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Infant Characteristics and Parental Engagement at the Transition to Parenthood

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Abstract

Positive engagement activities support children's adaptive development and new parents are encouraged to be highly engaged with infants. Yet, fathers' engagement is widely understudied and maternal engagement quantity is frequently overlooked. Our study contributes to growing knowledge on associations between infant temperament and parental engagement by testing transactional and moderation models in a recent sample of first-time parents when infants were 3, 6, and 9 months old. Stringent longitudinal, reciprocal structural equation models partially confirmed an engagement "benefit". Mothers' engagement marginally contributed to their children's gains in effortful control from 3 to 6 months regardless of child gender. Further, mothers' engagement reduced infant negative affect from 6 to 9 months regardless of child gender. Mothers' ratings of infant negative affect were gendered; mothers' ratings of infant negative affect increases more from 3 to 6 months for boys. Fathers' engagement was contextually sensitive; child gender moderated the link between negative affect and engagement from 6 to 9 months, such that fathers became more engaged with boys whom they rated higher on negative affect; there was no effect for daughters. Finally, we found that effortful control moderated associations between negative affect and maternal engagement; mothers' engagement increases from 3 to 6 months were greater for children initially rated lower in effortful control. Implications for future research and parenting education and support services are discussed.

Keywords

temperament; negative affect; effortful control; engagement; transactional

1. Introduction

Frequent engagement in developmentally appropriate parenting activities is central to facilitating children's early socioemotional development (e.g., Pleck, 2010). For instance, mothers' and fathers' engagement with infants promotes mastery motivation and attention during toddlerhood (Lang et al., 2014), key skills that facilitate children's later social and educational success (Carter & Briggs-Gowan, 2006). Similarly, child temperamental characteristics like negative affect (i.e., irregularity of mood, frequent crying, low enjoyment) and effortful control (i.e., inhibitory control, soothability, low intensity pleasure) are foundational to children's socioemotional development. Infants displaying high levels of

negative affect are often irritable and respond poorly to parental structuring (Rothbart, Ahadi, & Evans, 2000), behaviors that may later be met with rejection from teachers and peers (Scaramella & Leve, 2004). In contrast, children with greater effortful control are better regulated and tend to have greater academic competence (Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008) and fewer problem behaviors (Murray & Kochanska, 2002) than peers with lower effortful control.

Child characteristics are integral determinants of parental engagement (Belsky, 1984), yet few studies have explored links between parental engagement and infant temperament beyond a focus on mothers and the implications of difficult temperament (e.g., Bridgett et al., 2009). This gap in knowledge is surprising given the importance of fathers (e.g., Pleck, 2010) and early effortful control (Murray & Kochanska, 2002; Valiente et al., 2008) in supporting children's positive development. Moreover, we know of no study that has explored reciprocal associations between infant temperament and parental engagement. Infant negative affect may function as a risk factor that may reduce parental engagement. Reduced parental engagement represents a significant risk for children early in life, as parental engagement may benefit infants by promoting regulatory capacities, thereby reducing displays of negative affect and increasing effortful control (see Crockenberg & Leerkes, 2003).

Even fewer studies have explored important interactions among temperament traits (Crockenberg & Leerkes, 2003) and between temperament and child gender (Buss, 1981). Frequent displays of negative affect may place infants at risk for lower parental engagement, but evidence suggests that effortful control may protect children with high negative affect from losing the important benefits of parental engagement (Belsky, Friedman, & Hsieh, 2001; Gartstein, Putnam, & Rothbart, 2012; Stifter, Spinrad, & Braungart-Reiker, 1999). Further, parents may respond differently to temperamental displays based on child gender; girls with higher effortful control elicit greater engagement from mothers (Schoppe-Sullivan, Kotila, Jia, Lang, & Bower, 2012), whereas boys' negative affect lowers maternal engagement (Maccoby, Snow, & Jacklin, 1984). We do not know how these important interactions shape fathers' engagement, which is troubling given that contemporary dual-earner fathers are highly engaged with infants (e.g., Kotila, Schoppe-Sullivan, & Kamp Dush, 2013).

Our study contributes to existing knowledge in at least four ways. First, we examined links between infant temperament and mothers' and fathers' frequency of direct engagement with infants in developmentally appropriate activities in a recent sample of new parents experiencing first-time parenthood, a critical period of development in the life course. The developing infant requires high levels of parental engagement (Bornstein, Lamb, & Teti, 1992), and the developing family negotiates and establishes new relationships and routines that set the stage for future parental engagement. Second, father engagement is often measured as the quantity of time spent with children, whereas research on mother engagement is typically focused on qualitative aspects of her parenting (Pleck, 2010); thus, few studies have explored associations between temperament and engagement frequency in mothers (for exceptions see McBride, Schoppe, & Rane, 2002; Mehall, Spinrad, Eisenberg, & Gaertner, 2009; Schoppe-Sullivan et al., 2012). Our third contribution is through the use

of both mother and father reports of infant temperament; we know of no other studies that have investigated associations between infant temperament and father engagement using father reports. Finally, we used a transactional framework (Sameroff, 1975), exploring longitudinal, reciprocal associations between infant temperament and parental engagement.

1.1 Parental engagement

Positive engagement encompasses a wide range of interactions that facilitate children's adaptive development and has been highlighted as the most important aspect of a father's involvement with his child (Pleck, 2010). During infancy, these activities may range from meeting basic childcare needs to playing and reading with children. Though mothers spend more time with infants overall, fathers as well as mothers devote large proportions of their child-related time to positive engagement with infants (Kotila et al., 2013).

A social context of intensive parenting encourages parents to be highly engaged with their children (Quirke, 2006), a standard that is especially salient for dual-earner mothers who must "compensate" for their time spent working by maximizing their engagement time. Yet, some studies indicate child gender differences in engagement, such that fathers are more engaged with sons than daughters (e.g., Raley & Bianchi, 2006) and some scholars argue that father engagement is particularly sensitive to contextual influences, such as child temperament and gender (Belsky, 1984). Developmentally appropriate, stimulating parental engagement fosters positive child outcomes (Lang et al., 2014), therefore identifying characteristics that may place infants at risk for decreased engagement by either parent may create opportunities for early parenting intervention.

1.2 Infant temperament

Temperament describes several aspects of early behavior that appear early in infancy, are relatively stable over time, and are precursors of later personality development (Else-Quest et al., 2006). Individual differences in temperament are constitutionally and environmentally influenced, and are contextually-driven expressions of reactivity and self-regulation (Rothbart & Derryberry, 1981). Conceptualizations of temperament indicate the presence of three defining factors: effortful control, negative affect, and surgency (Rothbart et al., 2000). We focused our analysis on negative affect and effortful control because of the large literatures linking negative affect and effortful control to child outcomes.

Negative affect is one of the first temperamental characteristics displayed early in infancy (e.g., Rothbart, 1989). Infants exhibiting negative affect may become distressed when presented with novel stimuli that elicit fear or when responding to structure and limits (Rothbart & Derryberry, 1981). Biological underpinnings warrant the study of negative affect in infancy, as the physiological basis necessary for displays of negative affect, the frontal cortex, is active pre-birth, whereas the control (i.e. discriminatory/regulatory) mechanism, the neocortex, becomes active later on through the infant's experience (Dawson, 1994). Frequent parental engagement that is developmentally appropriate may provide the diverse experiences necessary for infants to adjust to and distinguish between stimuli that should or should not elicit a negative response.

Effortful control refers to the ability to self-regulate, or to suppress a dominant response in favor of a subdominant response (Rothbart & Bates, 2006), and has developmental origins during infancy (Rothbart, Ellis, Rosario, & Posner, 2003). During this critical time the capacity for self-regulation in infants significantly increases (Eisenberg & Spinrad, 2004), and its growth is shaped through socialization processes such as parenting (Eisenberg et al., 2005). Infants exhibit early effortful control primarily via orienting, or selecting information from available stimuli, whereas “true” effortful control manifests during toddlerhood following a period of rapid brain development (Rothbart, Sheese, Rueda, & Posner, 2011). Compared to the limited capacity of the orienting network, “true” effortful control is manifested through executive functioning and involves more complicated goal-oriented and purposeful behaviors (see Mezzacappa, 2004).

Parents are particularly important in shaping infants' capacity for self-regulation via orienting behaviors that shift infants' attentional focus and help control the expression of emotions (e.g., Posner, Rothbart, Sheese, & Voelker, 2012). For instance, parents frequently use orienting to soothe infants during emotional outbursts beginning around three months of age (Harman, Rothbart, & Posner, 1997). Rothbart et al. (2011) posit that parents' engagement with infants via activities that include novel stimuli, such as toys, books, or songs, may be a primary mechanism responsible for strengthening brain connections between the orienting and higher-order executive functioning networks. Further, this focused engagement may have the added “benefit” of reducing infants' negative affect; orienting suppresses displays of negative emotions in infants (Harman et al., 1997).

1.3 A transactional approach

Scholars have speculated that a variety of infant characteristics are likely to predict early parenting behaviors (Crockenberg & Leerkes, 2003), and the importance of child characteristics for mothers' parenting, and of mothers' parenting for children's development, has been widely studied. However, the body of literature exploring the dynamic relationships between parents and children, and particularly fathers, is by comparison small.

We used a transactional framework to examine bidirectional exchanges between parent and infant over time. Transactional models describe how certain child behaviors evoke parental responses that, in turn, escalate the child's behavior (Crockenberg & Leerkes, 2003; Sameroff, 1975). Following Crockenberg and Leerkes' (2003) conceptual guide to transactional models of infant temperament and family relationships, we see children as born into parenting contexts with specific constitutional temperament (Rothbart & Derryberry, 1981) and gender-related characteristics. These characteristics evoke responses from parents that either encourage or discourage parental engagement, a critical facilitator of healthy socioemotional regulation in early infancy (Rothbart & Bates, 2006). In turn, the child's responses to parental engagement function as feedback mechanisms that establish transactional associations between temperament and parental engagement.

1.4 Temperament and parental engagement

Most research considering associations between child characteristics and parenting has focused on difficult temperament (Clark, Kochanska, & Ready, 2000). On the whole,

findings have focused on mothers and indicate the importance of risk in shaping associations. Under conditions of high risk, such as low socioeconomic status, mothers respond to negative affect with lower quality parenting behaviors. However, under conditions of low risk, mothers' responses to negative affect are less consistent; some studies have indicated no links (Leerkes & Crockenberg, 2002), whereas others indicated positive (Washington, Minde, & Goldberg, 1986) or negative (e.g., Clarke, Hyde, Essex, & Klein, 1997) associations. First-time, dual-earner parents' engagement time may be especially susceptible to declines in response to a highly negative infant during first few months of life due to considerable time pressures involved in reorganizing relationships and learning to balance work, home, and family.

Of the few studies that have included fathers, some have found that first-time fathers are less affectionate and responsive with difficult children (Woodworth, Belsky, & Crnic, 1996), whereas others have found few links between father engagement and difficult temperament (Mehall et al., 2009). The weak and inconsistent links for low-risk fathers may indicate that these fathers respond to negative affect in ways similar to low-risk mothers. Or, the lack of associations may result from a reliance on maternal reports of temperament; a father's own perception of his child's temperament, which we have obtained in the current study, may be critical to establishing links with paternal engagement. Given that difficult temperament may discourage positive father engagement, and father engagement may serve as a buffer against the development of children's behavior problems (Jia, Kotila, & Schoppe-Sullivan, 2012), the lack of research exploring these links is surprising.

Even more rare are studies exploring associations between "easy" temperament and parental engagement. Of the few studies that have investigated these links, findings are inconsistent. Schoppe-Sullivan et al. (2012) found that mothers were more engaged when preschoolers demonstrated greater effortful control, and these links were stronger for girls. However, in a longitudinal study of adolescents, Eisenberg et al. (2005) found no direct associations between children's positive self-regulation and parental warmth and responsiveness during parent-child interactions. Parents may spend more time engaging with infants with a high capacity for self-regulation, as these interactions are likely enjoyable. To our knowledge, no studies have investigated these links during infancy among contemporary, first-time parents.

1.5 Parental engagement and temperament

Parents may respond to their child's temperamental traits by increasing or decreasing their engagement, but considerable evidence also documents the importance of parental engagement to the development of temperament during the formative years (e.g., Rothbart & Bates, 2006). Yet, these links have most often been explored for mothers and have primarily focused on the contributions of parenting quality to temperament development, rather than parenting quantity. Frequent parental engagement in infancy provides the scaffolding necessary for children to focus attention and guide behavior. Today's new mothers and fathers devote the majority of their child-related time to engagement (Kotila et al., 2013), and despite some research that suggests mothers and fathers may engage children in different ways (e.g., Power & Parke, 1983), little support for differences exist (see Lamb & Lewis, 2004). Parents' engagement via developmentally appropriate orienting behaviors

such as reading books, playing with novel toys, and invitations to explore environmental surroundings likely fosters the growth of effortful control and reduces displays of negative affect (see Crockenberg & Leerkes, 2003), an engagement "benefit".

1.6 Effortful control as a moderator of negative affect

Few scholars have investigated interactions between temperamental traits (Crockenberg & Leerkes, 2003), yet among the limited studies evidence indicates that effortful control and negative affect interact. Gartstein et al. (2012) found that infant negative affect was more closely associated with externalizing problems in early childhood when infants also displayed poorer orienting, or an inability to shift attention away from an aversive stimulus, a precursor to effortful control. Similarly, Stifter et al. (1999) found that 5-month-old infants who were highly reactive and low on effortful control were the most defiant when responding to structure and limits two years later. In a study of toddlers, Belsky et al. (2001) found that negative affect was only linked to poorer social competence when effortful control was low, whereas higher negative affect was linked with greater school readiness when effortful control was high. Thus, effortful control may also serve as a protective factor for children who may be at risk for engagement declines due to high levels of negative affect.

1.7 The moderating effect of child gender

Child characteristics are a primary determinant of parental engagement (Belsky, 1984), yet few researchers have considered the potential for child characteristics, like gender, to influence parental engagement in combination with other child characteristics, like temperament (Buss, 1981). Schoppe-Sullivan et al. (2012) found that mothers were more engaged with preschool girls who were higher on effortful control, a finding that parallels previous results indicating fathers were more engaged with "easy" daughters (e.g., McBride et al., 2002). Some scholars have suggested that fathers' engagement may be particularly susceptible to child characteristics when the child is a girl because fathers may feel they have greater flexibility in the extent to which they become involved with girls (McBride et al., 2002). As a result, new fathers may be less engaged with female infants who exhibit lower effortful control, or girls who have poorer orienting and are more difficult to soothe.

Socialization practices may influence the extent to which parents are engaged with sons and daughters, and this difference may be particularly pronounced for displays of negative affect. Maccoby et al. (1984) found that mothers reduced teaching behaviors in response to greater negative affect, and that greater teaching behaviors lowered negative affect, but only for boys. Cultural prescriptions allow girls to express greater emotion, whereas boys must appear self-controlled (Crockenberg & Langrock, 2001); thus, negative affect functions as a risk via lower maternal engagement for boys. However, associations for fathers remain unclear.

Contemporary fathers' increased involvement in family life (Pleck, 2010) may encourage fathers to take on more primary roles in the gender socialization of boys, responding with greater engagement when boys are emotionally difficult.

1.8 The present study

We used a longitudinal, cross-lagged design to explore reciprocal associations of negative affect and effortful control and positive parental engagement when infants were 3, 6, and 9 months of age. We expected parental engagement to "benefit" children by reducing negative affect and enhancing effortful control over time. Because our sample of first-time, dual-earner parents experienced considerable time pressures when adjusting to new work and family demands, we expected infant negative affect to function as a risk, with parental engagement decreasing in response to negative affect. Conversely, children who are more regulated may be more enjoyable for parents to interact with; thus, we expected parents to increase their engagement time when children were higher in effortful control.

We also expected two moderating effects, the first concerning the role of child gender in moderating associations between each temperament construct and parental engagement, and the second the moderating effect of effortful control on associations between negative affect and parental engagement. New fathers may be particularly invested in boys and view engagement with girls as more flexible, particularly in the challenging context of low infant effortful control. Thus, we expected fathers to be less involved with girls whom they perceived as lower in effortful control. Cultural gender norms discourage displays of intense negative emotion from boys, and today's involved fathers may be primarily responsible for enforcing these roles. Thus, we expected negative affect to elicit greater father and lower mother engagement when infants were boys. Negative affect is a risk factor for reduced parental engagement, but effortful control may buffer engagement declines associated with high negative affect. Therefore, we expected children with high levels of negative affect and high levels of effortful control to be protected from declines in parental engagement.

2. Materials and methods

2.1 Participants

Our sample of new parents was drawn from the New Parents Project, a longitudinal study designed to measure early parenting experiences in dual-earner families. Expectant parents were recruited through a variety of means, including local newspaper advertisements, flyers in OBGYN offices, childbirth education classes, pregnancy and health centers, community colleges, and stores located in diverse areas around a large Midwestern city. Participants met all following enrollment requirements: 1) either married or cohabiting, 2) at least 18 years of age, 3) expecting their first child, 4) the biological parents of the child, 5) able to read and speak English, and 7) employed prior to their child's birth and planning to return to paid employment shortly after the birth of the child. Parents received modest incentives for participation at each assessment. Mothers and fathers separately completed a series of questionnaires regarding their early experiences in parenting during the third trimester of pregnancy and again at 3, 6, and 9 months post-partum. We used data from all time points.

The full sample included 182 families. At the 3 month assessment, 4 mothers and 6 fathers were not interviewed. At the 6 month assessment, 54 (30% of sample) mothers and 58 (32% of sample) fathers were not interviewed. This significant decrease was due in part to a change in the interview protocol, and by 9 months most of these parents returned; only 27

mothers (14.8% of sample) and 31 fathers (17% of sample) from the original sample were lost at 9 months. Logistic regression analyses indicated that married mothers were significantly less likely to attrit at the 6 month interview ($OR = 0.32$, $se = 0.17$); no additional significant differences were found for mothers. Less educated fathers were more likely to attrit at the 6 month assessment ($OR = 2.20$, $se = 0.83$), and married fathers were less likely to attrit at 9 months ($OR = 0.26$, $se = 0.16$).

Sample characteristics were measured during the third trimester of pregnancy. On average, mothers were 28.80 years old ($sd\ 3.96$), predominately White (82.9%), and the majority (75%) held a bachelor's degree or higher. In comparison, fathers were about 30.70 ($sd\ 4.80$) years old, predominately White (85.9%), and more than half held a bachelor's degree or higher (65%). Approximately 85% of the final sample was married.

2.2 Measures

2.2.1 Engagement—Parents' engagement was assessed using a 6-item scale corresponding to the number of days per week (0 to 7) parents participated in the following activities with their infant: 1) play games like peek-a-boo, 2) sing songs or nursery rhymes, 3) read or tell stories, 4) play inside with toys, 5) hug or show physical affection, and 6) put baby to bed. Items from this scale were modified from the Child Development Supplement to the Panel Study of Income Dynamics (Hofferth & Anderson, 2003). Scale items were averaged and scale reliability for mothers ranged from .52 to .69, and for fathers ranged from .60 to .71, at each assessment. Reliability was low at the 6 month assessment ($\alpha = .52$ for mothers and $\alpha = 0.60$ for fathers), thus we tested for problematic items by constructing a latent variable from each engagement item and found that items 5 and 6 did not significantly load onto the latent factor. Despite low reliability, we retained the full scale at each phase to ensure measurement consistency and that a broad range of positive engagement activities that may function as orienting stimuli during infancy were assessed. We used mothers' and fathers' individual reports of their own engagement in our models.

2.2.2 Negative affect—We measured infant negative affect using the 12-item negative affect sub-scale from the Revised Infant Behavior Questionnaire -Very Short Form (Gartstein & Rothbart, 2003). Parents were asked to indicate how often their child displayed the following behaviors: 1) showed distress, 2) clung to a parent, 3) whimpered or sobbed, 4) cried if someone didn't come within a few minutes, 5) seemed angry when left in the crib, 6) startled with sudden body positioning changes, 7) became tearful, 8) protested being placed in a confining place, 9) refused to go to an unfamiliar person, 10) cried when unable to get attention, 11) became upset when unable to get what he/she wanted, and 12) clung to a parent when in the presence of several unfamiliar adults. Response options were based on a Likert-type scale ranging from 1 *Never* to 7 *Always*, where higher values indicated greater negative affect. Scale reliabilities ranged from .66 to .99 for mothers, and .63 to .99 for fathers, at each time point. We used mothers' and fathers' individual ratings of negative affect in our models.

2.2.3 Effortful control—Infant effortful control was measured using the 12-item effortful control sub-scale from the Revised Infant Behavior Questionnaire -Very Short Form

(Gartstein & Rothbart, 2003). Parents responded to a Likert-type scale ranging from *I Never* to *7 Always*, indicating how often their infant displayed the following behaviors: 1) enjoyed being read to, 2) played with one toy or object for 5–10 minutes, 3) seemed eager to get away after being fed (reversed), 4) soothed immediately, 5) enjoyed hearing sounds of words, such as in nursery rhymes, 6) looked at pictures in books or magazines for 5 minutes or longer, 7) seemed to enjoy him/herself, 8) soothed him or herself with things such as a stuffed animal or blanket, 9) enjoyed gentle rhythmic activities, 10) stared at a mobile, crib bumper, or picture for 5 minutes or longer, 11) enjoyed being rocked or hugged, and 12) soothed immediately when patting or rubbing. Scale items were averaged separately for each parent, and higher values indicated greater effortful control. Alphas ranged between .67 and .75 for mothers and between .72 and .77 for fathers at each time point. We used parents' individual ratings of effortful control in our models.

Following Belsky et al. (2001), we created a dichotomous indicator of children's effortful control to use in moderation analyses. We constructed the indicator by dividing the sample at the median value of effortful control, separately by parent reporter. Values of 1 indicated that the parent perceived the child as at or above the sample average on effortful control, and values of 0 indicated that that parent perceived the child as below the sample average on effortful control.

2.3 Data analysis

We used a cross-lagged structural equation modeling design to test longitudinal, reciprocal associations between infant negative affect and effortful control and mother and father engagement, and to test child gender and effortful control as moderators. Specifically, these models tested longitudinal associations between temperament and parental engagement while simultaneously controlling for initial and concurrent temperament and parental engagement. Figure 1 outlines the conceptual model for associations between negative affect /effortful control and parental engagement and expected moderating effects of child gender and effortful control. Significant paths reflect independent contributions from variables at 3 months to 6 months, and 6 months to 9 months, controlling for all other variables. For example, a significant path from temperament at 3 months to mother engagement at 6 months reflects the independent contribution of temperament to the change in mother engagement from 3 months to 6 months, controlling for initial levels of mother engagement, and previous and concurrent infant temperament. Models were estimated separately by parent and temperament construct.

To test the moderating effects of child gender on associations between infant temperament and parental engagement (i.e., to test whether associations were different for boys or girls) and the moderating effects of effortful control on associations between negative affect and parental engagement (i.e. to test whether associations were different for children with higher or lower effortful control), we conducted between group analyses. The dashed lines in Figure 1 represent the conceptual model of the moderating effect of child gender/effortful control on associations between infant temperament and parental engagement. First, we obtained model fit estimates for each group (boy and girl /high and low effortful control) separately to ensure adequate fit for each group. Next, we constrained the regression weights

for the cross-lagged paths between infant temperament and parental engagement to be equal across groups. Finally, we conducted a Chi-square difference test to determine if significant changes in model fit occurred when equality constraints were applied. A significant loss in model fit following an applied constraint confirms child gender /effortful control as a moderator.

All models were estimated using Stata12 and missing data were estimated using Full Information Maximum Likelihood (FIML), which estimates missing data for item nonresponse or attrition. This method has considerable advantages over listwise deletion and is a best practice for handling missing data (Johnson & Young, 2011). The final estimated sample size for mothers and fathers was 180 and 177, respectively. Model fit was evaluated using the χ^2 fit statistic, the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). For acceptable model fit, the χ^2 fit statistic should be nonsignificant, CFI values should be above .93 (Byrne, 1994), and RMSEA values should be below .08 (Browne & Cudeck, 1993). Stata cannot compute CFI and RMSEA values for between group analyses conducted to explore moderation effects; thus only χ^2 statistics are reported for the moderation model fits.

3. Results

3.1 Parent and infant characteristics

We report descriptive statistics and means and standard deviations for each of the variables used in our model in Table 1. Overall, both parents were highly engaged with their infants, with mothers reporting significantly greater engagement than fathers. Mothers rated infants significantly higher on effortful control than fathers at both time points, whereas parents' perceptions of infant negative affect at each time point were similar. On average, infants were rated above the midpoint of the scale on effortful control, and below the midpoint of the scale on negative affect. *T*-tests were used to compare sample means across boys and girls for each temperament and engagement measure. No significant gender differences were found for infant temperament or engagement regardless of the reporting parent, indicating that average levels of parental engagement and parent-reported temperament were similar for boys and girls.

3.2 Negative affect and parental engagement

3.2.1 Mother engagement—We first tested reciprocal associations between infant negative affect and parental engagement. We present unstandardized path coefficients for ease of interpretation, as these values reflect increases in the original scale value of the variable. Results for mothers appear in the first column of Table 2. This model fit the data well; $\chi^2(4) = 3.74, p = 0.44$; RMSEA 0.00; CFI 1.00. One significant cross-lagged association was found between mothers' engagement and her perceptions of infant negative affect; a one day increase in mothers' engagement at 6 months was associated with a 0.19 point decrease in mothers' perceptions of infant negative affect at 9 months. Early engagement was positively associated with later engagement, as was the same for perceptions of negative affect.

3.2.2 Father engagement—Unstandardized path coefficients for fathers are located in the second column of Table 2. The initial model provided poor fit $\chi^2(4) = 20.47, p = 0.00$; RMSEA 0.15; CFI = 0.94, and modifications were suggested. Error covariances between father engagement at 6 months and 9 months were correlated to account for repeated measures. The final model fit the data well; $\chi^2(3) = 6.19, p = 0.10$; RMSEA 0.08; CFI = 0.99. There were no significant cross-lagged associations between father engagement and infant negative affect. Early father engagement was positively associated with later engagement, as was also the case for fathers' perceptions of infant negative affect.

3.2.2 Moderation by child gender—We next tested whether associations between parental engagement and negative affect were moderated by child gender. Findings for mothers are presented in the third column of Table 2. The initial model fit the data well for both groups; $\chi^2(4) = 4.54, p = 0.34$ for boys, $\chi^2(4) = 2.88, p = 0.58$ for girls. Individual path coefficients were constrained to be equal across groups and χ^2 differences were computed. A significant loss in model fit for main associations between perceptions of negative affect from 3 to 6 months suggested that mothers perceived less stability in negative affect for girls than for boys. Final model fit was acceptable; $\chi^2(15) = 16.94, p = 0.29$; RMSEA 0.04; CFI 0.99. Specifically, a one point increase in mothers' perceptions of negative affect at 3 months was associated with a 0.73 point and 0.40 point increase in subsequent negative affect ratings for boys and girls, respectively, at 6 months. Mother engagement at 6 months continued to reduce negative affect at 9 months ($b = -0.20$) regardless of child gender.

Moderation results for fathers are located in the final column of Table 2. The initial model fit adequately for boys and girls; $\chi^2(3) = 11.37, p = 0.01$ for boys, $\chi^2(3) = 1.58, p = 0.66$ for girls. Constraints were independently applied for each path and χ^2 differences were computed. A significant loss in model fit confirmed child gender as a moderator of associations between infant negative affect and father engagement from 6 to 9 months. The final model fit the data well; $\chi^2(12) = 7.48, p = 0.82$; RMSEA 0.00; CFI 1.00. A one point increase in fathers perceptions of negative affect increased subsequent engagement by 0.30 days, but only for boys.

3.3 Effortful control and parental engagement

3.3.1 Mother engagement—We next tested reciprocal associations between effortful control and parental engagement. The first column of Table 3 shows associations for mothers. This model fit the data well; $\chi^2(4) = 6.52, p = 0.16$; RMSEA 0.06; CFI 0.99. After controlling for initial and concurrent maternal engagement and effortful control, only one marginal cross-lagged (i.e., temperament to engagement) association appeared. Specifically, a one day increase in engagement at 3 months was marginally associated with a 0.07 day increase in her perceptions of effortful control at 9 months. Early mother engagement was significantly associated with later mother engagement, as was the same for her perceptions of infant effortful control.

3.3.2 Father engagement—Unstandardized estimates for associations between father engagement and infant effortful control are located in the second column of Table 3. The initial model fit the data poorly; $\chi^2(4) = 18.52, p = 0.001$; RMSEA 0.14; CFI 0.94, and

modification indices suggested correlating errors between the engagement measure from 6 to 9 months to account for the use of repeated measures. The final model fit the data well; $\chi^2(3) = 5.28, p = 0.152$; RMSEA 0.06; CFI 0.99. There were no significant cross-lagged associations between father engagement and effortful control over time; however, father engagement and his perceptions of infant effortful control were each positively associated over time.

3.3.3 Moderation by child gender—We next tested whether associations between mother engagement and effortful control were moderated by child gender; results are located in the third column of Table 3. Initial models fit the data well for boys and girls; $\chi^2(4) = 4.08, p = 0.40$ for boys, $\chi^2(4) = 5.16, p = 0.27$ for girls. Next, we applied equality constraints on the regression weights for main (e.g., temperament to temperament) and cross-lagged associations between mother engagement and effortful control. After applying all constraints the final model fit the data well; $\chi^2(16) = 18.564, p = 0.292$; RMSEA 0.04; CFI .99. Chi-square difference tests were used to test each individual constraint for loss in model fit. No significant loss in fit was found for any constraint, indicating that associations were not gender-specific. Further, the marginal association between engagement at 3 months and effortful control at 6 months was retained. Specifically, a one day increase in mother engagement at 3 months was marginally associated with a 0.08 point increase in effortful control at 6 months for boys and girls.

Next, we explored the moderating effect of child gender for fathers; findings are presented in the final column of Table 3. The initial moderation model fit the data well for boys and girls, $\chi^2(3) = 6.78, p = 0.08$ for boys, $\chi^2(3) = 1.08, p = 0.78$ for girls. Each path was independently constrained to be equal across groups, resulting in a final model fit of $\chi^2(14) = 13.875, p = 0.459$; RMSEA 0.00; CFI 1.00. Chi-square difference tests indicated no significant loss in model fit for any applied constraint, suggesting that associations for fathers were not gender-specific.

3.4 Moderation by effortful control

We next tested whether effortful control might protect infants from potential engagement declines associated with negative affect. Findings for mothers are presented in the first column of Table 4. Initial models were adequate for high and low effortful control infants; $\chi^2(4) = 6.20, p = 0.19$ for high, $\chi^2(4) = 10.83, p = 0.03$ for low. Next, we independently constrained each main and cross-lagged path and calculated χ^2 differences. The final model fit the data well; $\chi^2(15) = 21.52, p = 0.121$, CFI = .99, and RMSEA = 0.07; CFI 0.97. Constraining the path between mothers' engagement at 3 months to her engagement at 6 months resulted in a significant loss in model fit, indicating differences in the change in mother engagement when mothers rated infants higher in effortful control. Specifically, a one point increase in mother engagement at 3 months was associated with a 0.15 day increase in engagement for high effortful control infants and a 0.54 day increase in engagement for low effortful control infants. Mother engagement remained significantly associated with perceptions of negative affect from 6 to 9 months; a one day increase in mother engagement at 6 months was associated with a 0.22 point decrease in negative affect at 9 months for both high and low effortful control infants.

Finally, we tested the moderating effect of effortful control for fathers. Results are located in the final column of Table 4. The initial model fit the data well for high and low effortful control infants; $\chi^2(3) = 3.67, p = 0.30$ for high, $\chi^2(3) = 2.53, p = 0.47$ for low. Each path coefficient was independently constrained across groups and fit was evaluated using the chi-square difference test. The final constrained model fit the data well; $\chi^2(14) = 14.88, p = 0.39$, RMSEA = 0.03; CFI = 0.99, and indicated no moderation by effortful control.

4. Discussion

Our study contributes to growing knowledge on associations between infant temperament and parental engagement by testing transactional and moderation models in a recent sample of first-time parents across the first 9 months of life. Stringent longitudinal, reciprocal structural equation models partially confirmed an engagement "benefit". Mothers' engagement marginally contributed to their children's gains in effortful control from 3 to 6 months regardless of child gender, a finding that is in line with previous work (e.g., Rothbart & Bates, 2006). We also found that mothers' engagement reduced infant negative affect from 6 to 9 months, and this effect was not dependent upon child gender. In contrast, fathers' engagement was more sensitive to child characteristics; child gender moderated the link between negative affect and engagement from 6 to 9 months, such that fathers became more engaged with boys whom they rated higher on negative affect; there was no effect for daughters. We found gender differences in mothers' ratings of infant negative affect over time; mothers' ratings of greater infant negative affect at 3 months were associated with larger increases in ratings at 6 months for boys. Finally, we found that effortful control moderated associations between negative affect and maternal engagement; increases in mothers' engagement from 3 to 6 months were greater for infants with low effortful control.

Infancy is a period of rapid developmental maturation, including temperament development. Thus, frequent, stimulating engagement during this critical period may represent a pathway for mothers to encourage regulatory skills. Our sample of recent, first-time, dual-earner mothers represents a demographic that faces considerable social pressure to account for time spent away from children by providing frequent, intense cognitive stimulation (Quirke, 2006). As our findings suggest, this frequent stimulation "pays off" by stimulating the growth of effortful control and reducing negative affect. Orienting activities inherent in engagement, such as reading and playing peek-a-boo, assist infants in learning to shift attentional focus (Posner et al., 2012) and lay foundations for the growth of effortful control, and subsequently, the reduction of negative affect.

Unlike mothers, fathers' engagement did not appear to shape infant temperament. There are a few possible explanations for our lack of father findings. First, fathers may have been less engaged with infants than mothers, thus not reaching a level of input needed to influence infant temperament development. In additional analyses (not shown) we found that mothers were significantly more engaged than fathers at each time point, with differences exceeding one full day at 6 months (range 0.84 days - 1.01 days). This suggests that growth in regulatory capacity may require frequent engagement from the early months of life.

Second, fathers may have engaged with their infants in different capacities. Although by no means a universal finding, some scholars have observed differences in mothers' and fathers' engagement, noting that fathers were more physically engaged with infants than mothers (e.g., Power & Parke, 1983). Although we could not test this hypothesis directly, we found that at the item level, mothers spent more time reading, speaking, singing, playing inside, and putting their child to bed than fathers. Though broad, these common engagement activities may involve orienting behaviors; mothers may point to pictures while reading, play inside with objects rather than physically, and speak to children while directing their attention to the activity being performed. Over time, this frequent and focused engagement may stimulate the neocortex and bring about increases in effortful control and decreases in negative affect. Future studies should test for parental gender differences in orienting behaviors during parent-infant engagement.

As suggested by other scholars (Crockenberg & Leerkes, 2003; Raley & Bianchi, 2006), we found that child characteristics were important in shaping father engagement over time. Indeed, fathers' increased engagement with boys higher in negative affect may signal fathers' greater influence in the socialization of sons. Fathers with more challenging sons may have been less tolerant of negative affect due to cultural standards that require men to display emotional restraint (Crockenberg & Langrock, 2001). Dual-earner fathers' unique position as provider and caregiver may make these fathers especially attentive to attenuating displays of behavior that are outside socially acceptable norms. Yet, as our findings suggest, we do not know whether these fathers engaged enough, or in the most appropriate ways - via orienting behaviors - to reduce boys' negative affect. Thus, fathers' greater engagement with difficult sons may represent a vulnerability, as fathers may struggle to maintain high quality and frequent engagement with increasingly difficult sons over time.

We unexpectedly found that mothers' ratings of infant negative affect were sensitive to child gender; the increase in mothers' ratings of infant negative affect from 3 to 6 months was greater for mothers of boys. This finding is interesting given a relatively recent meta-analysis that found few gender-related differences in temperament from children ranging in age from 3 months to 13 years (Else-Quest et al., 2006). Our preliminary analysis indicated no significant gender differences in mothers' ratings of negative affect, thus we are inclined to interpret these findings as indicative of an earlier decline in negative affect among girls, as noted by early scholarship on temperament (Maccoby & Jacklin, 1974). As children's primary care providers (e.g., Kotila et al., 2013), mothers may have been more acutely aware of subtle changes in temperament than fathers, explaining our lack of similar findings for fathers.

Although we expected effortful control to buffer the risks of potential engagement declines associated with children's negative affect, this was not the case. Rather, we found that mothers of high effortful control infants showed much less of an increase in engagement over time. This finding is surprising given that the general pattern of mothers' engagement across infants' first 9 months of life is one of an increase in engagement time (Lang et al., 2014). There are a few possible explanations for this difference. First, mothers of high effortful control infants may have been initially more engaged with their infants than mothers of infants low in effortful control. We compared mothers' average engagement time

between the high and low effortful control groups and found that mothers were significantly more engaged with high effortful control infants at the 3 month assessment ($t(df=172) = 2.00, p = 0.04$). Second, our sample of dual-earner parents likely had limited time; new parents must incorporate work, household chores, child-related duties, leisure time, and more into a mere 24-hours/day. New mothers are compelled to meet intensive parenting standards and invest considerable amounts of time in developmentally stimulating engagement (Quirke, 2006). For mothers who do so early in life, there may be much less room to increase engagement time in the subsequent months. Rather, high effortful control children may receive more stable engagement frequency across the first 9 months from mothers than their low effortful control counterparts. We compared mothers' engagement at 3 and 6 months, and at 6 and 9 months, across the high and low effortful control groups and found that only mothers in the low effortful control group significantly increased engagement.

Taken together, these findings may suggest that (1) mothers in low risk families recognize infant temperamental risk and increase engagement to compensate, (2) orienting capacity, an early indicator of effortful control, may be acquired by some infants prior to 3 months of age, eliciting greater maternal engagement earlier, and/or (3) mothers with a propensity to engage earlier and more frequently promote the earlier development of effortful control. Our sample of primarily low-risk mothers may have been aware of the importance of frequent and stimulating engagement for infant development. As a result, mothers of low effortful control infants quickly adjusted their engagement to compensate for their child's temperamental risk (Crockenberg & Leerkes, 2003). The potential for earlier reciprocal relationships is important and points to a limited but identifiable time period in which infants can be screened for delays in orienting capacity, and mothers and fathers can be encouraged to engage from birth and in specific ways to promote greater effortful control. Future studies should stringently test these associations earlier in infant development using physiological markers to disentangle the directions of these associations.

Though our study used stringent, longitudinal reciprocal models, several limitations should be kept in mind when interpreting the results. First, our measures of temperament and engagement suffered from shared-method variance and may have inflated associations between temperament and parental engagement. In addition, self-report measures frequently overestimate general time use (Juster & Stafford, 1991) and suffer from social desirability bias (Press & Townsley, 1998). Future studies should consider alternative measurement methods to explore the quantity of parents' engagement in relation to child characteristics. Finally, our sample of dual-earner first-time parents, selected to examine the parenting experiences of couples in which both partners worked outside the home, was demographically homogenous and thus our findings may not generalize to other groups of new parents and their infants. However, dual-earner parents are caught at the intersection of intensive mothering, involved fathering, and child-centric parenting ideals as they strive to balance competing time demands of work and family. Thus, our sample may have been particularly well suited for examining the interplay between parental engagement time and infant temperament.

5. Conclusions

The implications of our findings are tri-fold. First, we found evidence for a gendered engagement "benefit", where mothers' but not fathers' engagement was linked with positive infant temperament development via reductions in negative affect and marginal increases in effortful control. The importance of mothers to children's healthy socioemotional development points to the importance of maximizing mothers' time with infants early in life without compromising family wellbeing; this can be achieved through access to generous paid and extended maternal leave policies. Second, we found that fathers' engagement appeared responsive to boys' negative affect in ways that suggest a "policing" of gender norms that encourage men to be emotionally restrained (e.g., Crockenberg & Langrock, 2001). These fathers may be the most prone to declines in engagement quality that come from engaging with a difficult infant for prolonged periods of time. Strategies to help new fathers deal with their negative sons may increase fathers' ability to effectively manage their sons' emotional outbursts.

Finally, our findings suggest reciprocal relations between maternal engagement and effortful control prior to 3 months of life. Although we could not disentangle the process by which mothers of high effortful control children became more involved than mothers of low effortful control children (i.e., child-driven effects increased mother engagement, or mother-driven effects increased infant effortful control), our study points to a narrow window for researchers to study infant brain development and identify key engagement activities that are the most important for promoting growth in regions like the frontal cortex. Future research should continue to study the early transactions that shape infants' temperamental characteristics and strive to illuminate parent as well as child characteristics that may play a role in individual differences in the transactional patterns we identified.

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Figure 1. Conceptual Model of Associations between Negative Affect /Effortful Control and Parental Engagement, Moderated by Child Gender and Effortful Control

Note. For both parents, we expected parental engagement to reduce subsequent negative affect¹ and increase subsequent effortful control², and children's negative affect to reduce¹, and effortful control to increase², subsequent parental engagement. Dashed lines indicate the expected moderating effect of child gender and effortful control. *We expected a significant moderating effect of child gender, such that fathers would become more engaged, and mothers less engaged, with boys perceived as higher in negative affect. **We expected a significant moderating effect of effortful control, such that higher effortful control would protect children from experiencing engagement declines associated with negative affect.

Table 1

Correlation and Descriptive Statistics of Temperament and Parental Engagement

	1.	2.	3.	4.	5.	6.	7.	8.	9.
Mothers									
1. 3M Engage	1.00								
2. 6M Engage	0.44***	1.00							
3. 9M Engage	0.31***	0.43***	1.00						
4. 3M NA	0.15	-0.06	0.04	1.00					
5. 6M NA	0.15	-0.02	0.03	0.57***	1.00				
6. 9M NA	0.07	-0.14	-0.09	0.48***	0.72***	1.00			
7. 3M EC	0.19*	0.11	0.10	-0.14	-0.13	-0.18*	1.00		
8. 6M EC	0.20*	0.17*	0.06	-0.12	-0.12	-0.20*	0.54***	1.00	
9. 9M EC	0.25**	0.16	0.21**	-0.01	-0.02	-0.06	0.46***	0.61***	1.00
M	6.07	6.35	6.31	3.40	3.50	3.99	5.49	5.55	5.19
<i>sd</i>	1.04	0.67	0.88	0.89	0.91	0.98	0.59	0.59	0.69
<i>n</i>	174	128	155	174	129	155	174	129	155
Fathers									
1. 3M Engage	1.00								
2. 6M Engage	0.56***	1.00							
3. 9M Engage	0.61***	0.74***	1.00						
4. 3M NA	-0.10	-0.08	-0.03	1.00					
5. 6M NA	-0.08	0.01	0.08	0.54***	1.00				
6. 9M NA	-0.05	-0.07	-0.02	0.48***	0.66***	1.00			
7. 3M EC	0.19*	0.15	0.11	-0.21**	-0.18*	-0.20*	1.00		
8. 6M EC	0.03	0.13	0.13	-0.08	-0.08	-0.05	0.51***	1.00	
9. 9M EC	0.06	0.14	0.11	-0.17*	-0.10	-0.18*	0.41***	0.55***	1.00
M	5.12	5.31	5.48	3.47	3.57	3.94	5.21	5.27	4.96
<i>sd</i>	1.33	1.07	1.08	0.94	0.98	0.94	0.66	0.64	0.66

	1	2	3	4	5	6	7	8	9
Mothers									
<i>n</i>	170	124	151	172	125	150	172	125	150

Note.

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$.

Engage = Engagement. NA = Negative Affect. EC = Effortful Control. 3, 6, and 9 indicate child age in months.

Table 2
Cross-Lagged SEM Results for Parental Engagement and Negative Affect and Moderation by Child Gender

	<u>Mothers¹</u>	<u>Fathers²</u>	<u>Mothers × Child Gender³</u>	<u>Fathers × Child Gender⁴</u>
	<i>b</i> (<i>se</i>)	<i>b</i> (<i>se</i>)	<i>b</i> (<i>se</i>)	<i>b</i> (<i>se</i>)
Negative Affect 6M				
Negative Affect 3M	0.59*** (0.07)	0.56*** (0.08)	0.73*** (0.08) ^a ; 0.40*** (0.06) ^b	0.59*** (0.07)
Engagement 3M	0.05 (0.06)	-0.00 (0.06)	0.09 (0.06)	0.02 (0.05)
Engagement 6M				
Negative Affect 3M	-0.09 (0.06)	0.02 (0.07)	-0.09 (0.06)	-0.01 (0.07)
Engagement 3M	0.33*** (0.05)	0.48*** (0.06)	0.34*** (0.05)	0.49*** (0.06)
Negative Affect 9M				
Negative Affect 6M	0.77*** (0.06)	0.62*** (0.06)	0.77*** (0.06)	0.75*** (0.07)
Engagement 6M	-0.19* (0.09)	-0.06 (0.06)	-0.20* (0.09)	-0.05 (0.06)
Engagement 9M				
Negative Affect 6M	0.05 (0.07)	0.08 (0.07)	0.08 (0.07)	0.30** (0.11) ^a ; -0.06 (0.09) ^b
Engagement 6M	0.59*** (0.09)	1.02*** (0.11)	0.61*** (0.09)	1.00*** (0.11)

Note.

+ $p < 0.10$;

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$.

¹ χ^2 (4) 3.74, $p = 0.44$; RMSEA 0.00; CFI 1.00.

² χ^2 (3) 6.19, $p = 0.10$; RMSEA 0.08; CFI 0.99.

³ χ^2 (15) 16.94, $p = 0.29$; RMSEA 0.04; CFI 0.99.

⁴ χ^2 (12) 7.48, $p = 0.82$; RMSEA 0.00; CFI 1.00.

^a Boys.

b_{Girls}

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Table 3
Cross-Lagged SEM Results for Parental Engagement and Effortful Control and Moderation by Child Gender

	<u>Mothers¹</u>	<u>Fathers²</u>	<u>Mothers × Child Gender³</u>	<u>Fathers × Child Gender⁴</u>
	<i>b</i> (<i>se</i>)	<i>b</i> (<i>se</i>)	<i>b</i> (<i>se</i>)	<i>b</i> (<i>se</i>)
Effortful Control 6M				
Effortful Control 3M	0.52 *** (0.07)	0.47 *** (0.07)	0.54 *** (0.07)	0.49 *** (0.07)
Engagement 3M	0.07 + (0.04)	-0.02 (0.04)	0.08 + (0.04)	-0.03 (0.04)
Engagement 6M				
Effortful Control 3M	0.06 (0.09)	0.03 (0.10)	0.06 (0.09)	0.04 (0.10)
Engagement 3M	0.31 *** (0.05)	0.47 *** (0.06)	0.32 *** (0.05)	0.47 *** (0.06)
Effortful Control 9M				
Effortful Control 6M	0.70 *** (0.08)	0.56 *** (0.08)	0.70 *** (0.08)	0.56 *** (0.08)
Engagement 6M	0.07 (0.07)	0.05 (0.04)	0.06 (0.07)	0.05 (0.04)
Engagement 9M				
Effortful Control 6M	0.05 (0.11)	0.01 (0.11)	0.10 (0.11)	0.03 (0.11)
Engagement 6M	0.58 *** (0.10)	1.02 *** (0.12)	0.59 *** (0.09)	1.03 *** (0.12)

Note.

+ $p < 0.10$;

*** $p < 0.001$.

¹ χ^2 (4) 6.52, $p = 0.16$; RMSEA 0.06; CFI 0.99.

² χ^2 (3) 5.28, $p = 0.15$; RMSEA 0.06; CFI 0.99.

³ χ^2 (16) 18.564, $p = 0.292$; RMSEA 0.04; CFI 0.99.

⁴ χ^2 (14) 13.875, $p = 0.459$; RMSEA 0.00; CFI 1.00.

Table 4

Cross-Lagged SEM Results for the Moderating Effect of Effortful Control on Negative Affect

	<u>Mothers × Effortful Control¹</u>	<u>Fathers × Effortful Control²</u>
	<i>b</i> (<i>se</i>)	<i>b</i> (<i>se</i>)
Negative Affect 6M		
Negative Affect 3M	0.57*** (0.07)	0.56*** (0.08)
Engagement 3M	0.05 (0.06)	0.01 (0.06)
Engagement 6M		
Negative Affect 3M	−0.09 (0.06)	0.03 (0.07)
Engagement 3M	0.15* (0.06) ^a ; 0.54*** (0.08) ^b	0.47*** (0.06)
Negative Affect 9M		
Negative Affect 6M	0.75*** (0.06)	0.61*** (0.06)
Engagement 6M	−0.22** (0.08)	−0.06 (0.06)
Engagement 9M		
Negative Affect 6M	0.09 (0.07)	0.09 (0.07)
Engagement 6M	0.60*** (0.07)	1.04*** (0.12)

*Note.**
 $p < 0.05$;**
 $p < 0.01$;***
 $p < 0.001$.¹ χ^2 (15) 21.52, $p = 0.121$; RMSEA 0.07; CFI 0.97.² χ^2 (14) 14.88, $p = 0.39$; RMSEA 0.03; CFI 0.99.^a High Effortful Control,^b Low Effortful Control.