Parenting, Family Socioeconomic Status, and Child Executive Functioning: A Longitudinal Study

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Family socioeconomic status (SES) and the quality of maternal behavior are among the few identified predictors of child executive functioning (EF), and they have often been found to have interactive rather than additive effects on other domains of child functioning. The purpose of this study was to explore their interactive effects in the prediction of child EF. We assessed maternal behavior at 1 year and two dimensions of child EF (Conflict EF and Impulse Control) at 3 years with 114 mother–child dyads. The analyses revealed that better child performance on Conflict EF was significantly related to higher-quality maternal behavior and to higher SES, but no interactions were found. In contrast, significant interactions were found with Impulse Control such that higher-quality maternal behavior was predictive of better performance only among children from lower-SES families. These results support the idea that distinct mechanisms may underlie the development of different dimensions of child EF.

The preschool period is marked by quick, important changes in the control of thought and action (Zelazo & Jacques, 1996). Theory and empirical research strongly suggest that these changes can be explained, in part, by the development of *executive functioning* (EF), which refers to the set of higher-order

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cognitive processes that underlie flexible goal-directed behavior, such as working memory, set shifting, inhibitory control, and planning (Garon, Bryson, & Smith, 2008). Several studies have demonstrated that child performance on EF tasks clusters in factors (e.g., Garon et al., 2008), with a two-factor structure often reported among toddlers and preschoolers (see Beck, Schaefer, Pang, & Carlson, 2011): *Impulse Control*, which is the ability to delay or suppress an impulsive response, and *Conflict EF*, the ability to respond appropriately in the face of a salient conflicting response option. As noted by Zelazo, Carlson, and Kesek (2008), the literature on child EF has exploded in the last decade. A great deal has thus been learned, for instance regarding the brain structures implicated in EF (Anderson, Jacobs, & Anderson, 2008), age-related changes in early EF (Zelazo et al., 2008), the measurement of EF in the preschool period (Carlson, 2005), and correlates of child EF (e.g., Blair & Razza, 2007). In contrast, as highlighted by Hughes and Ensor (2005, 2009), studies on how the environment impacts the development of child EF are still relatively rare.

One of the few identified antecedents of individual differences in child EF is family socioeconomic status (SES): Children from higher-SES families consistently perform better on EF tasks (e.g., Ardila, Rosselli, Matute, & Guajardo, 2005; Hughes & Ensor, 2009; Mezzacappa, 2004; Noble, Norman, & Farah, 2005; Raver, Blair, & Willoughby, 2013). Studies finding similar links between family SES and other aspects of child cognition (see Bradley & Corwyn, 2002) have triggered the question of how such a distal concept as SES may influence child performance on specific cognitive tasks. It is thus advocated that research identifies proximal factors more likely to "reach" the child (Bradley & Corwyn, 2002; McLoyd, 1998). Quality of parenting has begun to be identified as a proximal antecedent of child EF (e.g., Bernier, Carlson, & Whipple, 2010). Importantly, high-quality parenting has also long been recognized as a buffer against the negative influence of socioeconomic disadvantage on many aspects of child functioning (e.g., Masten, 1994). The relations of SES and parenting to child EF are, therefore, likely to be nonindependent, but this has yet to be investigated. Accordingly, the primary goal of this report is to examine the interactions between family SES and the quality of early maternal behavior in the prediction of child subsequent EF performance.

Family Socioeconomic Status and Child Executive Functioning

The idea that family SES has a crucial influence on child development is not new. The mechanisms through which it can affect child development are illustrated by the idea of capital (Coleman, 1988; McLoyd & Ceballo, 1998). It is proposed that the more access families have to different types of capital (financial capital such as income, and human capital such as education), the better equipped they are to provide a rich environment, which is favorable to optimal child development (Hoff-Ginsberg & Tardif, 1995; Shonkoff & Phillips, 2000; Yeung, Linver, & Brooks-Gunn, 2002). In contrast, there is concern that many children growing up in lower-SES families have more limited access to these same material and human resources, which may place them at risk for developmental problems (Brooks-Gunn & Duncan, 1997).

Consistent with these theoretical claims, decades of research with vulnerable families confirm that lower family SES (e.g., economic disadvantage and/or lower levels of parental education) is associated with developmental risk in health, cognitive, and socioemotional domains, which can begin as early as pregnancy and continue into adulthood (Bradley & Corwyn, 2002; Conger & Donnellan, 2007; Duncan, Ziol-Guest, & Kalil, 2010). Infants living in disadvantaged families are more likely to experience early growth retardation and inadequate neurobehavioral development (DiPietro, Costigan, Hilton, & Pressman, 1999), as well as later sleep problems (El-Sheikh et al., 2013). Numerous studies have also observed robust correlations between family SES and child cognitive development. For instance, children from higher-SES families perform significantly better on verbal and nonverbal tasks and show higher school achievement and IQ throughout childhood (e.g., Duncan, Brooks-Gunn, & Klebanov, 1994; Escalona, 1982; National Institute of Child Health and Human Development Early Child Care Research Network [NICHD ECCRN], 2005). Child EF has also often been observed to correlate with family SES, whether in primarily middle-class (Bernier et al., 2010; Carlson, Mandell, & Williams, 2004), predominantly low-income (Blair et al., 2011) or socioeconomically diverse samples (Hughes, Ensor, Wilson, & Graham, 2010; Mezzacappa, 2004; Noble et al., 2005).

The link between family SES and child EF thus appears to be robust, as well as consistent with a large body of research on the effects of SES on child cognitive functioning. It does not, however, open avenues for intervention, given that SES is not easily malleable. According to an ecological perspective (Bronfenbrenner, 1979), proximal factors are at least as influential in shaping developmental outcomes. Among the very few more proximal and more malleable factors that have been shown to predict child EF is the quality of parent–child interactions.

Parenting and Child Executive Functioning

The quality of parent–child relationships has been found to relate to constructs bearing similarities to some components of EF—for instance, metacognition (Moss, Parent, Gosselin, & Dumont, 1993); self-regulation (e.g., Jennings et al., 2008), planning, attention, and memory (Gauvain, 2001; NICHD ECCRN, 2005); behavioral regulation (Clark, Woodward, Horwood, & Moor, 2008); or effortful control (e.g., Eisenberg et al., 2010; Kochanska, Murray, & Harlan, 2000). When considering EF per se, however, the evidence is more limited, although growing. Thus far, studies have often focused on parental scaffolding and found it to relate to child subsequent performance on EF tasks (Hammond, Müller, Carpendale, Bibok, & Liebermann-Finestone, 2012; Hughes & Ensor, 2009). Bernier et al. (2010) found such relations, as well, but also observed two other maternal behaviors—namely, sensitivity and mind-mindedness—to relate to child subsequent EF performance. These last results suggest, as proposed by Hughes and Ensor (2009), that different types of parental behavior may contribute to child EF development. In fact, research increasingly suggests that different dimensions of caregiving can have distinct contributions to child functioning (e.g., Meins, Fernyhough, Fradley, & Tuckey, 2001; Moran, Forbes, Evans, Tarabulsy, & Madigan, 2008) and, indeed, Blair et al. (2011) reported that both positive and negative aspects of parenting were related to child EF. Accordingly, the current report adopts a multidimensional approach to maternal behavior in order to pursue the investigation of the prospective links between parenting and child EF.

Dimensions of maternal behavior will be assessed using the Maternal Behavior Q-Sort (MBQS; Pederson & Moran, 1995), which has traditionally been used to derive one score of overall sensitivity. However, the authors of the instrument argue that the sole use of this global score may result in loss in data precision and so have developed seven theoretically derived domains of maternal behavior that can be extracted from the MBQS (see the Method section for a full description). In addition to this increased level of precision, the MBQS was deemed well suited to investigate the current research questions, given its particularly well-documented psychometric properties (e.g., Pederson, Gleason, Moran, & Bento, 1998; Pederson & Moran, 1995; Pederson et al., 1990), along with its impressive predictive capacity with respect to many aspects of young children's functioning, such as attachment security (Van IJzendoorn, Vereijken, Bakermans-Kranenburg, & Riksen-Walraven, 2004), emotional and behavioral adjustment (Bordeleau, Bernier, & Carrier, 2012), and cognitive development (Lemelin, Tarabulsy, & Provost, 2006). Accordingly, the present study uses the domains of the MBQS to assess the quality of maternal behavior at age 1, as a predictor of child EF performance at age 3.

From Direct Links to Moderation Models

Most developmental theorists agree that the factors that influence child development are intertwined in complex ways, with general consensus that the nature of the interplay between these factors is interactive (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000). Hence, it is proposed that the role of parenting in child functioning can be fully understood only by examining parenting in light of more distal contextual forces, which may accentuate or attenuate the effect of parental behavior on children (Bronfenbrenner, 1979; Collins et al., 2000). And, indeed, contextual influences—for instance, neighborhood characteristics and SES—have often been found to interact with parenting in predicting child functioning (Darling & Steinberg, 1997; Klebanov, Brooks-Gunn, & Duncan, 1994). More specifically, in this report we propose that higher-quality parenting may buffer the adversity associated with lower SES in relation to child EF, and thus that parenting may bear special importance for relatively less advantaged children, even in a middle-class sample. There are several reasons for this hypothesis. First, the notion that parenting may be of special importance for vulnerable children is not new and is embedded in the notion of *differential susceptibility:* As summarized by Belsky, Bakermans-Kranenburg and Van IJzendoorn (2007), studies suggest that more genetically vulnerable or temperamentally difficult children are more susceptible to caregiving influences.

While this pertains to biological vulnerability, there are many reasons to believe that parenting interacts also with *environmental* characteristics such that more environmentally vulnerable children—for instance, those from relatively lower-SES homes—are more susceptible to parenting. Theoretically, it has long been recognized that high-quality parenting can function as a buffer against the negative influence of social disadvantage on different aspects of child functioning (Garmezy, 1993; Masten, 1994). Furthermore, it has been proposed that, in relatively less advantaged families, there are often fewer alternative resources around the child besides the parents, which places more responsibility on parents' shoulders, whereas children in higher-SES homes may benefit from a greater diversity of favorable and potentially compensatory influences (Beyers, Bates, Pettit, & Dodge, 2003;

Buckhalt, 2011). This is speculated to result in greater specific parental impact on children living in less advantaged homes.

Empirical studies tend to support this view that parenting may matter especially in less advantaged homes. First, when considering other parental influences, the sleep literature suggests that family SES interacts with factors such as marital discord or parental psychological adjustment such that the links between these factors and child sleep are consistently greater among lower-SES families. Importantly for our purposes, this has been observed not only in samples characterized by SES diversity (e.g., Kelly & El-Sheikh, 2011) but also in samples mostly composed of middle-class families (Bernier, Bélanger, Bordeleau, & Carrier, 2013). Second, specifically to parenting, research on child behavioral development also suggests the presence of interactions with family SES. Indeed, research in that area largely suggests that higher-quality parenting is associated with lower levels of children's externalizing behavior problems to a greater degree among children from lower-SES backgrounds (for a review, see Schonberg & Shaw, 2007). Interestingly for the current study, this body of research highlights not only that more disadvantaged children are more vulnerable to inadequate parenting but also that they appear to benefit more from positive parenting.

These studies, however, pertain to sleep and behavioral outcomes. Less is known about interaction effects between parenting and family SES with respect to child cognitive development, although such interactive effects have been postulated (Conger & Donnellan, 2007). Indirect evidence comes from the day-care literature, which suggests that high-quality day care may be especially beneficial for lower-SES children's cognition. Hence, Geoffroy et al. (2007) found that high-quality day care was beneficial for children's language skills, but only in lower-SES families. Geoffroy et al. (2010) also reported that children of less educated mothers caught up with their peers in the spheres of mathematics, reading, vocabulary, and school readiness when they were exposed to high-quality day care. Likewise, Dearing, McCartney, and Taylor (2009) observed that low family income was less predictive of school underachievement for children exposed to high-quality day care. These three studies support the notion that high-quality care, at least that is nonparental, may protect children against the negative consequences of social disadvantage on cognitive functioning. However, whether this holds true with parental care, such that high-quality parenting would serve a protective function for child EF among relatively lower-SES families, is yet unknown, although it has been postulated (Blair et al., 2011; Raver et al., 2013). Addressing this issue, the current report investigates interactive effects of family SES and quality of maternal behavior in the prediction of child EF.

Goals and Hypotheses of the Present Study

This report had three major goals. First, we sought to replicate previous findings that child EF is positively associated with family SES in a middle-class sample. Second, we aimed to investigate the relations among different dimensions of maternal behavior as observed at 1 year of age and child EF performance at 3 years. Finally, interactions between family SES and maternal behaviors were examined. Owing to findings of previous studies pertaining to parental adjustment and child sleep, parenting and child externalizing problems, and day care and child cognition, consistently suggesting greater effects for lower-SES children, it was hypothesized that children from relatively lower-SES families, compared to their peers from more advantaged families, would benefit to a greater degree from quality maternal behaviors.

Method

Participants

A total of 114 middle-class mother–child dyads (68 girls and 46 boys) living in a large Canadian metropolitan area participated in this study. Families were recruited from birth lists provided by the Ministry of Health and Social Services. Mothers were 20–45 years old (M = 31.41, SD = 4.99). Most mothers (87.7%) were White. They had 15.6 years of education on average (varying from 8 to 18, SD = 2.36), with 62.3% holding a college degree (while 63.3% of parents in the province of Quebec hold a college degree [Government of Quebec, 2005]). Family income was based on categorical scores distributed as follows: 1 < $20,000 ($20K, referring to Canadian currency throughout), 2 = $20K–$39K, 3 = $40K–$59K, 4 = $60K–$79K, 5 = $80K–$99K, and 6 = $99K and over. Mean family income for the sample was 4.46 (SD = 1.45), near the mean family income in Canada, which was $74,600 for the years of data collection. Nearly all mothers (96.5%) were married or living with the child's father.

Procedure

The mother–child dyads took part in two home visits, when children were 1 year (Time 1 [T1]; M = 12.58 months, SD = 1.07) and 3 years of age

(T2; $M = 36.82$ months, $SD = 0.84$). Both visits lasted 70–90 min, were videotaped, and were organized in a similar way: The research assistant first conducted a brief interview with the mother, administered research tasks to the child, and then asked mothers and children to participate in dyadic activities not used in this report, except for the context that they provided for the observation of maternal behavior at T1 (used to rate the MBQS—see the Maternal Interactive Behavior section that follows). Most research tasks at T2 were EF tasks, described in the Executive Functioning section that follows. The T1 visit also included a period where mothers were asked to complete questionnaires while infants were *not* kept busy by the research assistant. This procedure was modeled after the work of Pederson and Moran (1995) and purposely designed to create a situation where maternal attention was being solicited by both research tasks and infant demands, reproducing the need for multitasking that is inherent to caring for an infant in daily life. This provided an optimal context for the observation of mother–infant interactions (Pederson & Moran, 1995).

To maximize the reliability of observations of maternal behavior, we followed Pederson and Moran's (1995) recommendations for training our home visitors. Research assistants first attended a 2-day training workshop pertaining to techniques of home visiting and observation of early mother–infant interactions. In order to practice using the MBQS, they reviewed several videotapes of mother–infant interactions. The assistants then conducted their first few home visits with a more experienced colleague, and they completed the MBQS together. When the junior home visitors were deemed ready to rate maternal behavior, the next few visits were followed by a debriefing session with an experienced graduate student in order to review the salient elements of the visit before scoring the MBQS. Double-coding for interrater reliability purposes took place only after the research assistants had gone through this process.

Measures

Family socioeconomic status. SES was assessed by using a self-report questionnaire completed by mothers. A rare case of consensus in the literature is that the power of prediction is higher when SES components are combined rather than taking each indicator singly (White, 1982). In line with this, and owing to the correlation ($r = .65$, $p < .01$) between maternal education and family income in this sample, these two variables were standardized and averaged, yielding a global index of maternal SES ($M = 0.04$, $SD = 0.84$).

Maternal interactive behavior. The 90-item MBQS (Pederson & Moran, 1995) was used at T1 to assess maternal interactive behavior. This measure is designed to assess the quality of maternal behavior during mother–infant interactions in the home. Each item describes a potential maternal behavior. Based on observations throughout the entire T1 visit, the 90 items were sorted by the observers into nine piles, from most representative of the mother to least representative. Each item was thus assigned a score varying between 1 and 9, indicating the extent to which it resembled the mother's behavior as observed during the visit.

Pederson, Moran, and their colleagues (e.g., Morley et al., 2010) subdivided the MBQS items into seven domains of maternal behavior: (1) response to positive signals (12 items; α = .83; e.g., *Notices when B smiles and vocalizes*), (2) response to distress (7 items; α = .86; e.g., *Responds immediately to cries or whimpers*), (3) positive affect sharing (6 items; α = .85; e.g., *Praises child*), (4) hostility/rejection (8 items; α = 79; e.g., *Is punitive or retaliatory*), (5) sensitivity/responsiveness (27 items; α = .87; e.g., *Interprets cues correctly, as evidenced by child's response*), (6) teaching orientation (9 items; α = .54; e.g., *Is instructive during interactions with child*), and (7) physical proximity (7 items; α = .79; e.g., *Molds child to self when holding*). This multidimensional approach is used here to operationalize the quality of maternal behavior, by computing averaged scores for each dimension based on the 1–9 score assigned to each item. Given that the teaching orientation domain showed less than satisfactory reliability, it was dropped, leaving six dimensions for further analysis.

The MBQS is anchored in the descriptions of sensitive responsiveness provided by Ainsworth, Bell, and Stayton (1974). Its authors (e.g., Pederson & Moran, 1995; Pederson et al., 1990, 1998) have presented detailed descriptions regarding the development of the MBQS, as well as its validity and reliability. These authors' longitudinal studies show that the MBQS is useful in predicting multiple aspects of child development. The MBQS is also significantly related to other measures of maternal behavior, such as the Home Observation for Measurement of the Environment (HOME) Inventory and the Ainsworth scales (see Pederson & Moran, 1995). In this study, a second research assistant was present for 30 home visits (26%) and completed the MBQS independently. Agreement between the two raters' sorts was high, with intraclass correlation = .84.

Executive functioning. This was assessed during the second home visit, when children were 3 years old. The tasks were chosen based on Carlson's (2005) empirically derived measurement guidelines with the aim of maximizing reliable detection of individual differences in three dimensions of EF: working memory, inhibitory control, and set shifting.

Bear/Dragon (Reed, Pien, & Rothbart, 1984). This task mostly calls upon working memory and inhibition. Experimenters introduced children to two puppets: a *nice bear* and a *naughty dragon.* Children were asked to perform the actions requested by the bear only. For example, when the bear asked "Touch your head," children had to touch their head, but they had to stand still if the dragon made the same request. There were two series of six requests each, alternating in a pseudorandom order of requests by the bear and the dragon, with all requests pertaining to touching a body part. Scores corresponded to the total number of correct responses and could thus vary from 0 to 12.

Day/Night (Gerstad, Hong, & Diamond, 1994). Experimenters first showed two separate pictures to children: a black card displaying stars and a moon, and a white card displaying a yellow sun. Children were asked to say "day" when they were shown the stars and moon, and "night" when shown the sun. The task, focusing on set shifting and inhibition, consisted of 16 trials alternating the sun and the moon in a random but previously defined order, and children's scores were computed as the percentage of correct answers.

Dimensional Change Card Sort (DCCS; Zelazo, 2006). Experimenters showed children a red card depicting a truck, and a blue card depicting a star, and explained that they would play a sorting game. In the first round, children were instructed to classify the cards given to them, one by one, by shape. In the second round, they were instructed to sort the cards by color. Between the two rounds, the experimenter explained the new rule. There were six trials in each round. This task mostly taps into set shifting and working memory. Scores represented the number of correct answers on the postswitch trials (0–6).

Delay of gratification (Kochanska et al., 2000). The experimenter explained to children that they could take a treat, placed under a transparent cup in front of them, only when she rang the bell. Four increasingly longer trials were used (5, 15, 30, and 45 s), tapping into inhibition. Scores were the number of seconds waited on each trial.

Child verbal ability. The Peabody Picture Vocabulary Test 3 (PPVT-3; Dunn & Dunn, 1997) was used to index children's verbal ability at 3 years of age. The PPVT-3 is a widely used norm-referenced test of receptive vocabulary for ages 2½ and above.

Results

Preliminary Analyses

Table 1 presents the observed ranges, means, and standard deviations for the domains of maternal behavior and child scores on EF tasks. All variables showed good variability, although children's average performance on the delay of gratification trials and the DCCS was very good.

EF scores were standardized and then submitted to a principal component analysis in order to compute reliable aggregate estimates. This analysis yielded a two-factor solution (Eigen values > 1.0) representing 56.3% of the total variance. These two factors were submitted to a principal axis rotation (oblimin). Factor loadings for the 5-s Delay (.81), 15-s Delay (.92), 30-s Delay (.87), and 45-s Delay (.62) trials suggest that the first factor taps Impulse Control, whereas the second factor appears to represent working memory, set shifting, and inhibitory control (Conflict EF): Bear/Dragon (.73), Day/Night (.72), and DCCS (.55). No cross loadings (above .32) were observed, and the correlation between the two factors was .26. Studies of EF in young children have often found similar factor structures, whether using exploratory (e.g., Carlson & Moses, 2001; Carlson, Moses, & Breton, 2002; Carlson et al., 2004; Conway & Stifter, 2012; see also Beck et al., 2011) or confirmatory approaches (Carlson, White, & Davis-Unger, 2014). Given that the current factor structure was very clear empirically and

Table 1. Descriptive statistics

Measure	Range	*M*	*SD*
Maternal behavior			
Response to positive signals	2.36–8.45	7.25	1.13
Response to distress	1.71–8.57	7.18	1.32
Positive affect sharing	1.43–8.86	7.35	1.23
Hostility/rejection	1.38–7.38	2.92	1.05
Sensitivity/responsiveness	3.15–7.48	6.49	.84
Physical proximity	2.00–8.14	6.84	1.14
Child EF performance			
Bear/dragon	2–10	6.50	2.10
Day/night (%)	0–100	60.14	34.61
Dimensional change card sort	0–6	5.49	1.53
Delay in seconds			
5	1–5	4.84	.73
15	1–15	13.87	3.29
30	1–30	27.07	7.63
45	1–45	39.85	13.06

Note. EF = executive functioning.

reproduced these two dimensions, two averaged standardized scores were computed and used in further analyses. The correlation between Impulse Control and Conflict EF was $r = .30$, $p < .001$. Concurrent language skills were significantly related to both Impulse Control, $r = .36$, $p < .001$, and Conflict EF, $r = .28$, $p = .002$. Child language was therefore considered in final analyses. Children's gender and exact age at T2 were unrelated to these two EF dimensions (all *p*s > .39) and therefore not retained for further analysis.

Finally, in line with their theoretical definitions as distinct aspects of one global construct, the domains of maternal behavior were found to be moderately to highly intercorrelated, with correlations ranging from $r = .44$ to $r = .79$ (mean $r = .63$, see Table 2). The domains were nonetheless considered separately in main analyses, given the current report's secondary aim to examine whether some maternal behaviors are more closely related than others to child EF. Indeed, it is not unusual in developmental research that highly related constructs show distinct relations to outcomes (e.g., Poulin & Boivin, 2000).

Main Analyses

Family socioeconomic status and child executive functioning. Consistent with the results of several previous studies, maternal SES was significantly related to child Impulse Control ($r = .19$, $p = .03$) and Conflict EF ($r = .30$, $p < .001$).

Maternal behaviors and child executive functioning. Table 2 presents the zero-order correlations between the six domains of maternal behavior and the two EF dimensions. The results are strikingly different according to which dimension of EF is considered. Hence, while no significant (or even marginal) relations were found between maternal behaviors and child Impulse Control, four of the six domains of maternal behavior were significantly related to child Conflict EF, and one of the two remaining dimensions showed a similar although marginal trend (Hostility/Rejection, $p = .056$). All significant (or marginal) relations between maternal behaviors and child performance on Conflict EF were in the expected direction such that mothers who were observed to be more competent during mother–infant home interactions at 1 year had children performing better on Conflict EF 2 years later. In contrast, the nonsignificant findings with Impulse Control could suggest either that early maternal behavior is unrelated to later child Impulse Control in this sample or

Table 2. Intercorrelations among family SES, maternal behaviors, and child EF scores

	1	2	3	4	5	6	7	8	9
1. SES	—	.17†	.20*	.05	−.03	.23*	.20*	.19*	.30***
2. Response to positive signals		—	.64***	.72***	−.60***	.72***	.75***	.08	.26**
3. Response to distress			—	.49***	−.51***	.79***	.66***	−.01	.23**
4. Positive affect sharing				—	−.74***	.44***	.64***	.06	.20*
5. Hostility/ rejection					—	−.51***	−.60***	.04	−.17†
6. Sensitivity/ responsiveness						—	.68***	.08	.13
7. Physical proximity							—	.07	.32***
8. Impulse control EF								—	.30***
9. Conflict EF									—

Note. EF = executive functioning; SES = socioeconomic status.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

that relations do exist, but only for a nonrandom portion of the sample, which implies a moderation effect (Baron & Kenny, 1986). In line with the hypotheses of the current study, the next section examines whether the links between maternal behavior and subsequent child EF are greater among lower-SES families.

Protective effects of high-quality parenting against socioeconomic disadvantage. To address the last research question, we conducted moderation analyses to examine whether maternal behavior interacted with family SES in predicting child EF. All scores were first centered. Conflict EF and Impulse Control were submitted to distinct sets of regression equations. In each equation, SES was entered with one of the domains of maternal behavior in a first block, followed by their interactive product in a second block (Aiken & West, 1991). As shown in Table 3, only one of the MBQS domains (Response to Distress) interacted significantly with SES when predicting child Conflict EF. In contrast, Table 4 shows that Response to Distress, as well as Response to Positive Signals and Physical Proximity, also interacted with SES in the prediction of child Impulse Control.

These four interactions were broken down according to guidelines provided by Aiken and West (1991), plotting fitted regression lines at predetermined levels of the moderator, in our case at 1 *SD* above and below the mean for family SES. The same pattern of results was found for all four interactions. Figures 1–4 illustrate that, among higher-SES families, the relation between the quality of maternal behavior and child

Table 3. Summary of regression analyses predicting conflict EF according to maternal behaviors and family SES

	B	*SE B*	β	R^2
				17%
SES	.22	.08	.26**	
Response to positive signals	.11	.06	.17	
Interaction	−.13	.07	−.17†	
				16%
SES	.21	.08	.25**	
Response to distress	.08	.05	.14	
Interaction	−.10	.05	−.18*	
				14%
SES	.26	.07	.31***	
Positive affect sharing	.11	.05	.18*	
Interaction	−.10	.07	−.12	
				14%
SES	.25	.08	.29***	
Hostility/ rejection	−.10	.06	−.14	
Interaction	.10	.07	.13	

Continued

Table 3. Summary of regression analyses predicting conflict EF according to maternal behaviors and family SES (*Continued*)

	B	*SE B*	β	R^2
				10%
SES	.24	.08	.28**	
Sensitivity/ responsiveness	.05	.08	.05	
Interaction	−.04	.08	−.05	
				17%
SES	.21	.08	.24**	
Physical proximity	.15	.06	.24**	
Interaction	−.06	.07	−.08	

Note. EF = executive functioning; SES = socioeconomic status.

† $p < .10$* $p < .05$** $p < .01$.*** $p < .001$.

Table 4. Summary of regression analyses predicting impulse control according to maternal behaviors and family SES

	B	*SE B*	β	R^2
				10%
SES	.16	.09	.16†	
Response to positive signals	.00	.07	.00	
Interaction	−.20	.08	−.24**	
				7%
SES	.17	.09	.18†	
Response to distress	−.06	.06	−.09	
Interaction	−.12	.06	−.19*	
				4%
SES	.18	.09	.19*	
Positive affect sharing	.03	.06	.05	
Interaction	.05	.09	.05	

Continued

Table 4. Summary of regression analyses predicting impulse control according to maternal behaviors and family SES (*Continued*)

	B	*SE B*	β	R^2
				4%
SES	.19	.09	.20*	
Hostility/ rejection	.04	.07	.05	
Interaction	.00	.08	.00	
				6%
SES	.14	.09	.15	
Sensitivity/ responsiveness	.02	.09	.02	
Interaction	.15	.10	−.15	
				8%
SES	.13	.09	.14	
Physical proximity	−.02	.07	−.04	
Interaction	−.17	.08	−.22*	

Note. SES = socioeconomic status.

† $p < .10$. * $p < .05$. ** $p < .01$.

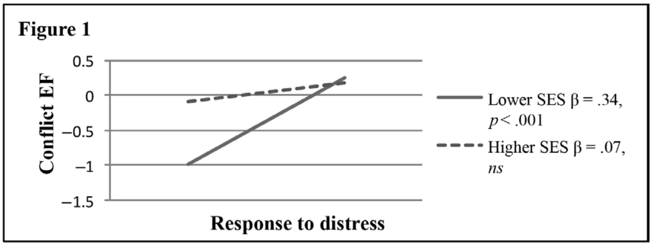

Figure 1. Children's conflict executive functioning (EF) as a function of maternal response to distress in lower-socioeconomic status (SES) and higher-SES families.

Impulse Control or Conflict EF was nonsignificant for all domains considered. In contrast, the relations were positive and consistently significant among lower-SES families such that higher-quality maternal behavior was related to better child performance on EF tasks.

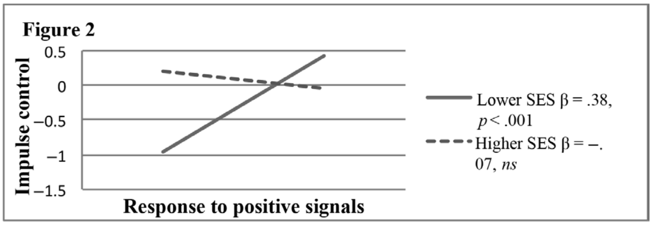

Figure 2. Children's impulse control as a function of maternal response to positive signals in lower-socioeconomic status (SES) and higher-SES families.

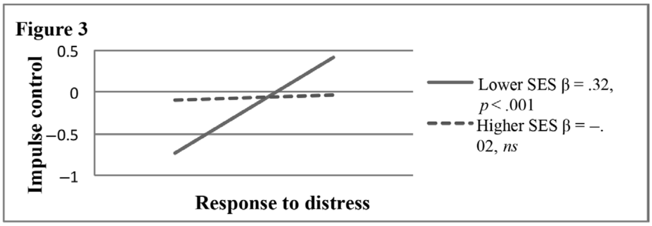

Figure 3. Children's impulse control as a function of maternal response to distress in lower-socioeconomic status (SES) and higher-SES families.

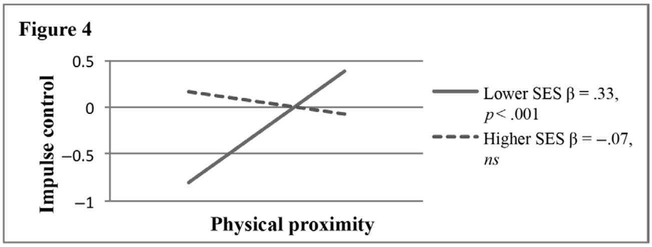

Figure 4. Children's impulse control as a function of maternal physical proximity in lower-socioeconomic status (SES) and higher-SES families.

Supplemental Analyses

Language is a well-established correlate of child EF. We thus ran a final series of regression analyses, entering child language in a first block. The results showed that, when controlling for child language, the interaction that was significant for Conflict EF (with Response to Distress) remained significant, $\beta = -.18$, $p = .041$. Likewise, when predicting Impulse Control, the interactions with Response to Positive Signals ($\beta = -.21$, $p = .025$) and

Physical Proximity ($\beta = -.18$, $p = .048$) remained significant, although their exact magnitudes decreased slightly. However, the original significant interaction involving Response to Distress became of marginal significance ($\beta = -.15$, $p = .088$).

One concern with all the aforementioned analyses is that multiple analyses were run on closely related constructs (the six domains of maternal behavior). To offer some control over Type I error, we applied a statistical correction known as FDR (false-discovery rate). FDR presents the advantage of being more powerful than classic methods like the Bonferroni correction, which are very strict and present high rates of false negatives (Benjamini & Hochberg, 1995, 2000; Keselman, Cribbie, & Holland, 1999). After applying the FDR procedure to the results of the equations pertaining to Impulse Control, we found that the interactions between family SES and Response to Positive Signals as well as Physical Proximity remained significant, while that involving Response to Distress became marginally significant. In the case of Conflict EF, as well, the interaction with Response to Distress became marginal after FDR was applied. In a last, exploratory step, we examined the interactions of SES with the global score of maternal sensitivity that can be extracted from the MBQS, and which represents an overall assessment of the quality of maternal behavior in different domains. As would be expected from the set of analyses run on the separate dimensions, the interaction between overall maternal sensitivity and family SES was marginal when predicting Impulse Control ($\beta = -.16$, $p = .090$) and nonsignificant when predicting Conflict EF ($\beta = -.14$, $p = .141$).

Discussion

The primary aim of this report was to investigate the interactive effects of family SES and maternal behaviors in predicting subsequent child EF. It was expected that family SES and several dimensions of maternal behavior would be associated with child EF performance, and that the positive links between the quality of maternal behavior and child EF would be more pronounced among children from relatively lower-SES families. Overall, the results support the hypotheses, while suggesting that important differences may exist between the developmental processes subsuming different dimensions of EF. When child language was controlled for, three of the four interactions found remained significant, but their magnitudes decreased and one became nonsignificant. This is consistent with theoretical propositions (Hughes & Ensor, 2009; Lewis

& Carpendale, 2009) and empirical findings (Matte-Gagné & Bernier, 2011) suggesting that child language can account for some of the relations between parenting and child EF. Finally, the correction for multiple comparisons revealed that two interactions remained significant, while two became marginal trends.

The results first reiterated those of previous studies by highlighting links among family SES, quality of maternal behavior, and child EF. However, while family SES was related to both dimensions of EF, the quality of maternal behavior showed direct relations to conflict EF only. This appeared to be a robust phenomenon, given that it was replicated across almost all domains of maternal behavior. Hence, while four of the six domains were related to conflict EF (in addition to one trend-level association), none was related to impulse control. In fact, close examination of the literature suggests an interesting pattern of findings. First, we previously reported comparable results when the same children were 2 years of age, finding relations between other aspects of parenting and child conflict EF, but not with impulse control (Bernier et al., 2010). Second, the other studies reporting links between parenting and concurrent (Bibok, Carpendale, & Müller, 2009) or subsequent child EF (Blair et al., 2011; Hammond et al., 2012; Hughes & Ensor, 2009) used tasks with strong working memory and cognitive flexibility requirements. None of their tasks involved a degree of impulse control as marked as in a delay-of-gratification task. We would therefore argue that the links between parenting and conflict EF are becoming increasingly robust, with concurrent and prospective links found in different samples and at different ages. However, our attempt to draw specific predictions from particular aspects of maternal behavior was inconclusive. These results probably reflect the complexity of trying to tease apart constructs that are conceptually and empirically interrelated, and this is even more so in the current study, given the methodological and empirical proximity among the dimensions of parenting assessed. Hence, it is best to view the findings obtained here with different aspects of maternal behavior as providing partially overlapping evidence for one global phenomenon rather than independent results.

In contrast, the near-zero relations we found between maternal behavior and child impulse control, if not complemented by moderation analyses, could have suggested the lack of a true relation between maternal behavior and impulse control. The moderation analyses rather indicated the presence of a phenomenon of greater theoretical and practical relevance: Exposure to higher quality of some types of maternal behaviors does relate to better subsequent impulse control performance, but only among children from relatively lower-SES homes. (It is unclear whether the one interaction found with conflict EF is meaningful or rather is spurious.) This is in line with previous research that suggests that less advantaged children benefit more from high-quality parenting (Schonberg & Shaw, 2007) and day care (Dearing et al., 2009; Geoffroy et al., 2007, 2010). Specifically, the results found here suggest a protective effect of high-quality parenting against the disadvantage normally associated with lower SES with respect to child EF. Indeed, results suggested that when mothers were responsive to their infants' positive signals, responsive to their signals of emotional distress, and/or were often physically close and affectionate to them, infants from the relatively less affluent families in this sample caught up with their more advantaged counterparts and grew up to show similar impulse control performance at 3 years (see Figures 2–4). However, the same children exposed to low-quality maternal behaviors appeared to perform the worst.

These results are all the more appealing that our sample is essentially middle class, with generally well-educated mothers. Hence, these findings highlight the particular salience of the quality of early mother–infant interactions not only for children growing up in highly disadvantaged families but also when socioeconomic risk is mild to moderate rather than severe. In fact, research has found that small variations in family SES can be meaningfully related to child EF (Bernier et al., 2010; Carlson et al., 2004), and McCall (1991) suggested that while interactions between parenting and environmental influences may be easier to detect with high-risk populations for some outcomes, other interactions may be relevant for only children in the normative range. Given that both main and interactive effects of parenting and family SES have now been found for child EF in middle-class samples, this appears to be one area of child functioning that is sensitive to variations within the normative range. At the same time, given that the current sample is, overall, relatively advantaged, the lower-SES subset cannot be readily compared to the very high-risk samples often discussed in the literature and can rather be described as lower middle class. Therefore, the generalizability of the current results to very disadvantaged families can by no means be assumed. In situations of very high social or economic disadvantage, the contextual risk may be so strong and pervasive as to preclude parents from showing high-quality parenting behavior, or child executive development may be compromised beyond what can be compensated by high-quality parenting behavior (see Gorman-Smith, Tolan, & Henry, 1999).

Of course, given the aforementioned methodological and empirical proximity among the dimensions of maternal behavior assessed, one should not view the different interactions depicted as independent from one another, but rather as providing confirmatory evidence for one phenomenon tackled from slightly different angles. In fact, whether considering main or interactive effects, we would argue that the exact specificity of the results will not necessarily generalize to other samples. Hence, while Table 4 appears to suggest that response to positive signals, response to distress, and physical proximity are the specific aspects of maternal behavior that interact with family SES to predict child impulse control, this precise pattern may well be specific to this sample. It appears more prudent to conclude that the current findings suggest that certain aspects of maternal behavior relate to subsequent child impulse control to a greater degree in less advantaged homes. Given the intercorrelations among the MBQS domains obtained here, it remains to be investigated whether this is a broad phenomenon that describes the links between overall quality of parenting and child impulse control or rather a particular form of interplay that applies to some but not all dimensions of parenting. However, the trend-level interaction that we found when considering the overall score for maternal sensitivity may suggest that such interactive effects are specific rather than broad.

The figures suggest that the relations between the quality of maternal behavior and child impulse control in higher-SES families were almost null (in contrast to lower-SES families, for whom these links were similar to those observed with conflict EF). This may be driven by the specific score distribution observed here: Given that we used only one task to assess impulse control, there was less individual variation (see Table 1), and examination of Figures 2–4 suggests that impulse control was higher overall among more advantaged children. Given that impulse control generally develops earlier than other executive functions (see Anderson et al., 2008), and owing to its connections to family SES, it may be the case that higher-SES children's performance on the task used here was already near its peak, thereby leaving little room for quality maternal behavior to have a further positive impact, in contrast to the poorer performance of children from lower-SES homes. A more optimal approach would entail the use of several tasks with different impulse control demands (e.g., Kochanska, Philibert, & Barry, 2009). In addition, as indicated in Table 2, family SES was more strongly related to conflict EF than to impulse control, and, indeed, SES retained a significant main effect in all models predicting conflict EF (Table 3), whereas this effect dropped to nonsignificance or marginal significance in several models pertaining to impulse control (Table 4). This left more variance to be explained by interactive effects, and, indeed, interactions were found to be significant only when the main effect of SES was marginal or nonsignificant. Thus, it may be that in samples where a large portion of the variance in child EF is explained by family SES, interaction effects with parenting will need to be quite large so as to be detected.

This study presents a number of limitations, most notably the fact that the design, although longitudinal, was nonexperimental, which precludes causal inference. In addition, maternal behavior was assessed only at Time 1. Therefore, we cannot rule out that part of the results may be due to stability in maternal behavior such that concurrent parenting would be responsible for some of the links uncovered between early maternal behavior and subsequent child EF. The use of only one task to assess impulse control may have reduced variation, especially among the higher-SES children as noted earlier. Finally, as mentioned earlier, the nature of the sample limits both generalizability and direct comparison to studies pertaining to poverty while also suggesting that small variations in the SES spectrum may have an impact on how parent–child interactions influence child development.

The predictive relations found here between the quality of maternal behavior and subsequent child EF are consistent with the rationale of existing intervention programs that target mother–child interactions with the aim of impacting child outcomes. These interventions are based on the assumption that parent–child relationships constitute a key mechanism to break the intergenerational cycle of risk often characterizing disadvantaged families (e.g., Moss et al., 2011). The findings of this study, suggesting that relatively lower-SES children perform the worst on EF tasks when exposed to low-quality mothering but catch up with their more advantaged peers when experiencing high-quality interactions with their mothers, provide encouraging support for interventions targeting parent–child interactions as a vehicle to improve vulnerable children's developmental outcomes. This appears to be relevant also when psychosocial risk is low overall, such as in the current sample. Meta-analytic data suggest that brief behavioral intervention is effective in improving the quality of maternal behavior (Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2003). Promoting sensitive, responsive parental behavior is thus feasible and may have a positive impact on children's executive and cognitive development. The results of the current study also support public health initiatives like national campaigns that target warm, stimulating parenting to promote healthy child development. The results suggest that such an approach may be beneficial to children generally, across SES levels, while being likely particularly to help protect children from less affluent families against the negative consequences of socioeconomic disadvantage that might affect their developing executive capacities.

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