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Children's behavioral self-regulation and conscience: Roles of child temperament, parenting, and parenting context

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Abstract

This study examined longitudinal, temperament-specific relations between parenting qualities in two interactive contexts and behavioral measures of child self-regulation and conscience. Mother-toddler interactions were observed for maternal gentle control and mutual positivity and responsiveness (MPR) when children were 18 months old (sample $N=134$, 53% male, 92% non-Hispanic White). Child temperament was also assessed, yielding exuberant, inhibited, and average-approach temperament groups. Children's behavioral self-regulation and conscience were assessed at 4.5 years of age. Mother gentle control in a free play related to poorer later behavioral self-regulation for children in the average-approach group, whereas gentle control in a clean-up related to better behavioral self-regulation in the exuberant group. MPR during the clean-up related to better conscience in the inhibited group. These results provide further support for temperament- and context-specific relations between different parenting qualities and children's later regulatory skills, which may inform the development of more effective temperament-based parenting interventions.

Keywords

temperament; parenting; socialization; self-regulation; conscience

Children achieve a host of cognitive and motor milestones in the early years of life that set the stage for the development of self-regulation, or the ability to modulate emotion and behavior to meet external demands in different contexts (Calkins, Perry, & Dollar, 2016; Kopp, 1982). These early developmental milestones also allow for the development of conscience, a system of self-regulatory processes that motivate moral thought, emotion, and behavior (Kochanska & Aksan, 2006). Researchers have proposed that behavioral indicators of self-regulation and conscience draw from the same systems of functioning, and their

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development and expression are highly related over time (Kochanska & Aksan, 2006; Kochanska, Murray, & Coy, 1997; Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996). Although the capacity for many self-regulatory processes appears within the first three years of life, children display clear individual differences in their performance on self-regulation and conscience tasks (Kochanska, Coy, & Murray, 2001; Kochanska et al, 1996; 1997; Kopp, 1982). Previous research suggests that child temperament and parenting influences both contribute to these outcomes; however, few studies have considered how differing forms of parenting quality may have varying benefits for children of different temperament types. Further, almost no research has considered how temperament-based effects may emerge more strongly from certain parenting contexts relative to others. The present study examined whether different forms of parenting predict children's behavioral self-regulation and conscience depending on the temperament of the child and the context in which parenting occurs.

Child Temperament

Temperament, as conceived by Rothbart (e.g., Rothbart & Bates, 2006; Rothbart & Derryberry, 1981) comprises constitutional differences in reactivity and self-regulation. The self-regulatory component, termed effortful control, reflects individual differences in the ability to regulate reactivity by way of inhibiting a dominant response, performing a subdominant response, detecting errors, and/or engaging in planning (Rothbart & Bates, 2006; Rothbart, Ellis, & Posner, 2011). Self-regulation, by definition, therefore supports the ability to align with rules or expectations intentionally. However, reactive components of temperament, specifically emotional and behavioral reactivity to novelty, threat/punishment, and reward, can also influence the ability to regulate behavior. A helpful way to interpret temperamental differences is by framing them within temperament types. Researchers describe inhibited children as those who display relatively higher reactive inhibition to novelty, fearful emotional reactivity, and sensitivity to threat or punishment (e.g., Fox, Henderson, Marshall, Nichols, & Ghera, 2005; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Rothbart & Bates, 2006). In contrast, exuberant children display relatively higher reactive approach to novelty, impulsivity, positive emotional reactivity, and sensitivity to reward (e.g., Kagan et al, 1984; Polak-Toste & Gunnar, 2006; Putnam & Stifter, 2005). When identified, children who are more moderate on these traits have been labeled "low" or "average" in reactivity (Dollar, Stifter, & Buss, 2017; Moding & Stifter, 2018; Putnam & Stifter, 2005).

Temperamental differences in self-regulation and conscience are frequently tied to inhibited or exuberant traits. Specifically, inhibited children's tendency to reactively inhibit behavior in the presence of novelty or threat relates to voluntary control of behavior in other contexts (Aksan & Kochanska, 2004). Moreover, fearfulness and punishment-sensitivity may motivate correct behavior so as to avoid punishment and/or discomfort about transgressing against rules or against other people (e.g., Kochanska, 1993). Exuberant children's tendency to display reactive approach (e.g., impulsivity) to novel and rewarding stimuli may create difficulties in self-regulation when external expectations require the child to control their responses (Polak-Toste & Gunnar, 2006; Stifter & Dollar, 2016). Lower levels of fearfulness and punishment-sensitivity may also lead to greater disregard for the consequences of one's

behavior or the impact it has on other people (Frick & Morris, 2004; Kochanska, 1993; Stifter, Putnam, & Jahromi, 2008). Thus, collectively, inhibited children evidence a greater preparedness to develop regulatory skills and conscience, whereas exuberant children may require greater support to develop these abilities (Kochanska, 1993; Polak-Toste & Gunnar, 2006; Stifter & Dollar, 2016).

Parenting Quality

Children's experiences in the parent-child relationship also play an important role in their development of self-regulation and conscience (Dunn, 2014; Kopp, 1982; Laible & Thompson, 2007). Different parenting influences work together to predict child outcomes (Darling & Steinberg, 1983); however, many researchers focus on two general forms of parenting quality when predicting better self-regulatory outcomes. The present study examined these qualities individually due to an expectation that their effects may differ by child temperament.

First, a high level of mutual positive affect, responsiveness, and cooperation among parent and child, sometimes called a "mutually responsive orientation," may forge a parent-child relationship in which the child embraces parent socialization messages and has a greater motivation to align behavior with parental demands (Kochanska, 1997b). Similarly, mutually positive and reciprocal interactions with the parent serve as early bases for the child's perceptions of mutual responsibility to other people and a desire to respect moral rules and values at large (Kochanska, 1997b; Russell, Pettit, & Mize, 1998; Thompson, Meyer, & McGinley, 2006). Importantly, research suggests measures that consider contributions of both parent and child are empirically distinct from measures of each individual's behavior (Aksan, Kochanska, & Ortmann, 2006). Thus, although this quality may be established by responses on the part of the parent starting early in infancy, it is appropriate to ultimately conceptualize it at the dyadic level. Additionally, given variation in the methods used across studies to reflect this form of parenting quality, we refer to the measure used in the current study as "mother-child mutual positivity and responsiveness," or "MPR" for brevity.

Second, parents may socialize regulatory skills more effectively through gentle control or structuring behaviors. Consistent supervision, demands, and feedback can guide children toward appropriate responses that align with parental expectations, but also give children the autonomy to plan and produce their future responses (Baumrind, 2012; Grolnick & Pomerantz, 2009; Maccoby & Martin, 1983), thus leading children to perceive parents' messages with acceptance and motivation (Grusec & Goodnow, 1994). Considered distinct from coercive or harsh parenting, gentle control behaviors impose reasonable constraints on children's behavior while directing them toward an independent understanding and enactment of acceptable responses. We propose that these two parenting qualities may thus promote children's behavioral self-regulation and conscience, but these associations may depend on other factors.

Temperament-Specific Parenting Effects

Given the emphasis placed on child behavior and perceptions in the parenting literature, research on self-regulation and conscience has increasingly incorporated joint influences of both temperament and parenting. Early perspectives on the role of the child in their own development suggested that child characteristics may evoke different kinds of parenting (Bell, 1968; Thomas & Chess, 1977). Subsequent research has certainly found differences in parenting behavior attributable to temperamental characteristics, such as child frustration or irritability predicting more negative or controlling parenting behavior, but findings from this body of research are also relatively mixed (Kiff Lengua, & Zalewski, 2011). In fact, these perspectives are compatible with an argument that children with different temperamental characteristics may react differently to the same environmental input, including parenting (Wachs & Gandour, 1983). They emphasize the potential for variability in parenting behavior based on parents' attitudes and values regardless of child temperament, and that the most positive outcomes result from a "goodness of fit" between the child's temperament and the nature of the parent-child relationship (Thomas & Chess, 1977). Accordingly, the current study explored how parents' natural variations in parenting quality appear to represent a relatively good or poor fit for different types of children

Kochanska and colleagues were among the first researchers to investigate differential parental socialization of conscience based on temperament (Kochanska, 1993). They demonstrated across multiple samples that in fearful children, maternal gentle discipline deemphasizing power predicted greater compliance, adherence to rules without supervision, and prosocial or moral responses (Kochanska, 1995; 1997a), whereas maternal power assertion predicted less moral self-identity (Kochanska, Aksan, & Joy, 2007). They proposed that gentle discipline elicits anxious arousal regarding violation of rules in fearful children without eliciting fear or distress, thus increasing internalization of parent values. Alternatively, in fearless children, the aforementioned outcomes were predicted by indicators of a positive parent-child relationship, including attachment security (Kochanska, 1995; 1997) and mother responsiveness (Kochanska, 1997a), as well as composite measures based on mother responsiveness, harmonious exchanges, and shared positive affect (Kochanska et al., 2007, Study 1), or mutual responsiveness, shared positive affect, and mutually responsive orientation (Kochanska et al., 2007, Study 2). They proposed that fearless children are less likely to experience anxious arousal in response to rule violations, so positive parent-child interaction qualities instead promote behavioral control by increasing their willingness to accept parental values. Despite their consistent findings, all studies cited above examined temperament based on median-splits or tests of high and low values on a continuous, aggregate measure of child fearfulness or inhibition to novelty. To our knowledge, no study has investigated similar effects using a person-oriented or typological approach to assessing temperament. The current study examined similar patterns in children characterized as inhibited, exuberant, and average-approach to provide additional perspective on this conceptual argument. Importantly, we further hypothesized that variation in these patterns will depend on the context in which parents display such parenting qualities.

Contexts of Measurement

Temperament-based effects may also emerge more strongly when parenting qualities are observed in specific contexts. Given the importance of compliance to rules and internalization of parental messages in the development of self-regulation and conscience, contexts with different regulatory expectations may pull for differing expressions of parenting quality. This idea aligns with existing arguments that the manifestation and impact of parental socialization behaviors may differ depending on the parent's goals for the child, the child's perception of parental goals or messages, and the domains of child functioning to which parental socialization behavior applies (Dix, 1992; Grusec & Davidov, 2010; Grusec & Goodnow, 1994; Grusec, Goodnow, & Kuczynski, 2000). Situations in which parental goals center on child regulation and on encouraging the child to produce responses that differ from their preferred response, like a cleanup task, likely evoke more feedback and attempts to change child responses through gentle control (Grusec & Davidov, 2010). Conversely, situations in which parental and child goals are more diffuse or non-directive, like a free play session, may allow for more parenting behavior and parent-child interactions reflecting positivity and reciprocity (Grusec & Davidov, 2010).

Despite this intuitive argument that parenting may have different implications in different situations, only a few studies have incorporated contextual differences in studies of parenting, temperament, and regulatory outcomes. Kochanska and colleagues' (Kochanska & Aksan, 1995; Kochanska et al, 2001) research on early regulatory development included comparisons of parent and child behavior in "don't" contexts, in which the child is expected to inhibit a desired response, and "do" contexts, in which the child is expected to sustain an undesired or tedious response. Their findings suggested that "do" contexts are more challenging for children and pull for individual differences in regulation even in more inhibited children. Drawing from these evident differences in regulatory challenge, Augustine and Stifter (2015) found that maternal socialization behaviors related to later conscience outcomes in exuberant toddlers only when measured in a "don't" context, and for inhibited toddlers only when measured in a "do" context.

This limited research appears to suggest that differences in regulatory expectations may play a role in how mother-child interactions relate to regulatory skills in children of different temperament types. Regulatory tasks that require children to produce and sustain requested behaviors could be well-attuned to inhibited children's motivation to comply to parental requests (Kochanska, 1993), and pull for differences in these skills (e.g., Kochanska et al., 2001), thus mother behavior in contexts with "do" regulatory demands may be a stronger predictor of conscience and regulatory outcomes for inhibited children relative to children of other temperament types (Augustine & Stifter, 2015). These studies did not, however, consider mother behavior in tasks with little regulatory structure. Mother behavior in these contexts may be a stronger predictor of conscience and behavioral regulation for exuberant children relative to children of other temperament types, as they may allow for more exchanges of mutual positivity and responsiveness in the parent and child (Kochanska, 1993).

In light of this issue, one study to our knowledge (Dennis, 2006) examined temperament-specific relations between parenting in tasks with more or less regulatory structure and children's regulation. Results indicated that maternal behaviors that focused on positive child or situational qualities during a wait task related to better emotional self-regulation in high-approach children, whereas shared positive affect in a free play related to mother-reported compliance in low-approach children. However, all measures were collected concurrently and at preschool age, when children may have already developed many regulatory skills. Better regulatory skills may allow for more positive mother-child interactions, with effects more apparent in contexts in which one's temperament group would otherwise not be expected to be the most positive or responsive to the mother—regulation tasks for exuberant children, free play for inhibited children. The current study utilized longitudinal data spanning the early years of self-regulatory development, to lend greater confidence to the interpretation that parenting in contexts with more or less regulatory structure has differential developmental implications based on temperament.

Current Study

Child temperamental fearfulness appears to underlie differences in the effectiveness of specific parenting qualities like mother gentle control behavior and mother-child mutual positivity and responsiveness in promoting children's self-regulatory and conscience development (e.g., Kochanska, 1997a). However, few studies have considered such patterns using person-oriented measures of temperament, and almost no research considers how the benefits of putatively positive parenting qualities may be more apparent in some situations than others. Taken together, developmental research that considers specific comparisons of temperament, parenting qualities, and parenting contexts may provide novel information about what constitutes "goodness of fit" in promoting children's regulatory skills, and what behaviors or situations are the most fruitful targets for intervention. To that end, the current study sought to contribute to the literature clearer understanding of the means through which parenting quality promotes self-regulation and conscience based on child temperament, with a focus on behavioral indicators of each outcome.

Measures of mother-child mutual positivity and responsiveness (MPR) and maternal gentle control were observed in a context involving no inherent regulatory goal, a free play task, and a context involving a clear regulatory goal, a clean-up task, when the child was 18 months old. Child temperament was assessed at the same time point based on responses to novel stimuli and latent profile analysis was used to classify infants to temperament profiles. Several measures of child behavioral self-regulation and conscience were assessed when the child was 4.5 years old. Children's receptive vocabulary was also assessed at this time point, as language skills may assist task performance due to better understanding of task instructions (see Augustine & Stifter, 2015).

Consistent with the extant literature (e.g., Aksan & Kochanska, 2004; Kochanska, 1995; 1997a; Kochanska, et al., 2007) it was hypothesized that MPR is a stronger predictor of behavioral self-regulation and conscience measures for exuberant children compared to children of other temperament types, whereas maternal gentle control is a stronger predictor of these outcomes in inhibited children compared to children of other temperament types.

Further, based on expected situational differences in parental goals and responses, it was predicted that the effects of MPR for exuberant children would be stronger when this quality is observed in a free play context, and the effects of maternal gentle control for inhibited children would be stronger when this quality is observed in a clean-up context.

Method

Participants

Participants for this study were 135 infants and their primary caregivers recruited for a larger longitudinal study of emotional development. The primary caregiver was the mother for all infants but one for whom the father was the primary caregiver; thus, these participants are collectively referred to as “mothers.” Infants in the original study sample ($N=147$) were equally distributed by gender (53% male) and primarily non-Hispanic White (92%). Mothers averaged 29.66 years of age at the time of the child’s birth ($SD = 4.11$ years, range = 20–40 years) and 55% had at least a college education. The majority (81.9%) were married to the infant’s father. Median annual family income in this sample fell in a category of \$40,000–\$60,000.

Mothers and infants participated in laboratory visits starting at 6 months of age; however, the current study utilizes data collected during a laboratory visit when children were 18 months of age and two visits at 4.5 years of age. A total of 12 families from the original sample did not complete the 18 month visit and 35 did not complete one or both 4.5-year visits, typically because they were too busy or had moved from the area. These families who did not provide full data did not differ from the remainder of the original sample on major maternal or child demographic characteristics collected in the larger study, i.e., child gender, maternal age, maternal education, parent marital status, family income, or if the child had an older sibling. Similarly, families who provided data at 18 months but not 4.5 years did not differ on these demographic characteristics from those who participated at both time points. All study procedures were approved by the institutional review board and informed consent was obtained from all participants (mother provided consent on behalf of the child). Difficulties with task administration led to unusable 18-month temperament data for one child, but all other participants were included in the final analytic sample ($N=134$).

Procedures and Measures

18 months.—Mothers and infants participated in a laboratory visit within two weeks of when the infant turned 18 months of age. Relevant to this study, infants participated in a risk room task at the beginning of the lab visit to assess infant temperament. Later in the visit, mothers and infants participated in a free play session to assess mother and child behavior in an interactive context with no regulatory structure, followed by a clean-up task to assess mother and child behavior in an interactive context with explicit regulatory structure. Trained teams of undergraduates coded all measures, and interrater reliability was assessed on least 20% of recordings for all coding schemes.

Temperament groups. During the risk room task, adapted from the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith, Reilly, Lemery, Longley, &

Prescott, 1994), an experimenter invited the mother and infant to enter the laboratory, asked the mother to sit in a chair placed in the corner, and allowed the infant to play freely. Prior to their entry, the room had been filled with a small pop-up tunnel, a set of steps, a black box with “teeth,” and a gorilla mask on a table. An unfamiliar experimenter entered the room after 3 minutes and asked the mother to sit back and be silent but did not approach the infant. Speaking in a positive tone, the experimenter then asked the child to climb through the tunnel, jump from the steps to a small mattress below, put a hand in the black box, and pet the gorilla mask. The experimenter-present portion of the task was coded for infant temperamental reactions to novelty.

Observations of this task were utilized to form a typological measure of temperament within the larger longitudinal study from which these data were drawn. Temperament coding, results of the person-oriented analysis, and temperament group formation in this sample are described in detail in Moding and Stifter (2018) and briefly below. Following previous research (e.g., Kagan et al., 1984; Putnam & Stifter, 2005) temperament was assessed through affective and approach-withdrawal responses to the risk room. Coded affective responses included child positive affect, from 1 (*no positive*) to 3 (*high positive*), and negative affect, from 1 (*no negative*) to 3 (*high negative*), based on child facial affect and vocalizations. Coded approach-withdrawal responses included proximity to the mother, latency to play, total time playing, engagement with the novel objects, activity level, and spontaneous vocalizations. All scores represented duration of time in seconds or ratings made second-by-second or in five-second intervals. Interrater reliability was $ICC > .92$ for all measures except spontaneous vocalizations, which was assessed with an average kappa of .70.

Temperament groups were identified using latent profile analysis. The coded behaviors that were described above were entered as observed indicators and a four-class solution was selected as best-fitting. The profiles conformed to high-inhibited (i.e., very high negative affect, low positive affect, high withdrawal), inhibited (i.e., high negative affect, low positive affect, high withdrawal), average approach (i.e., relatively close to the sample mean on all indicators), and exuberant (i.e., low negative affect, high positive affect, high approach) patterns (see Moding and Stifter, 2018 for more detail). Entropy for the four-class solution was .94 and posterior probabilities of class membership were generally very high, so toddlers were classified to observed temperament groups for use in primary analyses. Consistent with previous studies (Dollar et al, 2017; Putnam & Stifter, 2005), the high-inhibited group was small ($n = 4$) and distinguished from the inhibited group primarily based on negative affect, so the two inhibited groups were combined for analyses. The temperament groups utilized in analyses were inhibited ($n = 44$), average approach ($n = 52$), and exuberant ($n = 38$).

To confirm the distinctness of the observed temperament groups, each group was compared to the others on the indicators used in the latent profile analysis. The inhibited group differed from the exuberant group on all indicators in the expected direction, $t_s = [2.71-24.11]$, $p_s < .001-.009$. The inhibited group differed significantly from the average approach group on nearly all indicators in the expected direction except for positive affect, $t(94) = .60$, $p = .55$, other indicators $t_s = [2.28-13.22]$, $p_s < .001-.03$. The exuberant group differed significantly

from the average approach group on positive affect, proximity to mother, latency to play, total time playing, and engagement, all in the expected direction, $ts = [3.06-12.80]$, $ps = <.001-.003$. The exuberant group was marginally higher on spontaneous vocalizations than the average approach group, $t(88) = 1.75$, $p = .08$. These groups did not differ significantly on negative affect or activity level, $t(88) = .62$, $p = .54$, $t(58) = 1.22$, $p = .23$, respectively.

Mother and child interactive behaviors in free play and clean-up.: The experimenter provided the mother and child with a basket of age-appropriate toys and invited them to sit together on the laboratory floor to play. The experimenter gave mothers no specific instructions for the free play except to play how they normally would at home, and to try to remove as many toys as possible from the basket throughout the interaction to prepare for the clean-up task. After 5 minutes, the experimenter cued the mother to begin the clean-up task with a knock on the wall. Prior to the task the experimenter asked the mother to do her best to get the child to return all the toys to the basket independently and to avoid cleaning up for the child. The clean-up task lasted 3 minutes or until all toys were returned to the basket.

Mother measures.: To observe comparable parenting measures in the free play and cleanup task, maternal responses were coded in a relatively task-neutral manner using similar definitions for each construct. *Maternal affect* was coded in 10-second intervals in each task using a scheme adapted from Kochanska and Aksan (1995). A “high positive” code was assigned if the mother displayed a clear smile, positive vocalization (i.e., laugh or chuckle), or a clearly playful or joyful intonation in her voice at least once during the interval. “Neutral/positive” was coded if the mother did not display high positive affect but the mood was pleasant or neutral throughout the interval. Although positive affect was of primary interest, if at any point in the interval the mother displayed mildly negative affect such as irritation, impatience, or boredom, a “neutral/negative” code was assigned (a review of recordings indicated that no mothers displayed negative affect more extreme than this mildly negative level). Intervals coded as high positive were assigned a score of 2, neutral/positive a score of 1, and neutral/negative code a score of 0. Interrater reliability was $ICC = .80$ for free play and $ICC = .80$ for clean-up.

Mother responsive behavior and gentle control behavior codes were adapted from past research (Cipriano & Stifter, 2010; Kochanska et al., 2001; Lindsey, Cremeens, & Caldera, 2010) to reflect behaviors that could be observed in either interaction context. As such, they were defined by their general function or intent in reference to the child, not specific to the nature of the task. *Mother responsive behaviors* indicated a willingness to praise, endorse, or follow the child’s agenda (encouragement), comply with the child’s requests (compliance), provide reasoning about behavior to the child (reasoning), or actively attend to child behavior without intervening (observation). Each task was coded in 10-second intervals for the presence of any of these behaviors; otherwise a “none” code was applied. Interrater reliability was assessed for each code with average kappas of .75–.94. Responsive behavior scores were calculated as the proportion of total behaviors (i.e., all responsive codes and “none” codes) that were coded as a responsive behavior. *Mother gentle control* behaviors were used by the mother to enact change in the child, such as to produce behavioral or

verbal responses (i.e., command, behavior request, knowledge request, decision request), to stop behavior (prohibition), redirect attention to her or another stimulus (redirection), or to copy her modeled or guided behavior (scaffolding). Importantly, all behaviors were required to be displayed with neutral or positive affect, indicating gentle control. Each task was coded in 10-second intervals for the presence of any of these behaviors; otherwise a “none” code was applied. Interrater reliability was assessed for each code with average kappas of .83–1.00. Gentle control scores were calculated as the proportion of total behaviors (i.e., all control codes and “none” codes) that were coded as a control behavior.

Child measures.: Coding schemes were developed to capture positive affect and responsive behaviors in the child that were roughly analogous to those coded in mothers. *Child affect* was coded from facial affect and vocalizations in 10-second intervals. As children tended to display negative affect with greater frequency than mothers, both positive and negative responses were coded. Positive affect was rated on a 3-point scale from 0 (*No positive; no smiles or vocalizations that indicate positive affect*) to 2 (*High positive; child displays a clear smile, clear positive vocalization, or exuberant body movement*). Interrater reliability was $ICC = .97$ for free play and $ICC = .83$ for clean-up. Negative affect was rated on a 3-point scale from 0 (*No negative; no frowns or vocalizations that indicate negative affect*) to 2 (*High negative; child displays a clear frown or upset facial expression, a high negative vocalization like crying or screaming, or a highly negative body movement like stomping or hitting*). Interrater reliability was $ICC = .94$ for free play and $ICC = .96$ for clean-up. Positive and negative affect scores were calculated for each task as the mean affect level across intervals; 88% of infants displayed any positive affect throughout the tasks whereas only 53% displayed negative affect. Thus, negative affect was not considered separately, and instead an overall affect score was calculated for each task as the mean of positive and reversed-negative affect scores. A score above 0 indicated that the child displayed relatively more positive than negative affect, and a score below 0 indicated that the child displayed relatively more negative than positive affect.

Child responsive behavior was also coded in 10-second intervals, using more global codes than those for mothers due to their limited verbal fluency. In the free play task, child responsiveness tended to be displayed either as compliance to specific maternal requests or by spontaneous shifts in behavior or attention to align with the mother’s activity. Accordingly, *free play responsive behavior* was defined as an intentional shift in behavior or attention in response to the mother or accepting changes to behavior enacted by the mother. Additionally, coders could indicate if the mother did not provide a cue that could enact a child response during the interval. Interrater reliability was $ICC = .78$ for responsive behavior and $ICC = .82$ for no cue to respond. In the clean-up task, mother behavior was almost exclusively tied to the child’s progress at cleaning up the toys and mothers provided consistent cues to do so, so child responsiveness was generally represented by compliance to requests to put away the toys or enact behavior related to clean-up. Clean-up responsive behavior was thus defined as the presence of behavior directed toward the goal of cleaning up or otherwise in line with the mother’s request to clean up. Interrater reliability was $ICC = .93$. Responsive behavior scores were calculated for each task as the proportion of total

intervals in which responsive behavior was coded; for free play, this score was based only on the total number of intervals in which a cue to respond was present.

We examined consistency among mother and child responsive behavior and affect in free play and in clean-up for the purpose of data reduction. During free play, mother responsive behavior was significantly correlated with mother affect ($r = .35, p < .001$) and child responsive behavior ($r = .21, p = .02$), child affect was modestly correlated with mother responsive behavior, mother affect, and child responsive behavior ($r_s = .12-.15, p_s = < .09-.17$), but mother affect was not related to child responsive behavior ($r = .02, p = .79$). In clean-up, nearly all mother and child behaviors were significantly correlated ($r_s = .19-.60, p_s = < .001-.02$) and mother affect and mother responsive behavior were modestly correlated ($r = .14, p = .11$). Principal components analyses indicated that these measures loaded onto a single factor with moderate loadings for each task (free play eigenvalue = 1.53, loadings .46-.77 and clean-up eigenvalue = 1.88, loadings .50-.80). These associations suggested responses in one partner were not entirely contingent on that of the other, but there was moderate dependence, indicating that a measure that considers both partners' behavior may supersede those that consider only contributions of the individual (Aksan et al, 2006). Accordingly, mutual positivity and responsiveness (MPR) composites were calculated for each context as the mean of standardized mother responsive behavior, child responsive behavior, mother positive affect, and child affect scores. Constructed as such, the highest scores were assigned to dyads in which both partners displayed relatively high levels of each measure and thus indicated greater mutuality in responses. Collectively, the observed measures described in this section yielded four parenting quality variables for use in study analyses, including mother gentle control behavior during free play and clean-up and mother-child MPR during free play and clean-up.

4.5 years.—Children participated in a lab visit when they were approximately 4.5 years of age ($M = 4.56$ years) and a second lab visit approximately one month later. This study focuses on three measures of behavioral self-regulation (tongue task, continuous performance task, clean-up task) and two behavioral measures of conscience (memory game, puzzle task) from these visits. Trained teams of undergraduates coded all measures and interrater reliability was assessed on least 20% of recordings for all coding schemes.

Behavioral self-regulation. Three tasks were used to measure behavioral self-regulation, i.e., the child's ability to inhibit or produce behavior as instructed. During the tongue task (adapted from Kochanska et al., 1996), the experimenter introduced a game in which she and the child balanced a candy on their tongues for as long as possible with mouth open and without chewing, sucking, or swallowing the candy. They practiced the task with a 10-second training trial, then completed a test trial that lasted up to 2 minutes, at which point the experimenter would "lose the game" by eating her candy. If the child closed his/her mouth or touched the candy the experimenter provided one reminder to keep his/her mouth open and clear. The test trial was ended early if the child ate the candy or dropped the candy from his/her tongue after 1 minute had passed (the trial was re-started if the candy fell before 1 minute). Total task time was defined as the total time before the child ate or dropped the candy, reflecting rule adherence. Time spent engaging in two interfering

behaviors was subtracted from the total task time: mouth closed, defined as the total time the child closed his/her mouth for at least a 1 second period, and touching candy, defined as the total time the child spent touching the candy in his/her mouth, such as to hold it in place. Interrater reliability was $ICC=.99$ for latency to end task, $.84$ for mouth closed, and $.96$ for touch candy.

The clean-up alone task (Kochanska et.al, 1996) was conducted following a play session with an experimenter; the parent who accompanied the child to the visit, typically the mother, was asked to open the laboratory door and briefly instruct the child to start picking up the play items and put them in a provided basket. The parent then closed the door and the child was left alone to pick up the items for up to 2 minutes or when all the items were returned to the basket. Time spent cleaning was defined as the total time spent picking up items and putting them in the basket; interrater reliability was $ICC= .84$.

The *continuous performance task* (CPT) was a computerized task; the child was instructed to press a key as quickly as possible when a picture of a rabbit appeared on the screen, and to not press the key if a picture of another animal (i.e., polar bear, kangaroo, elephant, deer, frog) appeared. The task included three sets of 12 randomized presentations: six pictures of rabbits and six of other animals. Presentations lasted 3 seconds during the first set, 2 seconds during the second set, and 1 second during the third set; all presentations were separated by 500 millisecond breaks. The task was programmed using PsychoPy software (Peirce, 2007) and key presses were recorded. If the child appeared to stop paying attention or to watch the screen without responding, the experimenter provided one reminder to press the button when s/he sees a rabbit. A response was considered correct if the child pressed the key during a rabbit presentation or did not press the key during a non-rabbit presentation

We examined consistency among tongue task behavior, clean-up behavior, and overall CPT performance for the purpose of data reduction. Correlations among these measures were modest ($r_s = .10-.24$, $p_s = .02-.33$). It was found that CPT accuracy during the second set of images (2-second presentations) had relatively better consistency with the other measures ($r_s = .13-.24$, $p_s = .02-.20$), likely due to this set of presentations being moderately and thus most appropriately challenging to children's regulatory skills relative to sets with longer or shorter presentations. Additionally, in a principal components analysis these measures loaded onto a single factor (eigenvalue = 1.33) with similar magnitude loadings (.54-.74), suggesting that they represented distinct indicators of a larger coherent construct. Conversely, principal components analyses indicated poorer consistency in loadings when full CPT scores or first set scores were entered, and indicated the CPT third set scores loaded on a separate factor from clean-up and tongue task performance. Thus, a behavioral self-regulation composite score was calculated as the mean of standardized CPT set two performance, clean-up time, and tongue task time scores.

Behavioral measures of conscience.: Two tasks were used to measure the moral behavior component of conscience, i.e., the child's ability to inhibit or produce behavior as instructed, typically conceptualized as not cheating, and without supervision of their adherence to task rules. During the memory gametask (adapted from Kochanska et al., 1996), the experimenter introduced a game in which cards were placed face-down on the table and flipped over in

pairs to find a match. The experimenter told the child that each time they found a match they would receive a sticker. The pair took turns, and after the child had two matches, the experimenter was signaled to leave the room by a knock from the other room. The experimenter told the child she needed to go help outside and instructed the child not to look under the cards while she was gone because that would be cheating. The child was left alone with the cards for two minutes.

Latency to peek was defined as the total time before the child flipped or peeked beneath a card. Time spent peeking was defined as the total time the child spent flipping cards or lifting cards to look at the underside. Coders also recorded the total number of times the child flipped or peeked under a card. Interrater reliability was $ICC=1.00$ for latency to peek, .89 for time spent peeking, and 1.00 for total number of peeks. The majority of children (71%) did not peek during this task, thus the latency to peek measure was rescored as “did not peek” and “peeked.”

During the *puzzle task* (following Eisenberg et al, 2000), the child was seated in front of a box that had a cloth panel with arm holes facing the child, transparent plexiglass in the back, and a simple shape puzzle attached inside. The experimenter placed the puzzle pieces inside the box and told the child she wanted to see how fast children can complete puzzles when they can't see what they are doing. If the puzzle was finished before two minutes, the child would receive two stickers. The experimenter helped the child put his/her arms inside the box, set a timer, and reminded the child not to look at the puzzle because that would be cheating. The child was left alone for two minutes, or less if the child completed the puzzle.

Latency to peek was defined as the total time before the child lifted the cloth to see the puzzle or pulled out a puzzle piece to see its shape. Time spent peeking was defined as the total time the child spent looking under the cloth or removing puzzle pieces. Coders also recorded the total number of times the child peeked under the cloth or pulled out a piece. Most children quickly realized the task was too difficult to complete on their own, thus the tendency to display sustained persistence at the puzzle without peeking did appear to reflect a willingness to sustain a difficult rule-compliant activity without supervision, rather than a high level of approach to reward. Thus, persistence at the task was also coded, defined as the total time spent attempting to complete the puzzle without peeking. Interrater reliability was $ICC=1.00$ for latency to peek, .97 for time spent peeking, .90 for total number of peeks, and .96 for persistence.

We examined consistency among all coded responses in the memory game and puzzle task for the purpose of data reduction. Number of peeks in the puzzle task were unrelated to duration ($r = .05$, $p = .62$) and frequency ($r = .07$, $p = .49$) of peeks in the memory game, but all other behaviors were significantly correlated (absolute value r s = .19–.92, p s = <.001–.05). Additionally, in a principal components analysis these measures loaded onto a single factor (eigenvalue = 3.41) with loadings similarly large in magnitude for most measures (.68–.80) and adequate in magnitude loading for number of peeks in the puzzle task (.46), again suggesting these measures represented distinct indicators of a larger coherent construct. Accordingly, a conscience composite score was calculated as the mean of standardized scores for memory game peeked (no/yes), time peeking, memory game number

of peeks, puzzle task latency to peek time, puzzle task peeking time, puzzle task number of peeks, and puzzle task persistence time. All scores but persistence were reversed so that a higher score represented greater adherence to task rules. One child had an extreme score ($>3SD$ below the mean), so this child's score was replaced with the next lowest value in the dataset.

Child language assessment.: Due to possible differences in understanding of the task instructions, children's receptive vocabulary was assessed using the Peabody Picture Vocabulary Task, Fourth Edition (PPVT; Dunn & Dunn, 2007). Scaled receptive vocabulary scores were created for each child ($M=114.22$, $SD=14.31$). Two children refused to complete this measure. They both received approximately the mean score on an assessment of receptive vocabulary at 18 months (Bayley, 2006) that was significantly related to PPVT scores in this sample ($r=.41$, $p<.001$); thus a mean receptive language score of 114 was assigned for these participants.

Analytic Plan

Preliminary analyses.—Prior to conducting primary study analyses, we examined differences in the central variables of the study based on potential covariates, including demographic information (i.e., child gender, maternal age, maternal education, family income, if the child had an older sibling, if the child was in non-maternal child care at 18 months) or child receptive language score. Girls scored higher on behavioral self-regulation than boys, $t(109)=2.03$, $p=.05$. Children whose mother had at least a four-year degree scored higher on behavioral self-regulation than those whose mothers did not, $t(78)=2.30$, $p=.02$. Further, child PPVT receptive vocabulary was significantly correlated with both the behavioral self-regulation score ($r=.27$, $p=.01$) and the behavioral measure of conscience score ($r=.35$, $p<.001$). Thus, all models controlled for child gender, mother education, and child receptive vocabulary.

Primary analyses.—Temperament- and context-based prediction of behavioral self-regulation and conscience were tested with a series of multiple regression models. All analyses were conducted in Mplus version 8, which offered two advantages. First, in contrast to previous studies examining temperament-by-parenting interactions in categorical temperament groups through dummy-coded predictors following Aiken and West's (1991) recommendations (e.g., Augustine & Stifter, 2015; Cipriano & Stifter, 2010), we utilized the multigroup model option in Mplus to conduct a straightforward *a priori* test of main effects for the variables of interest within each of the three temperament groups. This approach was well-suited to design of the current study, as it allowed greater confidence in testing all predictors within the same model, thus accounting for potential shared variance across constructs or contexts, rather than running models separately by behavior or by context due to concerns for statistical power (e.g., Augustine & Stifter, 2015). Testing the unique effect of all variables within the same model also helped to reduce concerns for Type I error that might arise when splitting tests across models. Second, this approach allowed us to handle missing data using M information maximum likelihood estimation (FIML). The analyses met assumptions for FIML as there were no significant differences on 18-month model predictors for those who did and did not provide 4.5-year data, a missing value analysis

indicated data were missing completely at random, Little's MCAR $\chi^2(12) = 10.45, p = .58$, and outcome variables had acceptable distributions.

The primary analysis was a multigroup multivariate regression model predicting each of the two 4.5-year outcomes for each temperament group. The predictors included the covariates specified above as well as MPR and mother gentle control (the latter standardized for comparability) within each of the two 18-month interactive contexts. Regression models in which all variables are manifest indicators specified only as a predictor or an outcome are saturated in this framework, i.e., the model is specified to fit perfectly to the data. Thus, as with traditional multiple regression models, it is appropriate to report whether the predictors accounted for significant variance in each outcome based on omnibus R^2 values and individual regression coefficients, rather than examining fit statistics.

One caveat of the multigroup approach was that it tested if a predictor had a significant slope within each temperament group, but not if that slope differed in magnitude across temperament groups. Thus, if the slope of any parenting quality variable was significant for a specific temperament group, we conducted a follow-up regression with dummy-coded temperament group terms and parenting-by-temperament-group interactions with that temperament group as the reference group (following Aiken & West, 1991). As a post hoc test, each model included all covariates and primary variables but included interaction terms only for the significant variable of interest. A significant interaction indicated there was a significant difference in the slope for that variable between the reference temperament group and the comparison temperament group. Only effects that met this criterion were interpreted further.

Results

Descriptive statistics for all raw and composite variables are reported in Table 1. Context differences in the 18-month variables were confirmed using paired sample t -tests. Among indicators of MPR, mother responsive behavior did not differ significantly from free play and clean-up; however, child responsive behavior, mother affect, and child affect were higher in free play compared to clean-up. Additionally, mother control behavior was lower in free play compared to clean-up. Temperament group differences among all raw and composite 18-month predictors were also considered. Without controlling for other variables, it was found that mothers of children in the average-approach group displayed higher positive affect in clean-up than mothers of children in the inhibited group, $t(80) = 2.60, p = .02$. These mothers also displayed more gentle control in clean-up than mothers of children in the exuberant group $t(57) = 2.35, p = .02$. No other temperament group differences were found, suggesting that variation in the primary study variables did not clearly reflect evocative effects of child temperament group.

Correlations between primary study variables are reported in Table 2. Both MPR and gentle control were significantly correlated across contexts. MPR and mother gentle control were not significantly associated in free play; however, they had a significant negative correlation in clean-up. MPR in clean-up had a significant positive correlation with the conscience composite, whereas mother gentle control in clean-up had a marginally significant negative

correlation with this outcome. Lastly, there was a significant positive correlation between behavioral self-regulation and conscience composite scores.

Behavioral Self-Regulation

Results from models predicting the behavioral self-regulation composite from 18-month free play and clean-up variables are presented in Table 3. For the exuberant group, mother gentle control and MPR during the clean-up related to better behavioral self-regulation. For the average-approach group, however, mother gentle control during free play related to poorer behavioral self-regulation. No behaviors uniquely predicted behavioral self-regulation in the inhibited group. Follow-up tests indicated that the magnitude of the positive effect for gentle control in clean-up for the exuberant group was greater than that for the average-approach group (B difference = $-.46$, $SE = .21$, $p = .03$) and marginally greater than that for the inhibited group (B difference = $-.24$, $SE = .14$, $p = .08$; see Figure 1a). However, the effect of MPR in clean-up for the exuberant group was not different than that of either other temperament group (inhibited B difference = $-.14$, $SE = .24$, $p = .57$, average-approach B difference = $-.22$, $SE = .23$, $p = .34$). Secondly, the magnitude of the negative effect for gentle control in free play for the average-approach group was greater than that for the exuberant group (B difference = $.39$, $SE = .15$, $p = .01$) but not the inhibited group (B difference = $.09$, $SE = .15$, $p = .56$; see Figure 1b).

Conscience

Results from models predicting the behavioral component of conscience composite from 18-month free play and clean-up variables are presented in Table 4 and illustrated in Figure 2. For the inhibited group, MPR during the clean-up related to better conscience. No behaviors uniquely predicted the conscience outcome in the exuberant or average-approach temperament group. Follow-up tests indicated that the magnitude of the positive effect for MPR during cleanup for the inhibited group was greater than that for the exuberant group (B difference = $-.43$, $SE = .22$, $p = .05$) and marginally greater than that for the average-approach group (B difference = $-.37$, $SE = .21$, $p = .08$; see Figure 2).

Discussion

The current study investigated the contributions of child temperament type and two forms of parenting quality: mutual positivity and responsiveness (MPR) and mother gentle control, to behavioral measures reflecting two important developmental regulatory outcomes in childhood: self-regulation and conscience. Further, this study explored the relevance of parenting context in these relations, with the expectation that the effects of parenting quality on these regulatory outcomes for children of different temperament types will vary with the context in which parent-child interactions are observed. We hypothesized that MPR would be a stronger predictor for exuberant children compared to other temperament types, especially when observed in a free play context, and that mother gentle control behavior would be a stronger predictor for inhibited children compared to other temperament types, especially when observed in a clean-up context.

In general, the results of this study pointed to a somewhat different pattern of effects than we had hypothesized. In predicting behavioral self-regulation, the most prominent findings were for maternal gentle control. First, greater gentle control in the clean-up context was related to significantly better behavioral self-regulation for children in the exuberant temperament group. Thus, contrary to our expectations, exuberant children's behavioral self-regulation appeared to be most distinctly predicted by the mother's attempts to guide the child's attention and behavior, when displayed in a context with a focus on regulation. As mentioned, researchers have emphasized the importance of promoting behavioral control skills for children who are relatively uninhibited or exuberant, as these children may not otherwise be primed to adhere to external rules and expectations (Stifter & Dollar, 2016; Kochanska, 1993; Polak-Toste & Gunnar, 2006). If mothers of exuberant children infuse gentle control into interactions specifically relevant to children's regulatory skills, they may help their children to be more attentive and receptive to external expectations and provide more opportunities to practice compliance and self-control of behavior to meet these expectations (Gronick & Pomerantz, 2009). This may be particularly true for toddlers who are just beginning to internalize rules and standards. Previous studies have found that mothers' use of specific behaviors like commands and redirection related to positive regulatory outcomes in exuberant children (e.g., Augustine & Stifter, 2015; Cipriano & Stifter, 2010), and this study provides further evidence that gentle control may in fact be a meaningful contributor to behavioral self-regulation in exuberant children. Nonetheless, it is also worth noting that the effect of MPR during the clean-up also reached significance for the exuberant group, though this effect was not stronger than that for the other temperament groups. This provides partial support for our expectation that exuberant children are receptive to positivity and responsiveness in their socialization relationships (e.g., Kochanska, 1997a, Kochanska et al, 2007). Collectively, however, these parenting qualities appear to be more closely tied to measures of behavioral self-regulation, and may not be as effective in contexts in which regulatory goals are not the emphasis for the mother nor the child.

Conversely, mother gentle control during the free play was found to relate to lower behavioral self-regulation for children in the average-approach temperament group. Similar to reasoning regarding the exuberant group, this effect might reflect the appropriateness of this behavior in this context. A child identified as relatively average in temperamental approach and affective responses might be expected to be relatively average in qualities like reactive inhibition or affective discomfort, as well as in fearlessness or impulsivity (see Dollar et al, 2017; Putnam & Stifter, 2005). Accordingly, children of this temperament type may not always benefit from high levels of parental gentle control or feedback, particularly in contexts with limited regulatory goals when the child might instead independently initiate behavior or joint interactions with the mother. Thus, although mothers in this sample did not display harsh control, those who were very high in gentle control during the free play may have been overly directive for children of this temperament type. The mother's tendency to try to guide child behavior in contexts like free play may actually intrude on the child's autonomy to engage in self-initiated or self-controlled behavioral responses, thus interfering with the development of self-regulatory skills over time (see Gronick & Pomerantz, 2009). Maternal gentle control in clean-up, which was instead generally directed at a specific

behavioral and regulatory goal, was found to have a weaker, albeit negative, association with behavioral self-regulation for these children

In predicting behavioral measures of conscience, the most notable pattern of effect emerged for the inhibited temperament group, such that greater MPR in the clean-up task was related to this outcome. This result provides some preliminary evidence that indicators of positivity and responsiveness in mother-child interactions may also have positive outcomes for inhibited children, contrary to previous null findings (Kochanska, 1995; 1997a; Kochanska et al, 2007). Given that this effect emerged for the clean-up task, this finding may reflect the benefits of reducing high levels of distress or anxiety that inhibited children may experience when caregiver regulatory demands are salient (Kochanska, 1993), which, in turn, may have consequences for inhibited children's performance in the tasks used to measure conscience. For example, in the puzzle game, a child's anxiety about not completing the difficult task requested by the experimenter could potentially overwhelm the competing expectation to avoid cheating. By creating a perception of other people (including parents and authority figures) as responsive and understanding rather than punishing, positivity and reciprocity in parent-child interactions surrounding regulatory tasks may help inhibited children to avoid anxious responses and adhere to moral rules despite other demands (see Dunn, 2014).

With regard to the average-approach and exuberant groups, it is possible the conscience tasks did not elicit other challenges to regulatory functioning, particularly approach to reward, at a sufficient level. Although cheating paradigms are commonly used in research on conscience development and internalization of rules in children of this age (e.g., Kochanska et al, 1996; 2007), most children in this sample avoided cheating in the memory game, thus leaving most variability to be attributed to the puzzle task. Future research examining similar patterns may find stronger effects by using outcome measures of conscience development that involve greater behavioral demands or more potent reward stimuli. Greater variability may also be achieved with measures of conscience development that specifically pull for other-oriented concerns, such as opportunities for prosocial behavior or games in which cheating behavior clearly disadvantages another person. Since it has been argued that mutual positivity and responsiveness aid in conscience development by promoting a sense of caring and reciprocity for others (e.g., Dunn, 2014; Kochanska, 1997b, Thompson et al, 2006), stronger effects of this parenting quality may emerge with outcome measures that more clearly involve a concern for others' needs.

To conclude, the current study examined temperament- and context-based associations between parenting behavior and child behavioral self-regulation and conscience development. Our findings emerged from a wide range of observational data on child temperament, parent-child interactions across two different contexts, and two forms of regulatory functioning assessed by multiple tasks. The longitudinal design also allowed us to examine differences in children's regulatory outcomes at preschool age based on temperament and parent-child interactions observed earlier in development. The study design remained correlational in nature, however, so causal conclusions may not be drawn from the data. This study also utilized observations from a community sample of mothers and children without any over-sampling based on early temperament criteria. The temperament groups thus represent children who were relatively more or less extreme on

approach-withdrawal and affective responses to novelty in this sample of children. Though this caveat exists in other studies examining relative differences in temperament traits or dimensions in moderately-sized samples (e.g., 100–200 participants), it is unclear if children classified to the exuberant or inhibited groups represent children who would be considered extreme on temperamental exuberance or inhibition within the larger population. Distinct temperament profiles emerged from the temperament assessment and in a manner similar to the few other studies yielding inhibited, exuberant, and average-approach or low-reactive groups (Dollar et al, 2017; Putnam & Stiller, 2005), suggesting emerging reliability of these groupings. However, studies utilizing larger samples may be able to provide greater confirmation of these profiles in reference to population-level distributions of data. Alternatively, larger samples may allow for the identification of temperament profiles that are relatively less common in the population and thus were not identified in existing studies.

There are other potential methodological considerations that were not explored in the current study. We treated the present parenting quality variables as distinct predictors given previous support for their differential effects based on temperament (e.g., Kochanska, 1997a, Kochanska et al, 2007). However, we note the interrelations between these measures, and that mother gentle control may have depended somewhat on child responses, particularly during the clean-up. Our analyses attempted to account for this issue, as we found that individual responses were typically not strongly correlated, responses in each task largely did not differ by temperament group, and our primary models tested the unique effect of each predictor in light of the others. However, more complex patterns of moderation or mediation, for example, testing whether effects of mother control behavior depend on the level of mutual positivity and responsiveness, are also conceptually plausible (Darling & Steinberg, 1983; Grusec & Goodnow, 1994) and worthy of further study. Additionally, although we focused on a measure of mutual positivity and responsiveness tied to both mother and child responses, we acknowledge that effects may emerge differently if the responses of each partner were considered individually.

In terms of future directions, researchers could continue to unpack the influence of different parenting qualities based on temperament and contextual variation. For example, the current study examined frequency of behaviors displayed reflecting these qualities, but results should be confirmed with scale ratings or more global assessments. Conversely, studies could examine whether specific forms of gentle control or responsive behavior explain relatively more or less variation in regulation and conscience outcomes based on temperament type (see Augustine & Stifter, 2015; Cipriano & Stiller, 2010). Additionally, a wider range of parent-child interaction contexts may be examined such as a competing demands task (Cipriano & Stiller, 2010), or awaiting task (Dennis, 2006). These patterns could also be examined in applied settings, to see if parents' intentional attempts to manifest gentle control or MPR is associated with change in child regulatory behaviors, particularly in children with inhibited or exuberant traits. Lastly, given that the current study focused only on behavioral indicators (rule-compliant behavior), the consistency of these results should be examined with additional and different measures of child functioning at the emotional, cognitive, and/or physiological level.

Nonetheless, this study provides additional evidence of temperament-specific effects of parenting qualities like maternal gentle control and mutually positive and responsive mother-child interactions in predicting child self-regulatory outcomes. Further, this study contributes to the growing body of research suggesting that observation context is an important factor to consider when predicting the outcomes of temperament and/or parenting. In this case, the apparent relevance of different parenting qualities to children's self-regulatory development varied not only by child temperament, but by the context in which parenting was observed. These results are relevant to the development of temperament-based parenting interventions that seek to increase goodness of fit between child temperament and parenting (McClowry, Rodriguez, & Kozlowitz, 2008). As stated above, the present findings may inform experimental work examining how parent-led changes in different parent-child interaction qualities in specific contexts relate to changes in behavioral patterns for children of different temperament types. Based on the resulting body of evidence, intervention programs may be designed to first assess children's temperamental characteristics and then encourage parents to focus on enacting particular strategies in contexts in which they appear to enact the most positive behavioral change. A focus on targeted, temperament-specific change processes may also reduce burden on parents who might otherwise struggle to monitor their behavior across all situations. Taken together, continued investigation of differential outcomes of specific parenting behaviors in specific contexts appears to be a constructive means through which to understand how developmental experiences support or undermine positive self-regulatory and conscience development in children of differing temperament types.

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Highlights:

- Examines parenting influences on behavioral self-regulation and conscience.
- Two forms of parenting quality were observed in two interaction contexts.
- Effects were tested based on child temperament type.
- Parenting effects in each context differed by child temperament group.

Figure 1. Mother gentle control in free play and clean-up predicting behavioral self-regulation based on child temperament group.

Figure 2.
Mutual positivity and responsiveness in clean-up predicting conscience based on child temperament group.

Table 1

Means and Standard Deviations for Primary Study Variables

18 Month Predictors	Free Play			Clean-up			Difference <i>t</i> , <i>p</i> -value
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	
Mother responsive behavior ¹	.44	.14	.13-.82	.41	.20	.05-.94	-.14, .15
Child responsive behavior ¹	.85	.10	.50-1.00	.39	.28	0-1.00	19.78, <.001
Mother affect ¹	1.16	.13	1.00-1.78	1.12	.13	.79-1.67	9.59, <.001
Child affect ¹	.16	.19	-.65-.83	-.01	.16	-.82-.45	9.53, <.001
MPR composite ¹	.007	.60	-1.59-2.60	-.002	.67	-1.70-2.52	.14, .89
Mother gentle control	.81	.12	.39-1.00	.90	.13	.20-1.00	-6.66, <.001
4.5 Year Outcomes	<i>M</i>	<i>SD</i>	Range				
Tongue task time ²	.76	.29	.03-1.00				
Clean-up cleaning time ²	.72	.34	0-1.00				
CPT score (set 2) ²	10.28	1.97	6-12				
Behavioral self-regulation composite	.004	.66	-1.94-.84				
Memory game peeked (no/yes) ^{3,4}							
Memory game peeking duration ³	.02	.05	0-.39				
Memory game number of peeks ³	.94	2.78	0-22				
Puzzle task latency to peek ³	.49	.40	0-1.00				
Puzzle task peeking duration ³	.23	.26	0-.98				
Puzzle task number of peeks ³	3.24	4.81	0-38				
Puzzle task persistence duration ³	.52	.33	0-1.00				
Conscience composite	.01	.67	-1.85-.80				

*Note.*¹These behaviors were used to create the mutual positivity and responsiveness (MPR) composite.²These behaviors were used to create the behavioral self-regulation composite.³These behaviors were used to create the conscience composite.⁴Binary variable; 75% did not peek.

Table 2

Correlations Among Primary Study Variables

Variable	1	2	3	4	5	6
1. MPR ^I , Free Play	---	.35**	-.11	-.13	.02	.11
2. MPR, Clean-up		---	-.09	-.34**	.13	.22*
3. Mother gentle control, Free Play			---	.32**	-.09	-.13
4. Mother gentle control, Clean-up				---	.07	-.18 ⁺
5. Behavioral self-regulation composite					---	.26**
6. Conscience composite						---

Note.

⁺
 $p < .10$,

^{*}
 $p < .05$,

^{**}
 $p < .01$.

^I
MPR = Mutual positivity and responsiveness.

Table 3

Multiple Regression Models Predicting Child Behavioral Self-Regulation Composite by Temperament Group Based on 18M Free Play and Clean-up Variables

Variables	<i>B</i>	<i>SE(B)</i>	β	<i>F</i>	<i>R</i> ²
I. Exuberant Group				9.03**	.33
Mother Education	.24	.20	.20		
Child Sex	.16	.21	.14		
Child Receptive Vocabulary	.01	.01	.17		
Free Play Mother Gentle Control	.13	.10	.25		
Clean-up Mother Gentle Control	.23	.10	.42 ^{*2}		
Free Play MPR ¹	-.12	.15	-.13		
Clean-up MPR	.40	.18	.48*		
II. Inhibited Group				4.06**	.18
Mother Education	.36	.24	.24		
Child Sex	.34	.20	.26 ⁺		
Child Receptive Vocabulary	-.01	.01	-.12		
Free Play Mother Gentle Control	-.20	.13	-.29		
Clean-up Mother Gentle Control	.09	.09	.16		
Free Play Mutual MPR	.03	.19	.03		
Clean-up Mutual MPR	.21	.18	.20		
III. Average Group				12.56**	.41
Mother Education	.18	.20	.12		
Child Sex	.48	.19	.33*		
Child Receptive Vocabulary	.02	.01	.50**		
Free Play Mother Gentle Control	-.24	.11	-.29 ^{*2}		
Clean-up Mother Gentle Control	-.18	.18	-.17		
Free Play MPR	-.23	.16	-.19		
Clean-up MPR	.03	.15	.03		

Note.

⁺ $p < .10$;

* $p < .05$;

** $p < .01$.

¹ MPR= Mutual positivity and responsiveness.

² Significant simple slope for given variable is different from that for at least one other temperament group

Table 4

Multiple Regression Models Predicting Child Behavioral Component of Conscience Composite by Temperament Group Based on 18M Free Play and Clean-up Variables

Variables	<i>B</i>	<i>SE(B)</i>	β	<i>F</i>	<i>R</i> ²
I. Exuberant Group				7.46**	.29
Mother Education	-.38	.25	-.27		
Child Sex	.40	.24	.29		
Child Receptive Vocabulary	.01	.01	.20		
Free Play Mother Gentle Control	-.11	.12	-.18		
Clean-up Mother Gentle Control	-.09	.12	-.15		
Free Play MPR ¹	-.07	.18	-.06		
Clean-up MPR	.04	.21	.04		
II. Inhibited Group				9.07**	.34
Mother Education	-.13	.23	-.09		
Child Sex	-.02	.19	-.01		
Child Receptive Vocabulary	.02	.01	.28		
Free Play Mother Gentle Control	-.12	.13	-.16		
Clean-up Mother Gentle Control	-.04	.09	-.06		
Free Play MPR	.18	.19	.15		
Clean-up MPR	.36	.18	.32* ²		
III. Average Group				4.50**	.20
Mother Education	.11	.20	.08		
Child Sex	.19	.19	.15		
Child Receptive Vocabulary	.01	.01	.32 ⁺		
Free Play Mother Gentle Control	.06	.11	.08		
Clean-up Mother Gentle Control	-.22	.18	-.24		
Free Play MPR	-.09	.16	-.09		
Clean-up MPR	.01	.15	.01		

Note.

⁺ $p < .10$;

* $p < .05$;

** $p < .01$.

¹ MPR = Mutual positivity and responsiveness.

² Significant simple slope for given variable is different from that for at least one other temperament group