being measured by a given instrument (Decker et al., 2007) as most tasks measure multiple components (Barkley & Murphy, 2011; Best & Miller, 2010).

Methodological issues

Beyond the measurement issues there are also several methodological shortcomings in the current literature base. Most studies have been cross-sectional; longitudinal studies are necessary to establish temporal order and to improve our understanding of possible changes over time. Sampling is another issue in most maternal cognition and parenting studies. The majority of studies currently available use a convenience sampling approach. Randomization may not be possible or appropriate in many studies, but stratifying on such factors as family SES, neighborhood and household factors, and other sociodemographic factors may be useful when randomization is not realistic.

Consensus on the definition

Another current gap in the literature concerns the definition of emotion and cognitive control capacities. We have chosen in this review to use a broad definition that encompasses several constructs, but there are nuanced differences that may be important to research and intervention science. The lack of consensus on the definition both within and between fields creates chaos in the literature and unnecessary redundancy when research is being conducted across fields but using different names for essentially the same constructs. Further research is needed such as the work by Bridgett, Oddi, et al. (2013) that characterized the association and overlap between executive functioning and effortful control. Additionally, research is necessary to more fully answer the question as to whether emotion and cognitive control capacities are a unified construct or a set of independent components (Best & Miller, 2010).

Context

Most studies in this review were conducted in low to moderate risk communities. As SES appears to intersect with maternal emotion and cognitive control and parenting, conducting research in

high-risk communities should be a priority. While it is likely that some aspects of the relationship between maternal emotion and cognitive control and parenting are invariant across cultures and socioeconomic contexts, other aspects may be influenced by the context.

An unexplored area of research involves investigating family and community-level characteristics that mediate or moderate the relationship between maternal emotion and cognitive regulation and parenting. Positive environments may help to compensate for lower maternal emotion/cognitive control and help a mother engage in better parenting than she otherwise would. Some potential mediators include social support, couple relationship quality, family connectedness, and family routines. Not only may these variables serve as mediators, but they may have an important impact on the development and intergenerational transmission of emotion and cognitive control. It is also important to understand the interplay between emotion/cognitive control, attitudes, and behaviors; the role of stress and allostatic load on cognition and parenting behavior; and how cognitions, emotions, and behaviors relate.

An additional need for theoretical development and research is to better 'situate' emotion regulation and cognitive control capacities in the overall processes and skills that comprise effective parenting and household management. Efforts to promote effective parenting can be advanced by understanding how to address emotion and cognitive control capacities in parenting education and interventions, but they are only one aspect of the knowledge, attitudes, skills, and support needed for mothers to effectively parent their children. In the studies that were assessed in this review, the majority attempted to address the complexities of parenting by controlling for family SES and maternal and child psychopathology; significant associations between cognitive capacities and parenting were found both with and without these controls. However, additional analyses are necessary to understand how these factors intersect with maternal cognition and parenting.

Father's emotion and cognitive control capacity

Few studies on parent emotion/cognitive control capacities and parenting have included fathers. Those studies that have assessed fathers (Harvey et al., 2003; Hughes & Gullone, 2010; Mokrova et al., 2010; Psychogiou et al., 2007) have shown a significant relationship between a father's emotion and cognitive control capacity and his parenting behaviors. For example, in one study, fathers who self-reported more inattention and impulsivity were significantly more likely to report engaging in lax and overreactive parenting; they also argued more in videotaped parent-child interactions compared to more attentive and less impulsive fathers (Harvey et al., 2003). In a study assessing parent emotion regulation with supportive parenting practices, fathers' emotional suppression was significantly related to engaging in non-supportive parenting in response to their adolescent child's negative emotions (Hughes & Gullone, 2010). While based on these studies, the relationship of paternal emotional and cognitive control capacities with parenting appears to be similar to mothers, more studies that include fathers are necessary to fully understand whether the association operates the same for mothers and fathers in various parenting contexts.

In summary, this conceptual framework has significant potential to increase understanding of a powerful influence on parenting. The study of parental emotion and cognitive control capacity provides a range of opportunities for child psychology and parenting intervention research. A significant investment in this area is likely to pay off in terms of enhancing future parenting education and interventions and ultimately child outcomes.

Acknowledgments

Funding for Crandall's initial doctoral training: T232MH019545 NIMH Child Mental Health Services and Service System Research. Deater-Deckard was supported by NIMH grant number MH 99437. We express our appreciation to Tamar Mendelson for her comments on a draft of this manuscript.

References

Babinski, D. E., Pelham, W. E., Molina, B. S. G., Gnagy, E. M., Waschbusch, D. A., Wymbs, B. T., et al. (2012). Maternal ADHD, parenting, and psychopathology among mothers of adolescents with ADHD. *Journal of Attention Disorders*, <<http://jad.sagepub.com/content/early/2012/11/14/1087054712461688.citation>>; [November 15, 2012], published online.

- Bacharach, V. R., & Baumeister, A. A. (1998). Effects of maternal intelligence, marital status, income, and home environment on cognitive development of low birthweight infants. *Journal of Pediatric Psychology*, 23(3), 197–205.
- Bakker, M. P., Ormel, J., Verhulst, F. C., & Oldehinkel, A. J. (2011). Adolescent family adversity and mental health problems: the role of adaptive self-regulation capacities. the TRAILS study. *Journal of Abnormal Child Psychology*, 39(3), 341–350.
- Banks, T., Ninowski, J. E., Mash, E. J., & Semple, D. L. (2008). Parenting behavior and cognitions in a community sample of mothers with and without symptoms of attention-deficit/hyperactivity disorder. *Journal of Child and Family Studies*, 17(1), 28–43.
- Barbey, A. K., Colom, R., Solomon, J., Krueger, F., Forbes, C., & Grafman, J. (2012). An integrative architecture for general intelligence and executive function revealed by lesion mapping. *Brain: A Journal of Neurology*, 135(4), 1154–1164.
- Barkley, R. A., & Murphy, K. R. (2011). The nature of executive function (EF) deficits in daily life activities in adults with ADHD and their relationship to performance on EF tests. *Journal of Psychopathology and Behavioral Assessment*, 33(2), 137–158.
- Barrett, J., & Fleming, A. S. (2011). Annual research review: all mothers are not created equal: neural and psychobiological perspectives on mothering and the importance of individual differences. *Journal of Child Psychology and Psychiatry*, 52(4), 368–397.
- Beaver, K. M., Wright, J. P., & Delisi, M. (2007). Self-control as an executive function: reformulating Gottfredson and Hirschi's parental socialization thesis. *Criminal Justice and Behavior*, 34(10), 1345–1361.
- Belendiuk, K. A., Clarke, T. L., Chronis, A. M., & Raggi, V. L. (2007). Assessing the concordance of measures used to diagnose adult ADHD. *Journal of Attention Disorders*, 10(3), 276–287.
- Berry, D., Deater-Deckard, K., McCartney, K., Wang, Z., & Petrill, S. A. (2013). Gene-environment interaction between dopamine receptor D4 7-repeat polymorphism and early maternal sensitivity predicts inattention trajectories across middle childhood. *Development and Psychopathology*, 25(2), 291–306.
- Best, J. R., & Miller, P. H. (2010). A developmental perspective on executive function. *Child Development*, 81(6), 1641–1660.
- Biederman, J., Faraone, S. V., & Monuteaux, M. C. (2002). Impact of exposure to parental attention-deficit hyperactivity disorder on clinical features and dysfunction in the offspring. *Psychological Medicine*, 32(5), 817–827.
- Blair, C., Zelazo, P. D., & Greenberg, M. T. (2005). The measurement of executive function in early childhood. *Developmental Neuropsychology*, 28(2), 561–571.
- Blanton, C. A., Green, M. W., & Kretsch, M. J. (2013). Body iron is associated with cognitive executive planning function in college women. *The British Journal of Nutrition*, 109(5), 906–913.
- Boutwell, B. B., & Beaver, K. M. (2010). The intergenerational transmission of low self-control. *Journal of Research in Crime and Delinquency*, 47(2), 174–209.
- Bridgett, D. J., Burt, N. M., Laake, L. M., & Oddi, K. B. (2013). Maternal self-regulation, relationship adjustment, and home chaos: contributions to infant negative emotionality. *Infant Behavior & Development*, 36(4), 534–547.
- Bridgett, D. J., Gartstein, M. A., Putnam, S. P., Lance, K. O., Iddins, E., Waits, R., et al. (2011). Emerging effortful control in toddlerhood: the role of infant orienting/regulation, maternal effortful control, and maternal time spent in caregiving activities. *Infant Behavior and Development*, 34(1), 189–199.
- Bridgett, D. J., Laake, L. M., Gartstein, M. A., & Dorn, D. (2013). Development of infant positive emotionality: the contribution of maternal characteristics and effects on subsequent parenting. *Infant and Child Development*, 22(4), 362–382.
- Bridgett, D. J., Oddi, K. B., Laake, L. M., Murdock, K. W., & Bachmann, M. N. (2013). Integrating and differentiating aspects of self-regulation: effortful control, executive functioning, and links to negative affectivity. *Emotion*, 13(1), 47–63.
- Bugental, D. B., Ellerson, P. C., Lin, E. K., Rainey, B., Kokotovic, A., & O'Hara, N. (2002). A cognitive approach to child abuse prevention. *Psychology of Violence*, 1, 84–106.
- Bugental, D. B., & Schwartz, A. (2009). A cognitive approach to child mistreatment prevention among medically at-risk infants. *Developmental Psychology*, 45(1), 284–288.
- Carlson, M. C., Erickson, K. I., Kramer, A. F., Voss, M. W., Bolea, N., Mielke, M., et al. (2009). Evidence for neurocognitive plasticity in at-risk older adults: the experience corps program. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, 64(12), 1275–1282.
- Chen, M., & Johnston, C. (2007). Maternal inattention and impulsivity and parenting behaviors. *Journal of Clinical Child & Adolescent Psychology*, 36(3), 455–468.
- Chico, E., Gonzalez, A., Ali, N., Steiner, M., & Fleming, A. S. (2014). Executive function and mothering: challenges faced by teenage mothers. *Developmental Psychobiology*, 56(5), 1027–1035.
- Chronis-Tuscano, A., Raggi, V. L., Clarke, T. L., Rooney, M. E., Diaz, Y., & Pian, J. (2008). Associations between maternal attention-deficit/hyperactivity disorder symptoms and parenting. *Journal of Abnormal Child Psychology*, 36(8), 1237–1250.
- Chronis-Tuscano, A., Seymour, K. E., Stein, M. A., Jones, H. A., Jiles, C. D., Rooney, M. E., et al. (2008). Efficacy of osmotic-release oral system (OROS) methylphenidate for mothers with attention-deficit/hyperactivity disorder (ADHD): preliminary report of effects on ADHD symptoms and parenting. *The Journal of Clinical Psychiatry*, 69(12), 1938–1947.
- Chronis-Tuscano, A., O'Brien, K. A., Johnston, C., Jones, H. A., Clarke, T. L., Raggi, V. L., et al. (2011). The relation between maternal ADHD symptoms & improvement in child behavior following brief behavioral parent training is mediated by change in negative parenting. *Journal of Abnormal Child Psychology*, 39(7), 1047–1057.
- Chronis-Tuscano, A., Rooney, M., Seymour, K. E., Lavin, H. J., Pian, J., Robb, A., et al. (2010). Effects of maternal stimulant medication on observed parenting in mother-child dyads with attention-deficit/hyperactivity disorder. *Journal of Clinical Child and Adolescent Psychology*, 39(4), 581–587.
- Cornoldi, C., Giofrè, D., Calgaro, G., & Stupiggia, C. (2013). Attentional WM is not necessarily specifically related with fluid intelligence: the case of smart children with ADHD symptoms. *Psychological Research*, 77(4), 508–515. doi:10.1007/s00426-012-0446-8.
- Dahlin, E., Nyberg, L., Backman, L., & Neely, A. S. (2008). Plasticity of executive functioning in young and older adults: immediate training gains, transfer, and long-term maintenance. *Psychology and Aging*, 23(4), 720–730.
- Daniels, K., Toth, J., & Jacoby, L. (2006). The aging of executive functions. In *Lifespan cognition: Mechanisms of change* (pp. 96–111). New York: Oxford University Press.
- Deater-Deckard, K. (2014). Family matters intergenerational and interpersonal processes of executive function and attentive behavior. *Current Directions in Psychological Science*, 23(3), 230–236.

- Deater-Deckard, K., Chen, N., Wang, Z., & Bell, M. A. (2012). Socioeconomic risk moderates the link between household chaos and maternal executive function. *Journal of Family Psychology: JFP: Journal of the Division of Family Psychology of the American Psychological Association (Division 43)*, 26(3), 391–399.
- Deater-Deckard, K., Sewell, M. D., Petrill, S. A., & Thompson, L. A. (2010). Maternal working memory and reactive negativity in parenting. *Psychological Science*, 21(1), 75–79.
- Deater-Deckard, K., Wang, Z., Chen, N., & Bell, M. A. (2012). Maternal executive function, harsh parenting, and child conduct problems. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 53(10), 1084–1091.
- Decker, S. L., Hill, S. K., & Dean, R. S. (2007). Evidence of construct similarity in executive functions and fluid reasoning abilities. *The International Journal of Neuroscience*, 117(6), 735–748.
- Dennis, M., Francis, D. J., Cirino, P. T., Schachar, R., Barnes, M. A., & Fletcher, J. M. (2009). Why IQ is not a covariate in cognitive studies of neurodevelopmental disorders. *Journal of the International Neuropsychological Society*, 15(03), 331–343.
- Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, 64, 135–168.
- Duggan, A. K., McFarlane, E. C., Windham, A. M., Rohde, C. A., Salkever, D. S., Fuddy, L., et al. (1999). Evaluation of Hawaii's Healthy Start program. *The Future of Children*, 9(1), 66–90.
- Engle, R. W., & Kane, M. J. (2004). *Executive attention, working memory capacity, and a two-factor theory of cognitive control*. New York: US Elsevier Science.
- Faraone, S. V., Biederman, J., Spencer, T., Michelson, D., Adler, L., Reimherr, F., et al. (2005). Atomoxetine and Stroop task performance in adult attention-deficit/hyperactivity disorder. *Journal of Child and Adolescent Psychopharmacology*, 15(4), 664–670.
- Finkelhor, D., Turner, H., Ormrod, R., & Hamby, S. L. (2009). Violence, abuse, and crime exposure in a national sample of children and youth. *Pediatrics*, 124(5), 1411–1423.
- Fontaine, D., & Nolin, P. (2012). Study of “hot” executive functions in a sample of parents who have been accused of physical abuse or neglect. *Journal of Aggression, Maltreatment & Trauma*, 21(1), 1–18.
- Francis, H., & Stevenson, R. (2013). The longer-term impacts of Western diet on human cognition and the brain. *Appetite*, 63, 119–128.
- Friedman, N. P., Miyake, A., Young, S. E., DeFries, J. C., Corley, R. P., & Hewitt, J. K. (2008). Individual differences in executive functions are almost entirely genetic in origin. *Journal of Experimental Psychology: General*, 137(2), 201–225.
- Galinsky, E. (2010). *Mind in the making: The seven essential life skills every child needs*. New York: Harper Collins Publishers.
- Gonzalez, A., Jenkins, J. M., Steiner, M., & Fleming, A. S. (2012). Maternal early life experiences and parenting: the mediating role of cortisol and executive function. *Journal of the American Academy of Child and Adolescent Psychiatry*, 51(7), 673–682.
- Gross, D., Garvey, C., Julion, W., Fogg, L., Tucker, S., & Mokros, H. (2009). Efficacy of the Chicago parent program with low-income African American and Latino parents of young children. *Prevention Science*, 10, 54–65.
- Harvey, E., Danforth, J. S., Eberhardt McGee, T., Ulaszek, W. R., & Friedman, J. L. (2003). Parenting of children with attention-deficit/hyperactivity disorder (ADHD): the role of parental ADHD symptomatology. *Journal of Attention Disorders*, 7(1), 31–42.
- Henschel, S., Bruin, M., & Möhler, E. (2013). Self-control and child abuse potential in mothers with an abuse history and their preschool children. *Journal of Child and Family Studies*, doi:10.1007/s10826-013-9735-0.
- Hofmann, W., Schmeichel, B. J., & Baddeley, A. D. (2012). Executive functions and self-regulation. *Trends in Cognitive Sciences*, 16(3), 174–180.
- Horne, J. (2012). Working throughout the night: beyond ‘sleepiness’ – impairments to critical decision making. *Neuroscience and Biobehavioral Reviews*, 36(10), 2226–2231.
- Hughes, C. (2011). Changes and challenges in 20 years of research into the development of executive functions. *Infant and Child Development*, 20(3), 251–271.
- Hughes, E. K., & Gullone, E. (2010). Parent emotion socialisation practices and their associations with personality and emotion regulation. *Personality and Individual Differences*, 49(7), 694–699.
- Johnston, C., Mash, E. J., Miller, N., & Ninowski, J. E. (2012). Parenting in adults with attention-deficit/hyperactivity disorder (ADHD). *Clinical Psychology Review*, 32(4), 215–228.
- Kanske, P., & Kotz, S. A. (2012). Effortful control, depression, and anxiety correlate with the influence of emotion on executive attentional control. *Biological Psychology*, 91(1), 88–95.
- Kienhuis, M., Rogers, S., Giallo, R., Matthews, J., & Treyvaud, K. (2010). A proposed model for the impact of parental fatigue on parenting adaptability and child development. *Journal of Reproductive and Infant Psychology*, 28(4), 392–402.
- Knudsen, E. I., Heckman, J. J., Cameron, J. L., & Shonkoff, J. P. (2006). Economic, neurobiological, and behavioral perspectives on building America's future workforce. *Proceedings of the National Academy of Sciences*, 103(27), 10155–10162.
- Lemerise, E. A., & Arsenio, W. F. (2000). An integrated model of emotion processes and cognition in social information processing. *Child Development*, 71(1), 107–118.
- Lorber, M. F. (2012). The role of maternal emotion regulation in overreactive and lax discipline. *Journal of Family Psychology: JFP: Journal of the Division of Family Psychology of the American Psychological Association (Division 43)*, 26(4), 642–647.
- Lorber, M. F., & O'Leary, S. G. (2005). Mediated paths to overreactive discipline: mothers' experienced emotion, appraisals, and physiological responses. *Journal of Consulting and Clinical Psychology*, 73(5), 972–981.
- Luethi, M., Meier, B., & Sandi, C. (2009). Stress effects on working memory, explicit memory, and implicit memory for neutral and emotional stimuli in healthy men. *Frontiers in Behavioral Neuroscience*, 2, 5.
- Lupien, S. J., McEwen, B. S., Gunnar, M. R., & Heim, C. (2009). Effects of stress throughout the lifespan on the brain, behaviour and cognition. *Nature Reviews: Neuroscience*, 10(6), 434–445.
- Mandell, D. J., & Ward, S. E. (2011). Building the blocks of executive functioning: differentiating early developing processes contributing to executive functioning skills. *Developmental Psychobiology*, 53(8), 796–805.
- Martini, T. S., Root, C. A., & Jenkins, J. M. (2004). Low and middle income mothers' regulation of negative emotion: effects of children's temperament and situational emotional responses. *Social Development*, 13(4), 515–530.
- Melby-Lervag, M., & Hulme, C. (2013). Is working memory training effective? A meta-analytic review. *Developmental Psychology*, 49(2), 270–291.
- Mokrova, I., O'Brien, M., Calkins, S., & Keane, S. (2010). Parental ADHD symptomology and ineffective parenting: the connecting link of home chaos. *Parenting: Science and Practice*, 10(2), 119–135.

- Murray, C., & Johnston, C. (2006). Parenting in mothers with and without attention-deficit/hyperactivity disorder. *Journal of Abnormal Psychology, 115*(1), 52–61.
- Murray, G. K., Veijola, J., Moilanen, K., Miettunen, J., Glahn, D. C., Cannon, T. D., et al. (2006). Infant motor development is associated with adult cognitive categorisation in a longitudinal birth cohort study. *Journal of Child Psychology and Psychiatry, 47*(1), 25–29.
- Musser, E. D., Kaiser-Laurent, H., & Ablow, J. C. (2012). The neural correlates of maternal sensitivity: an fMRI study. *Developmental Cognitive Neuroscience, 2*(4), 428–436.
- Niendam, T. A., Laird, A. R., Ray, K. L., Dean, Y. M., Glahn, D. C., & Carter, C. S. (2012). Meta-analytic evidence for a superordinate cognitive control network subserving diverse executive functions. *Cognitive, Affective and Behavioral Neuroscience, 12*(2), 241–268.
- Nievar, M. A., van Egeren, L. A., & Pollard, S. (2010). A meta-analysis of home visiting programs: moderators of improvements in maternal behavior. *Infant Mental Health Journal, 31*(5), 499–520.
- Nigg, J. T., Stavro, G., Ettenhofer, M., Hambrick, D. Z., Miller, T., & Henderson, J. M. (2005). Executive functions and ADHD in adults: evidence for selective effects on ADHD symptom domains. *Journal of Abnormal Psychology, 114*(4), 706–717.
- Ninowski, J. E., Mash, E. J., & Benzie, K. M. (2007). Symptoms of attention-deficit/hyperactivity disorder in first-time expectant women: relations with parenting cognitions and behaviors. *Infant Mental Health Journal, 28*(1), 54–75.
- Nofziger, S. (2008). The 'cause' of low self-control: the influence of maternal self-control. *Journal of Research in Crime and Delinquency, 45*(2), 191–224.
- Ochsner, K. N., & Gross, J. J. (2008). Cognitive emotion regulation: insights from social cognitive and affective neuroscience. *Current Directions in Psychological Science, 17*(2), 153–158.
- Ochsner, K. N., Silvers, J. A., & Buhle, J. T. (2012). Functional imaging studies of emotion regulation: a synthetic and evolving model of the cognitive control of emotion. *Annals of the New York Academy of Sciences, 1251*(1), E1–E24.
- Olds, D. L., Eckenrode, J., Henderson, C. R., Kitzman, H., Powers, J., Cole, R., et al. (1997). Long-term effects of home visitation on maternal life course and child abuse and neglect. Fifteen-year follow-up of a randomized trial. *JAMA: The Journal of the American Medical Association, 278*(8), 637–643.
- Prinz, R., Sanders, M. R., Shapiro, C. J., Whitaker, D. J., & Lutzker, J. R. (2009). Population-based prevention of child maltreatment: the U.S. Triple P system population trial. *Prevention Science, 10*, 1–12.
- Psychogiou, L., Daley, D. M., Thompson, M., & Sonuga-Barke, E. (2007). Testing the interactive effect of parent and child ADHD on parenting in mothers and fathers: a further test of the similarity-fit hypothesis. *British Journal of Developmental Psychology, 25*(Pt. 3), 419–433.
- Psychogiou, L., Daley, D. M., Thompson, M. J., & Sonuga-Barke, E. J. S. (2008). Do maternal attention-deficit/hyperactivity disorder symptoms exacerbate or ameliorate the negative effect of child attention-deficit/hyperactivity disorder symptoms on parenting? *Development and Psychopathology, 20*(1), 121–137.
- Qian, Y., Shuai, L., Chan, R. C. K., Qian, Q., & Wang, Y. (2013). The developmental trajectories of executive function of children and adolescents with attention deficit hyperactivity disorder. *Research in Developmental Disabilities, 34*(5), 1434–1445.
- Reimherr, F. W., Marchant, B. K., Strong, R. E., Hedges, D. W., Adler, L., Spencer, T. J., et al. (2005). Emotional dysregulation in adult ADHD and response to atomoxetine. *Biological Psychiatry, 58*(2), 125–131.
- Reimherr, F. W., Williams, E. D., Strong, R. E., Mestas, R., Soni, P., & Marchant, B. K. (2007). A double-blind, placebo-controlled, crossover study of osmotic release oral system methylphenidate in adults with ADHD with assessment of oppositional and emotional dimensions of the disorder. *The Journal of Clinical Psychiatry, 68*(1), 93–101.
- Rösler, M., Retz, W., Fischer, R., Ose, C., Alm, B., Deckert, J., et al. (2010). Twenty-four-week treatment with extended release methylphenidate improves emotional symptoms in adult ADHD. *World Journal of Biological Psychiatry, 11*(5), 709–718.
- Rueda, M. R., Posner, M. I., & Rothbart, M. K. (2005). The development of executive attention: contributions to the emergence of self-regulation. *Developmental Neuropsychology, 28*(2), 573–594.
- Sanz de Acedo Lizarraga, M. L., Sanz de Acedo Baquedano, M. T., & Villanueva, O. A. (2012). Critical thinking, executive functions and their potential relationship. *Thinking Skills and Creativity, 7*, 271–279.
- Sarıtaş, D., Grusec, J. E., & Gençöz, T. (2013). Warm and harsh parenting as mediators of the relation between maternal and adolescent emotion regulation. *Journal of Adolescence, 36*(6), 1093–1101.
- Schroeder, V. M., & Kelley, M. L. (2010). Family environment and parent-child relationships as related to executive functioning in children. *Early Child Development and Care, 180*(10), 1285–1298.
- Sheridan, M. A., Sarsour, K., Jutte, D., D'Esposito, M., & Boyce, W. T. (2012). The impact of social disparity on prefrontal function in childhood. *PLoS ONE, 7*(4), e35744.
- Shipstead, Z., Redick, T. S., & Engle, R. W. (2012). Is working memory training effective? *Psychological Bulletin, 138*(4), 628–654.
- Sibinga, E. M. S., Kerrigan, D., Stewart, M., Johnson, K., Magyar, T., & Ellen, J. M. (2011). Mindfulness-based stress reduction for urban youth. *Journal of Alternative and Complementary Medicine, 17*(3), 213–218.
- Skowron, E. A., & Friedlander, M. L. (1998). The differentiation-of-self inventory: development and initial validation. *Journal of Counseling Psychology, 45*, 235–246.
- Skowron, E. A., Kozlowski, J. M., & Pincus, A. L. (2010). Differentiation, self-other representations, and rupture-repair processes: predicting child maltreatment-risk. *Journal of Counseling Psychology, 57*(3), 304–316.
- Sølsnes, A. E., Skranes, J., Brubakk, A. M., & Løhaugen, G. C. (2014). Executive Functions in very-low-birth-weight young adults: a comparison between self-report and neuropsychological test results. *Journal of the International Neuropsychological Society, 20*(5), 506–515.
- Sonuga-Barke, E. J. S., Daley, D., & Thompson, M. (2002). Does maternal ADHD reduce the effectiveness of parent training for preschool children's ADHD? *Journal of the American Academy of Child & Adolescent Psychiatry, 41*(6), 696–702.
- Thompson, P. M., Cannon, T. D., Narr, K. L., Van Erp, T., Poutanen, V. P., Huttunen, M., et al. (2001). Genetic influences on brain structure. *Nature Neuroscience, 4*(12), 1253–1258.
- Toplak, M. E., West, R. F., & Stanovich, K. E. (2012). Do performance-based measures and ratings of executive function assess the same construct? *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 54*(2), 131–143.
- Torralla, T., Gleichgerrcht, E., Lischinsky, A., Roca, M., & Manes, F. (2013). "Ecological" and highly demanding executive tasks detect real-life deficits in high-functioning adult ADHD patients. *Journal of Attention Disorders, 17*(1), 11–19.

- Turner, J. M., Wittkowski, A., & Hare, D. J. (2008). The relationship of maternal mentalization and executive functioning to maternal recognition of infant cues and bonding. *British Journal of Psychology*, *99*(4), 499–512.
- United States Government Accountability Office. Child maltreatment: strengthening national data on child fatalities could aid in prevention (GAO-11-599). (2011). <<http://www.gao.gov/products/GAO-11-599>> Accessed 15.02.09.
- Valiente, C., Lemery-Chalfant, K., & Reiser, M. (2007). Pathways to problem behaviors: chaotic homes, parent and child effortful control, and parenting. *Social Development*, *16*(2), 249–267.
- Wachs, T. D., & Evans, G. W. (2010). Chaos in context. In G. W. Evans & T. D. Wachs (Eds.), *Chaos and its influence on children's development: An ecological perspective*. Washington, DC: American Psychological Association.
- Wahler, R. G., & Dumas, J. E. (1989). Attentional problems in dysfunctional mother-child interactions: an interbehavioral model. *Psychological Bulletin*, *105*(1), 116–130.
- Watkins, S. J., & Mash, E. J. (2009). Sub-clinical levels of symptoms of attention-deficit/hyperactivity disorder and self-reported parental cognitions and behaviours in mothers of young infants. *Journal of Reproductive & Infant Psychology*, *27*(1), 70–88.
- Wietecha, L., Young, J., Ruff, D., Dunn, D., Findling, R. L., & Saylor, K. (2012). Atomoxetine once daily for 24 weeks in adults with attention-deficit/hyperactivity disorder (ADHD): impact of treatment on family functioning. *Clinical Neuropharmacology*, *35*(3), 125–133.
- Wostmann, N. M., Aichert, D. S., Costa, A., Rubia, K., Moller, H., & Ettinger, U. (2013). Reliability and plasticity of response inhibition and interference control. *Brain and Cognition*, *81*(1), 82–94.
- Zelazo, P. D., Qu, L., & Kesek, A. C. (2010). Hot executive function: emotion and the development of cognitive control. In S. D. Calkins & M. A. Bell (Eds.), *Child development at the intersection of emotion and cognition*. Washington, DC: American Psychological Association.
- Zhou, Q., Chen, S. H., & Main, A. (2012). Commonalities and differences in the research on children's effortful control and executive function: a call for an integrated model of self-regulation. *Child Development Perspectives*, *6*(2), 112–121.