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Pathways to social-emotional functioning in the preschool period: The role of child temperament and maternal anxiety in boys and girls

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Abstract

Individual differences in social-emotional functioning emerge early and have long-term implications for developmental adaptation and competency. Research is needed that specifies multiple early risk factors and outcomes simultaneously to demonstrate specificity. Using multigroup longitudinal path analysis in a sample of typically developing children ($N = 541$), we examined child temperament dimensions (surgency, negative affectivity, and regulation/effortful control) and maternal anxiety in infancy and age 2 as predictors of child externalizing, internalizing, dysregulation, and competence behaviors at age 3. Four primary patterns emerged. First, there was stability in temperament dimensions and maternal anxiety from infancy to age 3. Second, negative affectivity was implicated in internalizing problems and surgency in externalizing problems. Third, effortful control at age 2 was a potent mediator of maternal anxiety in infancy on age 3 outcomes. Fourth, there was suggestive evidence for transactional effects between maternal anxiety and child effortful control. Most pathways operated similarly for boys and girls, with some differences, particularly for surgency. These findings expand our understanding of the roles of specific temperamental domains and postnatal maternal anxiety in a range of social-emotional outcomes in the preschool period, and have implications for efforts to enhance the development of young children's social-emotional functioning and reduce risk for later psychopathology.

Keywords: maternal anxiety, path model, sex differences, social-emotional development, temperament

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Individual differences in social-emotional competence emerge early, are relatively stable after the first year of life, and are associated with current and future adaptive functioning (Eisenberg, Spinrad, & Eggum, 2010; Halligan et al., 2013). Clinically significant social-emotional delays and behavioral difficulties often emerge by age 3 years (Dougherty et al., 2015) and persist from childhood and adolescence into adulthood (Bosquet & Egeland, 2006; Campbell, Spieker, Burchinal, Poe, & NICHD Early Child Care Research Network, 2006; Dekker et al., 2007; Mesman, Bongers, & Koot, 2001; Mesman & Koot, 2001). With as many as one in five children affected, with anxiety disorders being most common, prevalence rates of clinical disorders in preschool-aged children are similar to those in school-aged children (Dougherty et al., 2013, 2015). Subclinical difficulties may also increase risk for later psychopathology (Briggs-Gowan et al., 2003; Rutter, 2003). Moreover, early difficulties increase the likelihood of poorer school adjustment and academic achievement (Montroy, Bowles, Skibbe, & Foster, 2014). Thus, identifying specific early indicators of risk for poorer social-emotional functioning will inform efforts to maximize children's developmental and academic competencies and mental health (Graziano & Hart, 2016).

Temperament—that is, inherent individual differences in reactivity and regulation along the dimensions of activity, affect, and attention—manifests early in life and is relatively stable across time and context (De Pauw & Mervielde, 2010; Gartstein & Rothbart, 2003; Shiner et al., 2012). Certain temperament characteristics may predispose children to later emotional and behavior difficulties (Abulizi et al., 2017) and externalizing or internalizing disorders (Sayal, Heron, Maughan, Rowe, & Ramchandani, 2014). To date, most studies have examined associations between isolated temperament dimensions and social-emotional outcomes (Diener & Kim, 2004). These studies have not adequately accounted for the stability, covariance, and transactional associations among temperament dimensions both within and across time in predicting outcomes, such as internalizing and externalizing behaviors

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(Carter, Briggs-Gowan, Jones, & Little, 2003). This presents a serious challenge to understanding how specific temperament dimensions contribute to different domains of social-emotional functioning. It remains unclear whether previous findings would replicate while analyzing all temperament dimensions simultaneously to demonstrate specificity.

Maternal emotional functioning has also been shown to influence children's social-emotional development, beginning in early life (Morris, Silk, Steinberg, Myers, & Robinson, 2007). The first 2 years of life are considered the most plastic and critical period of postnatal brain development in humans (Knickmeyer et al., 2008). During this period, the developing brain is especially responsive to environmental and experiential input, particularly to dyadic social interactions (Bernier, Calkins, & Bell, 2016; Bick & Nelson, 2016; Perry, Blair, & Sullivan, 2017). Infants are born with limited capacity to regulate their behavior or their physiological and emotional states (Eisenberg et al., 2010; Tronick, Als, Adamson, Wise, & Brazelton, 1978) and thus must develop the capacity for self-regulation over time. This social-emotional development is deeply embedded in the quality of the early dyadic interaction with their primary caregiver(s), often the mother (Bell & Ainsworth, 1972; Bowlby, 1982/1969; McElwain & Booth-LaForce, 2006). More specifically, early in life, sensitive mothers coregulate their infant's stress responses by attending promptly, appropriately, and contingently to their infant's distress signals (Ainsworth, 1979; Biringen, Derscheid, Vliegen, Closson, & Easterbrooks, 2014). In so doing, they support their infant, via emotional coregulation, toward developing social-emotional competencies, including emotion self-regulation (see also the biobehavioral synchrony model; Feldman, 2007, 2015, 2017). There is an extensive literature showing that high-quality early mother–child interactions may scaffold positive child development, facilitating more optimal outcomes related to emotion regulation and stress reactivity (Coppola, Ponzetti, Aureli, & Vaughn, 2015; Easterbrooks, Bureau, & Lyons-Ruth, 2012; Garvin, Tarullo, Van Ryzin, & Gunnar, 2012; Landry, Smith, & Swank, 2006), and lay the biobehavioral foundation for adaptive psychosocial functioning and emotional well-being across the life span (Englund, Kuo, Puig, & Collins, 2011). However, although infant distress signals such as crying function to elicit maternal caregiving responses and secure infant survival, they also may elicit strong, negative affect in mothers (Murray, 1979; Soltis, 2004). Mothers who have emotion regulation difficulties may struggle to regulate their own emotional response when faced with infant distress, which, in turn, can negatively impact the quality of early dyadic interactions (Crandall, Deater-Deckard, & Riley, 2015; Rutherford, Wallace, Laurent, & Mayes, 2015) and may predispose the infant to difficulties in emotion regulation in later childhood (Sanders & Mazzucchelli, 2013). This has been shown especially to be the case among mothers experiencing psychopathology (Graham, Blissett, Antoniou, Zeegers, & McCleery, 2018; Reck, Tietz, Muller, Seibold, & Tronick, 2018). For instance, maternal depression (Sherman, Vousoura, Wickramaratne, Warner, & Verdeli, 2016) and distress (Essex, Klein, Slattery, Goldsmith, & Kalin, 2010) have been identified as important risk factors, directly and indirectly predicting children's emotional and behavior difficulties (Goodman et al., 2011) and increasing risk for psychopathology across the life span (Murray et al., 2011). According to a recent meta-analysis, an estimated 8.5% of postpartum women experience one or more anxiety disorders (Goodman, Watson, & Stubbs, 2016), and prevalence rates of postnatal anxiety symptoms range up to 43% (Glasheen, Richardson, & Fabio, 2010; Matthey, Barnett, Howie, & Kavanagh, 2003). Nonetheless, relatively few studies have focused on maternal anxiety as a putative risk factor (Glasheen et al., 2010; Mughal et al., 2018), and no study has examined how specific dimensions of child temperament and postnatal maternal anxiety jointly contribute to child social-emotional outcomes at multiple waves of data collection over the first 3 years of life.

The overall goal of the current study was to examine developmental precursors to a range of preschool social-emotional and behavioral outcomes. Specifically, we simultaneously examined multiple temperament dimensions (surgency, negative affectivity, and orienting/regulation) and maternal anxiety in infancy as predictors of child externalizing, internalizing, dysregulation, and competence behaviors at age 3 years. By incorporating measures of child temperament and maternal anxiety at ages 2 and 3 years, we were able to account for stability effects and examine pathways through these same factors over time (i.e., cross-lagged effects) to demonstrate specificity of early risk factors. We also examined pathways to several domains of social-emotional functioning, estimated simultaneously to account for within-time associations among constructs. A secondary goal was to test for sex differences in the longitudinal pathways from infant temperament and maternal anxiety in infancy to later social-emotional functioning. Previous findings suggest sex differences in particular temperament domains (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006), in emotional and behavioral difficulties (Bosquet & Egeland, 2006; Briggs-Gowan et al., 2003; Carter et al., 2010; Crick & Zahn-Waxler, 2003; Lavigne, Lebailly, Hopkins, Gouze, & Binns, 2009; Mesman & Koot, 2001; Wade, Cairney, & Pevalin, 2002), and in developmental pathways to psychopathology (Abulizi et al., 2017; Karevold, Roysamb, Ystrom, & Mathiesen, 2009; Mesman et al., 2001; Sayal et al., 2014). This is the first study to examine sex differences in the longitudinal pathways connecting multiple dimensions of child temperament and maternal anxiety in infancy to a range of later social-emotional and behavioral outcomes in the preschool period.

Method

Participants, procedures, and ethical considerations

Participants were recruited from a registry of local births composed of families who had indicated willingness to participate in developmental research. Families for the current analyses participated in a prospective study to examine the early development of emotion processing. Exclusion criteria included known prenatal or perinatal complications, developmental delay, uncorrected vision difficulties, neurological disorder or trauma, and premature or postterm birth (±3 weeks from due date). Families were enrolled when the children were 5, 7, or 12 months old (Time 1 [T1]; laboratory visit and questionnaires) and followed when the child was 2 years (Time 2 [T2]; questionnaires) and 3 years (Time 3 [T3]; laboratory visit and questionnaires) of age. Study procedures were approved by the relevant institutional review board, and caregivers provided written informed consent.

The current analyses were conducted after all T1 assessments ($N = 807$) were concluded. At the time of the current analyses, 648 children had aged into the T3 assessment. Among this subsample, participants were excluded from the current analyses due to child diagnosis of autism spectrum disorder ($n = 11$) or Turner syndrome ($n = 1$); maternal report of opioid or antipsychotic medication use during pregnancy ($n = 9$); teenage parenthood ($n = 1$); father completing the caregiver anxiety measure at T1 ($n = 9$); and absence of essential T1 data (maternal anxiety or infant temperament data; $n = 76$), leaving a final sample size of $N = 541$ families for inclusion in analyses. No differences were found between participants with and without T2 and T3 data on infant temperament or maternal anxiety scores at T1 or on sociodemographics except that missingness negatively related to maternal education.

Measures

All measures were completed by mothers via online survey or tablet during a laboratory visit.

Infant and child temperament

Infant temperament was assessed at T1 using the short form of the Infant Behavior Questionnaire-Revised (IBQ-R; Forman et al., 2003; Gartstein & Rothbart, 2003; Parade & Leerkes, 2008), which provides composite measures for the dimensions of surgency/extraversion ($\alpha = .92$), negative affectivity ($\alpha = .86$), and orienting/regulation ($\alpha = .82$). Child temperament was assessed at T2 and T3 using the Early Childhood Behavior Questionnaire—Short Form (ECBQ). The ECBQ (Putnam, Gartstein, & Rothbart, 2006; Putnam, Rothbart, & Gartstein, 2008) is an age-upward extension of the IBQ-R, providing composite measures for the dimensions of surgency (T2 $\alpha = .85$, T3 $\alpha = .88$), negative affectivity (T2 $\alpha = .87$, T3 $\alpha = .88$), and effortful control (upward extension of infant orienting/regulation; T2 $\alpha = .88$, T3 $\alpha = .85$). For both the IBQ-R and the ECBQ, scores are calculated as means that range from 1 to 7 (scores close to 1 indicate that almost all items were rated as *never/very rarely*; scores close to 7 indicate that almost all items were rated as *almost always/always*). Clinical cutoff scores are not used for these scales.

Maternal anxiety

Maternal anxiety symptomatology at all time points was measured by the total score of the trait scale (T1 $\alpha = .89$, T2 $\alpha = .89$, T3 $\alpha = .89$) of the State–Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The total score is calculated as the item sum score, with possible scores ranging from 0 to 80 and a recommended clinical cutoff score of ≥40 (e.g., Grant, McMahon, & Austin, 2008).

Child social-emotional functioning

Child social-emotional functioning was assessed at T3 using the Infant–Toddler Social and Emotional Assessment (ITSEA; Carter et al., 2003), which provides composite measures of externalizing behaviors (activity/impulsivity, aggression/defiance, and peer aggression; $\alpha = .81$), internalizing behaviors (depression/withdrawal, general anxiety, separation distress, and inhibition to novelty; $\alpha = .84$), dysregulation (negative emotionality, sensory sensitivity, sleep, and eating; $\alpha = .83$), and competence (compliance, attention, imitation/ play, mastery motivation, empathy, and prosocial peer relations; $\alpha = .86$). Raw scores are calculated as means that range from 0 to 2 (scores close to 0 indicate that almost all items were rated as *not true/rarely*; scores close to 2 indicate that almost all items were rated as *very true/often*). Mean scores can be used to calculate *T* scores. *T* scores ($M = 50$, $SD = 10$) indicate the extent to which a child's raw mean score is higher or lower than the same age and sex peers' raw mean scores. Recommended clinical cutoff *T* scores of ≥63 and ≤37 for problem and competence domains, respectively, identify children in the extreme 10th percentile, who are considered to be at risk for social-emotional delays (Carter et al., 2003). In analyses, we used the raw scores. We present *T* scores for descriptive purposes.

Data analysis plan

Analyses were conducted using M*plus* Version 7. There were variable amounts of missing data due to attrition over time (no missing data at T1, ≤38% at T2, and ≤40% at T3). Because missingness was negatively related to maternal education, maternal education was included in analyses as an auxiliary variable, thereby justifying the missing at random assumption and supporting the use of full information maximum likelihood estimation to address missing data. A maximum-likelihood with robust standard errors estimator was utilized, which generates parameter estimates with standard errors and a chi-square that are robust to nonnormality with missing data (Yuan & Bentler, 2000). We age adjusted the manifest variables at all time points to account for within-time variance in infant age of assessment.

Multigroup path analysis assessed the associations between child temperament factors and maternal anxiety in infancy and social-emotional outcomes at age 3 years by child sex. Stability coefficients from infancy, through age 2, to age 3 were modeled for all temperament and maternal anxiety variables. Within-time covariance terms were also modeled, thus providing a very conservative model wherein the cross-lagged parameters can be interpreted as directional effects. The model was estimated conditioned on all of the predictors; thus, each parameter is a unique estimate. Indicators of model fit included root mean square error of approximation (RMSEA), comparative fit index (CFI), and the standardized root mean square residual (SRMR).

We report total, direct, and indirect effects, which were estimated simultaneously. Indirect effects were estimated using the delta method (Sobel, 1982), which calculates the standard error of the product of two variables that are used to determine the significance of the indirect path. We replicated the results using bootstrapping across 5,000 bootstrap draws. As the substantive results were not different, we present results from the maximum-likelihood with robust standard errors-based analysis, which allows for the incorporation of auxiliary variables related to missingness (i.e., maternal education).

Results

Descriptive statistics

Sociodemographic characteristics are presented in Appendix A. Overall, families reported high levels of education and socioeconomic status (92.8% of mothers with college degree or higher; 60.1% with annual household income ≥$100,000). The majority of children were White (79.7%) or multiracial (13.3%). Using the recommended clinical cutoff State–Trait Anxiety Inventory score of ≥40, 21.1% of mothers had elevated anxiety symptoms at T1, 16.2% at T2, and 15.3% at T3. Using recommended clinical cutoff ITSEA *T* scores of ≥63 and ≤37 for problem and competence domains, respectively, at T3, children scored in the clinical range (extreme 10th percentile) as follows: externalizing symptoms, 3.7%; internalizing symptoms, 9.2%; dysregulation, 6.5%; and competence delays, 6.4%. Social-emotional and sociodemographic characteristics by child sex are reported in Appendix A. Briefly, on the ITSEA, boys scored in the clinical range as follows: externalizing symptoms, 5.1%; internalizing symptoms, 9.4%;

dysregulation, 6.0%; and competence delays, 2.8%; girls scored in the clinical range as follows: externalizing symptoms, 2.0%; internalizing symptoms, 8.9%; dysregulation, 7.0%; and competence delays, 10.5%. In *t* tests uncorrected for multiple comparisons, boys had higher mean birthweight and T2 and T3 surgency scores, and girls had greater mean T3 internalizing scores; there were no sex differences on any other temperament scores, the remaining ITSEA scores, maternal anxiety scores, or sociodemographic variables. Bivariate correlations between study variables are presented in Appendix A.

Model fit and comparison of nested path models

We first fit a multigroup model with all paths fully constrained between sexes. This model offered a good fit to the data: RMSEA = .023, CFI = .99, SRMR = .040. For empirically derived differences in parameters between sexes, we examined modification indices that suggested freeing certain parameters to improve model fit. Parameters were freed sequentially in order of magnitude until no others were suggested or theoretically plausible. This partially free model offered a good fit to the data: RMSEA < .001, CFI = 1.00, SRMR = .039. Chi-square difference testing using the Satorra–Bentler scaling correction factor indicated that the partially free model fit better than the fully constrained model, $\Delta\chi^2$ (Δdf) = 43.60 (5), $p < .001$. Thus, the results presented below focus on this partially free model.

Total, direct, and indirect effects similar between sexes

We organize this section by T3 social-emotional outcomes. Tables 1 and 2 present the coefficients for each outcome by predictor and mediator variable for boys and girls, respectively. Figure 1 presents the significant paths for all outcomes for (a) boys and (b) girls, respectively. Results for temperament factors and maternal anxiety as outcomes at T3 are presented in Appendix A. All within-construct stability coefficients were significant from T1 to T2 and from T2 to T3, for both boys and girls. Within-time covariances between constructs and residual variances for each outcome (dependent variables and mediators) are presented in Appendix A. Below, we present results common between boys and girls, followed by a section highlighting differences between sexes. Only statistically significant ($p < .050$) and modest (nonsignificant trend, $p = .050–.079$) effects are reported in the text.

Externalizing behaviors

Surgency. The total effect of T1 surgency on T3 externalizing behaviors was significant: higher surgency predicted more externalizing behaviors. This effect operated indirectly through higher T2 surgency and, modestly, through higher T2 negative affectivity.

Negative affectivity. The total effect of T1 negative affectivity on T3 externalizing behaviors was not significant. However, there was an indirect effect of higher T1 negative affectivity on greater T3 externalizing behaviors through higher T2 negative affectivity.

Orienting/regulation. The total effect of T1 orienting/regulation on T3 externalizing behaviors was not significant. However, there was a significant indirect effect of lower T1 orienting/regulation on greater T3 externalizing behaviors through lower T2 effortful control.

Maternal anxiety. The total effect of T1 maternal anxiety on T3 externalizing behaviors was significant: higher maternal anxiety predicted greater externalizing behaviors. This effect operated indirectly through lower T2 effortful control.

Internalizing behaviors

Surgency. The total effect of T1 surgency on T3 internalizing behaviors was significant: lower surgency predicted greater internalizing behaviors. There was a modest indirect effect through higher T2 negative affectivity. There was also a residual direct effect of T1 surgency on T3 internalizing behaviors unaccounted for by the observed mediators, suggesting unmeasured variables are additional mediators in this pathway.

Negative affectivity. The total effect of T1 negative affectivity on T3 internalizing behaviors was significant: higher negative affectivity predicted greater internalizing behaviors. This effect operated indirectly through higher T2 negative affectivity.

Orienting/regulation. There were no total or indirect effects of T1 orienting/regulation on T3 internalizing behaviors.

Maternal anxiety. Although the total effect of T1 maternal anxiety on T3 internalizing behaviors was not significant, there was a modest indirect effect of higher maternal anxiety on greater internalizing behaviors through higher T2 negative affectivity.

Dysregulation

Surgency. The total effect of T1 surgency on T3 dysregulation was not significant. However, there was a modest indirect effect of higher surgency on greater dysregulation through higher T2 negative affectivity.

Negative affectivity. The total effect of T1 negative affectivity on T3 dysregulation was significant: higher negative affectivity predicted greater dysregulation. This effect operated indirectly through higher T2 negative affectivity. There was also a modest residual direct effect of T1 negative affectivity on T3 dysregulation unaccounted for by the observed mediators, suggesting unmeasured variables are additional mediators in this pathway.

Orienting/regulation. There was a significant total effect of T1 orienting/regulation on T3 dysregulation in girls, but not boys: lower orienting/regulation predicted greater dysregulation in girls. In both girls and boys, there was a significant indirect effect of lower T1 orienting/regulation on greater T3 dysregulation through lower T2 effortful control.

Maternal anxiety. The total effect of T1 maternal anxiety on T3 dysregulation was significant: higher maternal anxiety predicted greater dysregulation. This effect operated indirectly through lower T2 effortful control and, modestly, through higher T2 negative affectivity. There was also a residual direct effect of T1 maternal anxiety on T3 dysregulation unaccounted for by the observed mediators, suggesting unmeasured variables are additional mediators in this pathway.

Competence

Surgency. The total effect of T1 surgency on T3 competence was significant: higher surgency predicted greater competence. There were no indirect effects. There was a residual direct effect of T1 surgency on T3 competence unaccounted for by the observed

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Table 1. Total, direct, and indirect effects of infant temperament and maternal anxiety on children's social-emotional and behavioral outcomes at age 3 years: Boys only

		Externalizing behaviors		Internalizing behaviors		Dysregulation		Competence	
Predictor	Effect	β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI
Infant surgency	Total	**.111*** (.05)	[.01, .21]	**−.146*** (.06)	[−.27, −.03]	−.035 (.05)	[−.14, .07]	**.264***** (.06)	[.15, .38]
	Direct	.042 (.05)	[−.05, .14]	**−.154*** (.06)	[−.27, −.04]	−.074 (.05)	[−.18, .03]	**.228***** (.07)	[.1, .36]
		z	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI
	Indirect	2.3	**.069*** [.01, .13]	0.258	.008 [−.05, .07]	1.32	.039 [−.02, .1]	1.17	.036 [−.02, .1]
	SUR	4.13	**.080***** [.04, .12]	−1.75	−.030 [−.06, .004]	0.759	.013 [−.02, .05]	0.338	.006 [−.03, .04]
	NA	1.76	**.017†** [−.002, .04]	1.85	**.043†** [−.002, .09]	1.92	**.038†** [−.001, .08]	−0.009	.000 [−.01, .01]
	EC	−1.37	−.026 [−.06, .01]	−0.906	−.005 [−.02, .006]	−1.18	−.012 [−.03, .008]	1.38	.030 [−.01, .07]
	STAI	−.507	−.002 [−.01, .006]	0.103	.000 [−.003, .003]	−0.169	.000 [−.003, .003]	−0.052	.000 [−.003, .003]
		β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI
Infant negative affectivity	Total	.037 (.06)	[−.07, .15]	**.199***** (.06)	[.09, .31]	**.233***** (.06)	[.12, .35]	−.037 (.06)	[−.14, .07]
	Direct	−.019 (.05)	[−.12, .08]	.060 (.06)	[−.05, .17]	**.111†** (.06)	[−.002, .22]	−.030 (.06)	[−.14, .08]
		z	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI
	Indirect	1.79	**.056†** [−.005, .12]	4.66	**.139***** [.08, .2]	3.94	**.123***** [.06, .18]	−0.237	−.007 [−.07, .05]
	SUR	−0.555	−.007 [−.03, .02]	0.536	.003 [−.007, .01]	−0.438	−.001 [−.006, .004]	−0.309	−.001 [−.004, .003]
	NA	2.73	**.054*** [.02, .09]	4.61	**.136***** [.08, .19]	4.12	**.121***** [.06, .18]	−0.009	.000 [−.04, .04]
	EC	0.329	.006 [−.03, .04]	0.316	.001 [−.006, .008]	0.326	.003 [−.01, .02]	−0.328	−.006 [−.05, .03]
	STAI	0.769	.003 [−.005, .01]	−0.106	.000 [−.006, .005]	0.172	.000 [−.005, .006]	0.052	.000 [−.006, .006]
Infant orienting/ regulation	Total	−.097 (.06)	[−.21, −.01]	−.012 (.06)	[−.14, .11]	.070 (.08)	[−.08, .22]	**.219***** (.06)	[.11, .33]
	Direct	.043 (.06)	[−.07, .16]	−.002 (.07)	[−.13, .13]	.121 (.08)	[−.03, .27]	.063 (.06)	[−.06, .18]
		z	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI
	Indirect	−3.98	**−.140***** [−.21, −.07]	−0.311	−.010 [−.07, .05]	−1.58	−.051 [−.12, .01]	5.32	**.156***** [.1, .22]

(*Continued*)

Table 1. (*Continued.*)

Predictor	Effect	Externalizing behaviors		Internalizing behaviors		Dysregulation		Competence	
		β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI
	SUR	−0.631	−.009 [−.04, .02]	0.590	.003 [−.008, .02]	−0.467	−.001 [−.007, .005]	−0.319	−.001 [−.004, .003]
	NA	0.591	.005 [−.011, .02]	0.612	.012 [−.03, .05]	0.604	.011 [−.02, .05]	−0.009	.000 [−.004, .004]
	EC	−4.62	**−.134***** [−.19, −.08]	−1.13	−.026 [−.07, .02]	−2.36	**−.060*** [−.11, −.01]	5.39	**.157***** [.10, .21]
	STAI	−0.444	.002 [−.01, .006]	0.107	.000 [−.003, .003]	−0.158	.000 [−.003, .003]	−0.052	.000 [−.003, .003]
		β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI
Maternal anxiety in infancy	Total	**.210***** (.05)	[.11, .31]	.037 (.06)	[−.08, .15]	**.203***** (.06)	[.09, .32]	−.095 (.06)	[−.21, .02]
	Direct	.062 (.06)	[−.06, .19]	−.005 (.07)	[−.14, .13]	**.132*** (.06)	[.006, .26]	−.023 (.08)	[−.17, .12]
		z	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI
	Indirect	2.71	**.148*** [.04, .26]	0.763	.042 [−.07, .15]	1.3	.071 [−.04, .18]	−1.17	−.072 [−.19, .05]
	SUR	0.153	.002 [−.03, .03]	−0.153	−.001 [−.01, .01]	0.150	.000 [−.004, .005]	0.139	.000 [−.002, .002]
	NA	1.67	.015 [−.003, .03]	1.93	**.036†** [−.001, .07]	1.91	**.032†** [−.001, .07]	−0.009	.000 [−.01, .01]
	EC	3.07	**.064**** [.02, .11]	1.07	.012 [−.01, .04]	1.97	**.029*** [.000, .06]	−.3.13	**−.075**** [−.12, −.03]
	STAI	1.36	.068 [−.03, .17]	−0.107	−.006 [−.11, .1]	0.175	.009 [−.1, .11]	0.052	.003 [−.11, .12]

Note: β, beta coefficient. SE, standard error. 95% CI, confidence interval at .05 level. *z*, standardized estimate/*SE* (estimate). STD ES, standardized effect size (a*b) for the indirect effect. SUR, surgency. NA, negative affectivity. EC, effortful control. STAI, State–Trait Anxiety Inventory. $^{\dagger}p$ = .050–.079. *p < .05. **$p \leq$ .005. ***$p \leq$ .001.

Table 2. Total, direct, and indirect effects of infant temperament and maternal anxiety on children's social-emotional and behavioral outcomes at age 3 years: Girls only.

		Externalizing behaviors		Internalizing behaviors		Dysregulation		Competence	
Predictor	Effect	β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI
Infant surgency	Total	**.117*** (.05)	[.01, .22]	**−.135*** (.06)	[−.24, −.03]	−.029 (.04)	[−.12, .06]	**.235***** (.05)	[.13, .34]
	Direct	.044 (.05)	[−.06, .15]	**−.142*** (.05)	[−.25, −.04]	−.060 (.04)	[−.15, .03]	**.203***** (.06)	[.09, .32]
		z	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI
	Indirect	2.29	**.073*** [.01, .14]	0.258	.007 [−.05, .06]	1.32	.032 [−.02, .08]	1.16	.032 [−.02, .09]
	SUR	4.19	**.084***** [.05, .12]	−1.75	−.028 [−.06, .003]	0.762	.010 [−.02, .04]	0.338	.005 [−.02, .03]
	NA	1.79	**.018†** [−.002, .04]	1.88	**.039†** [−.002, .08]	1.93	**.031†** [−.001, .06]	−0.009	.000 [−.01, .01]
	EC	−1.39	−.027 [−.07, .01]	−0.907	−.005 [−.01, .005]	−1.19	−.010 [−.03, .006]	1.38	.027 [−.01, .07]
	STAI	−0.510	−.002 [−.01, .006]	0.103	.000 [−.003, .003]	−0.169	.000 [−.003, .002]	−0.052	.000 [−.003, .003]
		β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI
Infant negative affectivity	Total	.045 (.07)	[−.09, .18]	**.215***** (.06)	[.10, .33]	**.224***** (.06)	[.11, .34]	−.039 (.06)	[−.15, .07]
	Direct	−.024 (.06)	[−.15, .10]	.064 (.06)	[−.05, .18]	**.106†** (.06)	[−.003, .22]	−.032 (.06)	[−.14, .08]
		z	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI
	Indirect	1.81	.069 [−.006, .14]	4.6	**.150***** [.09, .22]	3.91	**.118***** [.06, .18]	−0.238	−.007 [−.07, .05]
	SUR	−0.556	−.009 [−.04, .02]	0.537	.003 [−.008, .01]	−0.439	−.001 [−.006, .004]	−0.308	−.001 [−.004, .003]
	NA	2.79	**.067**** [.02, .11]	4.52	**.147***** [.08, .21]	4.07	**.116***** [.06, .17]	−0.009	.000 [−.04, .04]
	EC	0.329	.007 [−.03, .05]	0.317	.001 [−.006, .008]	0.326	.002 [−.01, .02]	−0.329	−.007 [−.05, .03]
	STAI	0.760	.004 [−.007, .02]	−0.106	.000 [−.006, .005]	0.172	.000 [−.005, .006]	0.052	.000 [−.006, .006]
Infant orienting/ regulation	Total	−.115 (.07)	[−.25, .02]	−.013 (.07)	[−.14, .12]	**−.154*** (.07)	[−.28, −.03]	**.219***** (.06)	[.11, .33]
	Direct	.051 (.07)	[−.08, .18]	.002 (.07)	[−.14, .13]	−.107 (.07)	[−.25, .04]	.063 (.06)	[−.06, .18]
		z	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI
	Indirect	−4.07	**−.166***** [−.25, −.09]	−0.312	−.010 [−.08, .05]	−1.59	−.047 [−.11, .01]	5.06	**.156***** [.1, .22]

(*Continued*)

Table 2. (*Continued.*)

		Externalizing behaviors		Internalizing behaviors		Dysregulation		Competence	
Predictor	Effect	β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI
	SUR	−0.634	−.011 [−.04, .02]	0.592	.004 [−.008, .02]	−0.468	−.001 [−.007, .004]	−0.318	−.001 [−.005, .003]
	NA	0.591	.006 [−.01, .03]	0.609	.013 [−.03, .05]	0.603	.010 [−.02, .04]	−0.009	.000 [−.004, .004]
	EC	−4.71	**−.159***** [−.23, −.09]	−1.13	−.027 [−.07, .02]	−2.39	**−.056*** [−.10, −.01]	5.14	**.157***** [.1, .22]
	STAI	−0.442	−.002 [−.01, .008]	0.107	.000 [−.003, .003]	−0.157	.000 [−.003, .003]	−0.052	.000 [−.003, .003]
		β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI	β (*SE*)	95% CI
Maternal anxiety in infancy	Total	**.241***** (.06)	[.13, .35]	.037 (.06)	[−.08, .15]	**.181***** (.05)	[.08, .28]	−.091 (.06)	[−.20, .02]
	Direct	.071 (.07)	[−.07, .21]	−.005 (.07)	[−.14, .13]	**.118*** (.06)	[.007, .23]	−.022 (.07)	[−.16, .12]
		z	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI	*z*	STD ES 95% CI
	Indirect	2.62	**.170*** [.04, .3]	0.767	.042 [−.07, .15]	1.3	.063 [−.03, .16]	−1.16	−.069 [−.19, .05]
	SUR	0.153	.002 [−.03, .03]	−0.152	−.001 [−.01, .01]	0.150	.000 [−.004, .004]	0.138	.000 [−.002, .002]
	NA	1.67	.017 [−.003, .04]	1.91	**.037†** [−.001, .07]	1.89	**.029†** [−.001, .06]	−0.009	.000 [−.01, .01]
	EC	3.14	**.073**** [.03, .12]	1.07	.012 [−.01, .04]	1.99	**.026*** [.000, .05]	−3.12	**−.072**** [−.12, −.03]
	STAI	1.34	.078 [−.04, .19]	−0.107	−.006 [−.11, .10]	0.175	.008 [−.09, .10]	0.052	.003 [−.11, .11]

Note: β, beta coefficient. SE, standard error. 95% CI, confidence interval at .05 level. *z*, standardized estimate/*SE* (estimate). STD ES, standardized effect size (a*b) for the indirect effect. SUR, surgency. NA, negative affectivity. EC, effortful control. STAI, State–Trait Anxiety Inventory. †*p* = .050–.079. **p* < .05. ***p* ≤ .005. ****p* ≤ .001.

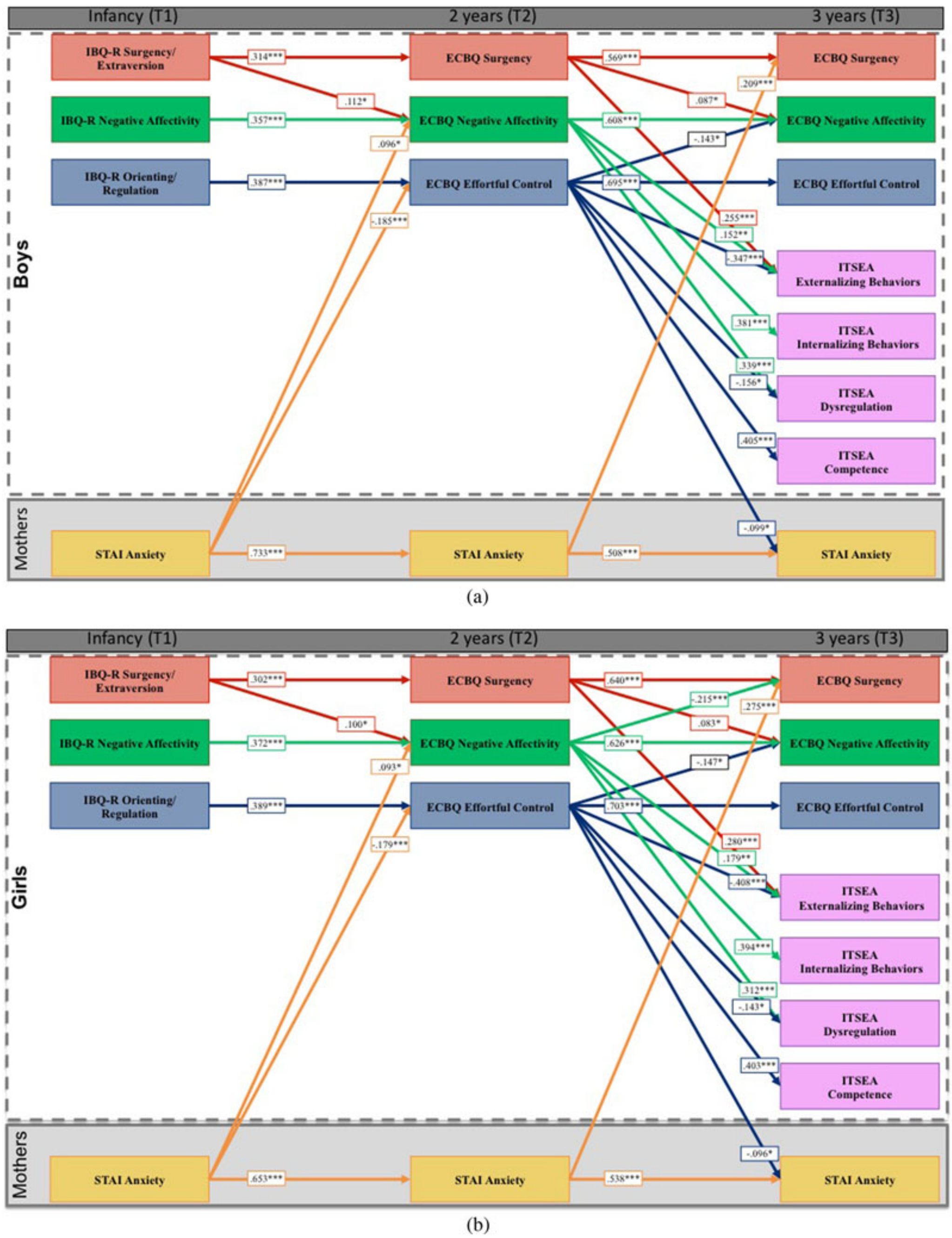

Figure 1. Final model for (a) boys and (b) girls. All paths between all variables were tested simultaneously, and all within-time covariances were included (not shown for clarity purposes). Only significant paths between contiguous time points are shown (solid lines). Standardized beta coefficients are presented in boxes on the relevant path. IBQ-R, Infant Behavior Questionnaire—Revised. ECBQ, Early Childhood Behavior Questionnaire—Short Form. STAI, State–Trait Anxiety Inventory, trait scale. ITSEA, Infant–Toddler Social and Emotional Assessment. *$p < .05$. **$p < .005$. ***$p < .001$.

mediators, suggesting unmeasured variables are additional mediators in this pathway.

Negative affectivity. There were no total or indirect effects of T1 negative affectivity on T3 competence.

Orienting/regulation. There was a significant total effect of T1 orienting/regulation on T3 competence: higher orienting/regulation predicted greater competence. This effect operated indirectly through higher T2 effortful control.

Maternal anxiety. Although the total effect of T1 maternal anxiety on T3 competence was not significant, there was a significant indirect effect of higher maternal anxiety on lower competence through lower T2 effortful control.

Sex differences in pathways

No indirect effects differed by sex. One total effect differed: the effect of T1 orienting/regulation on T3 dysregulation was significant in girls only. Modification indices suggested five individual parameters (three regression coefficients and two residual

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covariance terms) differed by sex. First, higher T2 negative affectivity predicted lower T3 surgency among girls, β (*SE*) = −.22 (.06), $p = .001$, but not boys, β (*SE*) = .04 (.06), $p = .54$. Second, the direct effect of T1 orienting/regulation on T3 dysregulation was in opposite directions for boys, β (*SE*) = .12 (.08), $p = .11$, versus girls, β (*SE*) = −.12 (.07), $p = .14$, but was not significant among either. Third, higher T1 surgency predicted higher T3 surgency among boys, β (*SE*) = .22 (.05), $p < .001$, but not girls, β (*SE*) = .06 (.06), $p = .34$. Fourth, higher T3 surgency was associated with lower T3 effortful control in girls, $r = −.22$, $p = .003$, but not boys, $r = .017$, $p = .82$. Fifth, higher T3 surgency was associated with greater T3 externalizing behaviors in boys, $r = .31$, $p < .001$, but not girls, $r = .011$, $p = .09$.

Discussion

The overall goal of this study was to examine longitudinal pathways from infant temperament and maternal anxiety in infancy to several social-emotional and behavioral outcomes at age 3. This was accomplished using a rigorous model that accounted for within-construct stabilities and cross-construct covariances over three waves of data collection, thus helping to explicate specific pathways from infant temperament and maternal anxiety in infancy to later social-emotional outcomes. Four primary patterns emerged. First, there was stability in temperament dimensions and maternal anxiety from infancy to age 3. Second, negative affectivity was implicated in internalizing problems and surgency in externalizing problems. Third, effortful control at age 2 was a potent mediator of maternal anxiety in infancy on age 3 outcomes. Fourth, there was suggestive evidence for transactional effects between maternal anxiety and child effortful control. Most pathways operated similarly for boys and girls, with some differences, particularly for surgency. Overall, the findings contribute to our understanding of temperamental stability in early life and the influence of different temperament dimensions in infancy and toddlerhood on a range of social-emotional outcomes in the preschool period. The findings also highlight similarities and differences by child sex in early developmental pathways from temperament to social-emotional functioning. Finally, this study considered the joint impact of child (i.e., temperament) and environmental (i.e., postnatal maternal anxiety) characteristics in predicting outcomes at age 3 years, highlighting parent-, child-, and parent–child specific pathways to preschool social-emotional functioning.

Our results indicated considerable stability in dimensions of temperament over the first 3 years, even controlling for child age and associations with other temperament dimensions within time, which expands recent findings on the relative stability of temperament in early childhood (Bornstein, Hahn, Putnick, & Pearson, 2018). Infant surgency, negative affectivity, and orienting/regulation independently predicted children's social-emotional and behavioral outcomes at age 3 years through stability in these dimensions from infancy to age 2 years. These findings are consistent with literature suggesting that individual differences in temperament dimensions arise early in development and are relatively stable precursors to later developmental competencies and social-emotional functioning (De Pauw & Mervielde, 2010; Gartstein & Rothbart, 2003).

We also identified specific longitudinal pathways from infant temperament to different preschool social-emotional outcomes. Specifically, greater externalizing behaviors were predicted by consistently higher surgency and negative affectivity and lower orienting/regulation/effortful control. The latter two are well-established risk factors for externalizing problems (Edwards & Hans, 2015; Pitzer, Esser, Schmidt, & Laucht, 2009). The finding that infant surgency predicted later externalizing behaviors is somewhat novel, but consistent with emerging data suggesting that high approach-related traits may underpin susceptibility to, and explain the overlap of, externalizing disorders such as attention-deficit/ hyperactivity disorder, oppositional defiant disorder, and conduct disorder (Ahmad & Hinshaw, 2017; Beauchaine, Zisner, & Sauder, 2017).

In contrast, the primary pathway to preschool internalizing behaviors was through stably high negative affectivity. In addition, there were trend-level effects for higher maternal anxiety and surgency in infancy predicting greater internalizing behaviors at age 3 through higher negative affectivity at age 2. Previous studies have identified early emotionality as an important risk factor for later internalizing psychopathology (Edwards, Rapee, & Kennedy, 2010; Karevold et al., 2009). Our results are consistent with these findings and further suggest that negative affectivity is a key trait connecting both early environmental risk (e.g., postnatal maternal anxiety) and other temperament dimensions (e.g., surgency) to later internalizing problems.

Two other pathways emerged that were common for multiple preschool outcomes. The first was a trend-level indirect effect from higher surgency in infancy to greater internalizing, externalizing, and dysregulation behaviors at age 3 via higher negative affectivity at age 2. Thus, in addition to serving as a robust predictor of internalizing behaviors, higher negative affectivity may connect higher surgency in infancy to other preschool social-emotional domains. Second, lower effortful control at age 2 was a key mediator between both infant orienting/regulation and maternal anxiety with later externalizing, dysregulation, and competence behaviors. Thus, effortful control in toddlerhood appears to have cross-cutting relevance for several domains of social-emotional functioning, linking both infant and maternal factors to later child outcomes. These findings dovetail with the notion that early self-regulation is foundational for later social and emotional development (Rhoades, Greenberg, & Domitrovich, 2009; Rhoades, Warren, Domitrovich, & Greenberg, 2011). We also found that stably lower child self-regulation from infancy to age 2 predicted maternal anxiety outcomes, with lower orienting/regulation in infancy predicting lower effortful control at age 2, which in turn predicted higher maternal anxiety symptomatology at age 3. Moreover, there was trend-level support for a transactional path from higher maternal anxiety in infancy to lower child effortful control at age 2 to higher maternal anxiety at age 3. Together, these findings raise the possibility of bidirectional, transactional associations between maternal anxiety and child self-regulation over the first 3 years of life. It is well established that mothers and their children reciprocally influence early dyadic interactions (e.g., Bakermans-Kranenburg & van IJzendoorn, 2007; Belsky, 1984); however, transactional effects over time are poorly understood. Transactional models of development postulate bidirectional effects of the individual and social contexts on development (Sameroff & Mackenzie, 2003). At least two previous studies found support for transactional effects of maternal/parenting stress and child temperament (Pesonen et al., 2008) and child behavior problems (Neece, Green, & Baker, 2012). Our findings also suggest that not only may mothers impact their children's early self-regulation development but also children may impact their mother's adjustment (i.e., levels of anxiety). However, it remains unclear when in development these transactional effects emerge and

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whether sensitive periods could be identified during which the mother or child may be most influential or most susceptible to change (Sameroff & Mackenzie, 2003). Putative bidirectional, transactional pathways to multiple measures of social-emotional functioning or developmental psychopathology should be tested in future studies using a fully cross-lagged model at multiple waves of data collection, allowing conclusions with respect to the directionality of effects.

Few sex differences were found in the longitudinal pathways connecting child temperament and maternal anxiety in infancy to child social-emotional outcomes at age 3. Most of the sex differences that were observed involved surgency. For example, there were differences in mean surgency levels between boys and girls that emerged by age 2 and persisted through age 3, favoring boys. There were also sex-specific concurrent associations between surgency and social-emotional outcomes at age 3. Specifically, although lower levels of surgency at age 3 were concurrently associated with greater internalizing behaviors for both sexes, higher levels of surgency were concurrently associated with more externalizing behaviors for boys only. In addition, there was a significant female-specific cross-temperament path from higher infant negative affectivity to lower surgency at age 3 that was mediated through higher negative affectivity at age 2.

It is interesting to note that surgency was the only temperament dimension that was predicted by stability in maternal anxiety from infancy to age 2, with higher maternal anxiety predicting higher surgency at age 3 for both sexes. Possibly, surgency is the temperament dimension most susceptible to change over development, with emergent sex differences in surgency—perhaps as a function of environmental influence—contributing to later behavioral differences between boys and girls. More broadly, the limited sex differences in the longitudinal pathways from infancy to preschool may have been due to the lack of sex differences in mean temperament scores in infancy. Sex differences in these longitudinal pathways may require a particular degree of development or environmental scaffolding before they fully manifest, not appearing until middle childhood (Panayiotou & Humphrey, 2018). This process may involve increased social exposures, including entry into formal schooling, where gender-role socialization and peer interactions may reinforce and magnify subtle, preexisting sex differences in behavior (Else-Quest et al., 2006). Thus, replication and expansion of the current results at later developmental periods is warranted.

This study has several limitations. First, although we employed a more robust analysis than many existing studies in the field, we were not able to test a fully cross-lagged model, as we did not have measures of social-emotional functioning before age 3, thus limiting conclusions with respect to the directionality of effects. Second, residual direct effects from infancy to age 3 outcomes suggest that additional mediators need to be considered in future studies. These mediators could be child-based traits and competencies (e.g., social cognition, language, and memory processes) and/or environmental/experiential factors (e.g., maternal responsiveness/sensitivity, paternal factors, household dysfunction/chaos, and daycare/preschool experiences). Third, we used mothers as the sole informants, which increases the risk of rater bias and shared-method variance. Future studies should consider including other informants (e.g., fathers or teachers) and observational measures. The sample was skewed toward higher socioeconomic families, which may have contributed to relatively constrained ranges in predictor and outcome variables. The reported pathways may vary in samples with greater psychosocial risk or more clinically significant levels of psychopathology. Of note, our findings align with recent models on the latent structure of psychopathology that have identified specific temperament dimensions in relation to internalizing and externalizing problems, both in community (Hankin et al., 2017; Olino et al., 2018) and clinic-referred (Scheper et al., 2017) samples. This provides some degree of external validation for the current findings. Nevertheless, given the high socioeconomic as well as educational status of the families in our study sample, generalizability is limited. Finally, postnatal maternal anxiety may have served as a proxy for other forms of psychological distress (e.g., depression, stress, or general psychopathology) following childbirth. In addition, prenatal maternal anxiety may have distinct/joint effects from/with postnatal maternal anxiety on the outcomes of interest (Barker, Jaffee, Uher, & Maughan, 2011); measures of prenatal anxiety were not available in this study. Because postnatal anxiety correlates with prenatal anxiety (e.g., Grant et al., 2008), some of the effects observed here may be the result of fetal programming of prenatal anxiety on child temperament (e.g., Van den Bergh, Mulder, Mennes, & Glover, 2005); we cannot distinguish between pre- versus postnatal effects in this study. Moreover, we were unable to examine the role of fathers in the analyzed pathways, as influencing either child risk (e.g., via paternal psychopathology/distress) or resilience (e.g., by offering positive caregiving that may buffer negative maternal effects; Pruett, Cowan, Cowan, Gillette, & Pruett, 2019). The role of fathers in early child development has been understudied (Cabrera, Volling, & Barr, 2018) and should be addressed in future research. Further, distinguishing shared and discrete pathways of different domains of risk and resilience to child social-emotional and behavioral outcomes is an important next step for research in this field.

Conclusions

These findings suggest that efforts to enhance child emotional control and self-regulation skills in early development may optimize preschool social-emotional functioning, increasing the likelihood of school adjustment and reducing risk for later psychopathology. The findings also highlight the potential utility of routine screening of clinical and subclinical anxiety by clinicians (e.g., obstetricians, gynecologists, primary care physicians, and pediatricians) following childbirth and perhaps throughout the prenatal period, as even modest levels of symptoms may increase risk for emotional difficulties of both mothers and their children.

Intervention programs that focus on the mother–child dyad might be most helpful, given the role of early dyadic interactions specifically and parenting in general in the development of children's self-regulation competencies. Programs promoting early emotional and behavioral regulation skills may facilitate achievement of developmental competencies and reduce risk for later psychopathology. To date, data on the effectiveness of early parenting interventions are limited, primarily because available interventions seldom directly target and measure self-regulation competencies and outcomes of both mother and child (Morawska, Dittman, & Rusby, 2019; Sanders & Mazzucchelli, 2013). To the best of our knowledge, for infants ages 0–2 years, no universal self-regulation based intervention is available (Pandey et al., 2018). Interventions in risk groups (e.g., preterm infants, Feldman, Weller, Sirota, & Eidelman, 2002; Wu et al., 2016; infants in foster care, Dozier, Peloso, Lewis, Laurenceau,

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& Levine, 2008; Lewis-Morrarty, Dozier, Bernard, Terracciano, & Moore, 2012) that mainly targeted sensitive parenting have produced positive effects on infant and child self-regulation competency development. In infancy, parental sensitivity in dyadic interactions may be key to the development of children's adaptive self-regulation competencies (Mihelic, Morawska, & Filus, 2017). The evidence for such effects, however, appears inconclusive for toddlers and/or preschool-aged children ages 2–5 years (Morawska et al., 2019). More recently, social-cognitive aspects of parenting (e.g., mentalization abilities), in addition to emotional and behavioral aspects of parenting (e.g., sensitivity), have been considered foundational to the early development of children's self-regulation competencies (Senehi, Brophy-Herb, & Vallotton, 2018). The mother's mentalization abilities (Fonagy & Target, 1997) may play a particularly strong role in toddlerhood, when children transition from parent-dependent coregulation to more autonomous self-regulation of their behavior and physiological and emotional states (Senehi et al., 2018). Thus, interventions targeting children in the toddler/preschool age range may be most successful if they promote the development of parental social-cognitive as well as emotional and behavioral regulation skills. Uncovering how these different dimensions of parenting independently and jointly contribute to children's early self-regulatory abilities, and the resultant impact on social-emotional functioning in the preschool period, is an important area of inquiry for future studies.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S0954579419000853.

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Conflicts of Interest. None.

References

Abulizi, X., Pryor, L., Michel, G., Melchior, M., Van Der Waerden, J., & Eden Mother–Child Cohort Study Group. (2017). Temperament in infancy and behavioral and emotional problems at age 5.5: The EDEN mother-child cohort. *PLOS ONE*, *12*, e0171971. doi:10.1371/journal.pone.0171971

Ahmad, S. I., & Hinshaw, S. P. (2017). Attention-deficit/hyperactivity disorder, trait impulsivity, and externalizing behavior in a longitudinal sample. *Journal of Abnormal Child Psychology*, *45*, 1077–1089. doi:10.1007/s10802-016-0226-9

Ainsworth, M. D. S. (1979). Infant-mother attachment. *American Psychologist*, *34*, 932–937. doi:10.1037/0003-066X.34.10.932

Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2007). Research Review: Genetic vulnerability or differential susceptibility in child development: The case of attachment. *Journal of Child Psychology & Psychiatry*, *48*, 1160–1173. doi:10.1111/j.1469-7610.2007.01801.x

Barker, E. D., Jaffee, S. R., Uher, R., & Maughan, B. (2011). The contribution of prenatal and postnatal maternal anxiety and depression to child maladjustment. *Depression and Anxiety*, *28*, 696–702. doi:10.1002/da.20856

Beauchaine, T. P., Zisner, A. R., & Sauder, C. L. (2017). Trait impulsivity and the externalizing spectrum. *Annual Review of Clinical Psychology*, *13*, 343–368. doi:10.1146/annurev-clinpsy-021815-093253

Bell, S. M., & Ainsworth, M. D. (1972). Infant crying and maternal responsiveness. *Child Development*, *43*, 1171–1190. doi:10.2307/1127506

Belsky, J. (1984). The determinants of parenting: A process model. *Child Development*, *55*, 83–96.

Bernier, A., Calkins, S. D., & Bell, M. A. (2016). Longitudinal associations between the quality of mother–infant interactions and brain development across infancy. *Child Development*, *87*, 1159–1174. doi:10.1111/cdev.12518

Bick, J., & Nelson, C. A. (2016). Early adverse experiences and the developing brain. *Neuropsychopharmacology*, *41*, 177–196. doi:10.1038/npp.2015.252

Biringen, Z., Derscheid, D., Vliegen, N., Closson, L., & Easterbrooks, M. A. (2014). Emotional availability (EA): Theoretical background, empirical research using the EA Scales, and clinical applications. *Developmental Review*, *34*, 114–167. doi:10.1016/j.dr.2014.01.002

Bornstein, M. H., Hahn, C. S., Putnick, D. L., & Pearson, R. (2018). Stability of child temperament: Multiple moderation by child and mother characteristics. *British Journal of Developmental Psychology*. Advance online publication. doi:10.1111/bjdp.12253

Bosquet, M., & Egeland, B. (2006). The development and maintenance of anxiety symptoms from infancy through adolescence in a longitudinal sample. *Development and Psychopathology*, *18*, 517–550. doi:10.10170S0954579406060275

Bowlby, J. (1982). *Attachment and loss: Vol. 1. Attachment* (2nd ed.). New York: Basic Books. (Work originally published 1969)

Briggs-Gowan, M. J., Owens, P. L., Schwab-Stone, M. E., Leventhal, J. M., Leaf, P. J., & Horwitz, S. M. (2003). Persistence of psychiatric disorders in pediatric settings. *Journal of the American Academy of Child & Adolescent Psychiatry*, *42*, 1360–1369. doi:10.1097/01.CHI.0000084834.67701.8a

Cabrera, N. J., Volling, B. L., & Barr, R. (2018). Fathers are parents, too! Widening the lens on parenting for children's development. *Child Development Perspectives*, *12*, 152–157. doi:10.1111/cdep.12275

Campbell, S. B., Spieker, S., Burchinal, M., Poe, M. D., & NICHD Early Child Care Research Network. (2006). Trajectories of aggression from toddlerhood to age 9 predict academic and social functioning through age 12. *Journal of Child Psychology and Psychiatry*, *47*, 791–800. doi:10.1111/j.1469-7610.2006.01636.x

Carter, A. S., Briggs-Gowan, M. J., Jones, S. M., & Little, T. D. (2003). The Infant–Toddler Social and Emotional Assessment (ITSEA): Factor structure, reliability, and validity. *Journal of Abnormal Child Psychology*, *31*, 495–514. doi:10.1023/A:1025449031360

Carter, A. S., Wagmiller, R. J., Gray, S. A., McCarthy, K. J., Horwitz, S. M., & Briggs-Gowan, M. J. (2010). Prevalence of DSM-IV disorder in a representative, healthy birth cohort at school entry: Sociodemographic risks and social adaptation. *Journal of the American Academy of Child & Adolescent Psychiatry*, *49*, 686–698. doi:10.1016/j.jaac.2010.03.018

Coppola, G., Ponzetti, S., Aureli, T., & Vaughn, B. E. (2015). Patterns of emotion regulation at two years of age: Associations with mothers' attachment in a fear eliciting situation. *Attachment and Human Development*, *18*, 16–32. doi:10.1080/14616734.2015.1109676

Crandall, A., Deater-Deckard, K., & Riley, A. W. (2015). Maternal emotion and cognitive control capacities and parenting: A conceptual framework. *Developmental Review*, *36*, 105–126. doi:10.1016/j.dr.2015.01.004

Crick, N. R., & Zahn-Waxler, C. (2003). The development of psychopathology in females and males: Current progress and future challenges. *Development and Psychopathology*, *15*, 719–742. doi:10.1017.S095457940300035X

Dekker, M. C., Ferdinand, R. F., van Lang, N. D., Bongers, I. L., van der Ende, J., & Verhulst, F. C. (2007). Developmental trajectories of depressive symptoms from early childhood to late adolescence: Gender differences and adult outcome. *Journal of Child Psychology and Psychiatry*, *48*, 657–666. doi:10.1111/j.1469-7610.2007.01742.x

De Pauw, S. S., & Mervielde, I. (2010). Temperament, personality and developmental psychopathology: A review based on the conceptual dimensions underlying childhood traits. *Child Psychiatry and Human Development*, *41*, 313–329. doi:10.1007/s10578-009-0171-8

Diener, M. L., & Kim, D. Y. (2004). Maternal and child predictors of preschool children's social competence. *Journal of Applied Developmental Psychology*, *25*, 3–24. doi:10.1016/j.appdev.2003.11.006

Dougherty, L. R., Leppert, K. A., Merwin, S. M., Smith, V. C., Bufferd, S. J., & Kushner, M. R. (2015). Advances and directions in preschool mental health research. *Child Development Perspectives*, *9*, 14–19. doi:10.1111/cdep.12099

Dougherty, L. R., Tolep, M. R., Bufferd, S. J., Olino, T. M., Dyson, M., Traditi, J., … Klein, D. N. (2013). Preschool anxiety disorders: Comprehensive assessment of clinical, demographic, temperamental, familial, and life stress correlates. *Journal of Clinical Child and Adolescent Psychology*, *42*, 577–589. doi:10.1080/15374416.2012.759225

Dozier, M., Peloso, E., Lewis, E., Laurenceau, J. P., & Levine, S. (2008). Effects of an attachment-based intervention on the cortisol production of infants and toddlers in foster care. *Development and Psychopathology*, *20*, 845–859. doi:10.1017/S0954579408000400

Easterbrooks, M. A., Bureau, J. F., & Lyons-Ruth, K. (2012). Developmental correlates and predictors of emotional availability in mother–child interaction: A longitudinal study from infancy to middle childhood. *Development and Psychopathology*, *24*, 65–78. doi:10.1017/S0954579411000666

Edwards, R. C., & Hans, S. L. (2015). Infant risk factors associated with internalizing, externalizing, and co-occurring behavior problems in young children. *Developmental Psychology*, *51*, 489–499. doi:10.1037/a0038800

Edwards, S. L., Rapee, R. M., & Kennedy, S. (2010). Prediction of anxiety symptoms in preschool-aged children: Examination of maternal and paternal perspectives. *Journal of Child Psychology and Psychiatry*, *51*, 313–321. doi:10.1111/j.1469-7610.2009.02160.x

Eisenberg, N., Spinrad, T. L., & Eggum, N. D. (2010). Emotion-related self-regulation and its relation to children's maladjustment. *Annual Review of Clinical Psychology*, *6*, 495–525. doi:10.1146/annurev.clinpsy.121208.131208

Else-Quest, N. M., Hyde, J. S., Goldsmith, H. H., & Van Hulle, C. A. (2006). Gender differences in temperament: A meta-analysis. *Psychological Bulletin*, *132*, 33–72. doi:10.1037/0033-2909.132.1.33

Englund, M. M., Kuo, S. I., Puig, J., & Collins, W. A. (2011). Early roots of adult competence: The significance of close relationships from infancy to early adulthood. *International Journal of Behavioral Development*, *35*, 490–496. doi:10.1177/0165025411422994

Essex, M. J., Klein, M. H., Slattery, M. J., Goldsmith, H. H., & Kalin, N. H. (2010). Early risk factors and developmental pathways to chronic high inhibition and social anxiety disorder in adolescence. *American Journal of Psychiatry*, *167*, 40–46. doi:10.1176/appi.ajp.2009.07010051

Feldman, R. (2007). Parent-infant synchrony and the construction of shared timing; physiological precursors, developmental outcomes, and risk conditions. *Journal of Child Psychology and Psychiatry*, *48*, 329–354. doi:10.1111/j.1469-7610.2006.01701.x

Feldman, R. (2015). The adaptive human parental brain: Implications for children's social development. *Trends in Neurosciences*, *38*, 387–399. doi:10.1016/j.tins.2015.04.004

Feldman, R. (2017). The neurobiology of human attachment. *Trends in Cognitive Sciences*, *21*, 80–99. doi:10.1016/j.tics.2016.11.007

Feldman, R., Weller, A., Sirota, L., & Eidelman, A. I. (2002). Skin-to-Skin contact (Kangaroo care) promotes self-regulation in premature infants: Sleep-wake cyclicity, arousal modulation, and sustained exploration. *Developmental Psychology*, *38*, 194–207. doi:10.1111/j.1467-8624.2009.01278.x

Fonagy, P., & Target, M. (1997). Attachment and reflective function: Their role in self-organization. *Development and Psychopathology*, *9*, 679–700. doi:10.1017/S0954579497001399

Forman, D. R., O'Hara, M. W., Larsen, K., Coy, K. C., Gorman, L. L., & Stuart, S. (2003). Infant emotionality: Observational methods and the validity of maternal reports. *Infancy*, *4*, 541–565. doi:10.1207/S15327078IN0404_08

Gartstein, M. A., & Rothbart, M. K. (2003). Studying infant temperament via the revised infant behavior questionnaire. *Infant Behavior and Development*, *26*, 64–86. doi:10.1016/S0163-6383(02)00169-8

Garvin, M. C., Tarullo, A. R., Van Ryzin, M., & Gunnar, M. R. (2012). Postadoption parenting and socioemotional development in postinstitutionalized children. *Development and Psychopathology*, *24*, 35–48. doi:10.1017/S0954579411000642

Glasheen, C., Richardson, G. A., & Fabio, A. (2010). A systematic review of the effects of postnatal maternal anxiety on children. *Archives of Womens Mental Health*, *13*, 61–74. doi:10.1007/s00737-009-0109-y

Goodman, S. H., Rouse, M. H., Connell, A. M., Broth, M. R., Hall, C. M., & Heyward, D. (2011). Maternal depression and child psychopathology: A meta-analytic review. *Clinical Child and Family Psychology Review*, *14*, 1–27. doi:10.1007/s10567-010-0080-1

Goodman, J. H., Watson, G. R., & Stubbs, B. (2016). Anxiety disorders in postpartum women: A systematic review and meta-analysis. *Journal of Affective Disorders*, *203*, 292–331. doi:10.1016/j.jad.2016.05.033

Graham, K. A., Blissett, J., Antoniou, E. E., Zeegers, M. P., & McCleery, J. P. (2018). Effects of maternal depression in the Still-Face Paradigm: A meta-analysis. *Infant Behavior and Development*, *50*, 154–164. doi:10.1016/j.infbeh.2017.12.001

Grant, K. A., McMahon, C., & Austin, M. P. (2008). Maternal anxiety during the transition to parenthood: A prospective study. *Journal of Affective Disorders*, *108*, 101–111. doi:10.1016/j.jad.2007.10.002

Graziano, P. A., & Hart, K. (2016). Beyond behavior modification: Benefits of social–emotional/self-regulation training for preschoolers with behavior problems. *Journal of School Psychology*, *58*, 91–111. doi:10.1016/j.jsp.2016.07.004

Halligan, S. L., Cooper, P. J., Fearon, P., Wheeler, S. L., Crosby, M., & Murray, L. (2013). The longitudinal development of emotion regulation capacities in children at risk for externalizing disorders. *Development and Psychopathology*, *25*, 391–406. doi:10.1017/S0954579412001137

Hankin, B. L., Davis, E. P., Snyder, H., Young, J. F., Glynn, L. M., & Sandman, C. A. (2017). Temperament factors and dimensional, latent bifactor models of child psychopathology: Transdiagnostic and specific associations in two youth samples. *Psychiatry Research*, *252*, 139–146. doi:10.1016/j.psychres.2017.02.061

Karevold, E., Roysamb, E., Ystrom, E., & Mathiesen, K. S. (2009). Predictors and pathways from infancy to symptoms of anxiety and depression in early adolescence. *Developmental Psychology*, *45*, 1051–1060. doi:10.1037/a0016123

Knickmeyer, R. C., Gouttard, S., Kang, C., Evans, D., Wilber, K., Smith, J. K., … Gilmore, J. H. (2008). A structural MRI study of human brain development from birth to 2 years. *Journal of Neuroscience*, *28*, 12176–12182. doi:10.1523/JNEUROSCI.3479-08.2008

Landry, S. H., Smith, K. E., & Swank, P. R. (2006). Responsive parenting: Establishing early foundations for social, communication, and independent problem-solving skills. *Developmental Psychology*, *42*, 627–642. doi:10.1037/0012-1649.42.4.627

Lavigne, J. V., Lebailly, S. A., Hopkins, J., Gouze, K. R., & Binns, H. J. (2009). The prevalence of ADHD, ODD, depression, and anxiety in a community sample of 4-year-olds. *Journal of Clinical Child and Adolescent Psychology*, *38*, 315–328. doi:10.1080/15374410902851382

Lewis-Morrarty, E., Dozier, M., Bernard, K., Terracciano, S. M., & Moore, S. V. (2012). Cognitive flexibility and theory of mind outcomes among foster children: Preschool follow-up results of a randomized clinical trial. *Journal of Adolescent Health*, *51*, 17–22. doi:10.1016/j.jadoh ealth .2012.05.005

Matthey, S., Barnett, B., Howie, P., & Kavanagh, D. J. (2003). Diagnosing postpartum depression in mothers and fathers: Whatever happened to anxiety? *Journal of Affective Disorders*, *74*, 139–147.

McElwain, N. L., & Booth-LaForce, C. (2006). Maternal sensitivity to infant distress and nondistress as predictors of infant-mother attachment security. *Journal of Family Psychology*, *20*, 247–255. doi:10.1037/0893-3200.20.2.247

Mesman, J., Bongers, I. L., & Koot, H. M. (2001). Preschool developmental pathways to preadolescent internalizing and externalizing problems. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *42*, 679–689. doi:10.1017/S0021963001007351

Mesman, J., & Koot, H. M. (2001). Early preschool predictors of preadolescent internalizing and externalizing DSM-IV diagnoses. *Journal of the American Academy of Child & Adolescent Psychiatry*, *40*, 1029–1036. doi:10.1097/00004583-200109000-00011

Mihelic, M., Morawska, A., & Filus, A. (2017). Effects of early parenting interventions on parents and infants: A meta-analytic review. *Journal of Child and Family Studies*, *26*, 1507–1526. doi:10.1007/s1082 6-017-0675-y

Montroy, J. J., Bowles, R. P., Skibbe, L. E., & Foster, T. D. (2014). Social skills and problem behaviors as mediators of the relationship between behavioral self-regulation and academic achievement. *Early Childhood Research Quarterly*, *29*, 298–309. doi:10.1016/j.ecresq.2014.03.002

Morawska, A., Dittman, C. K., & Rusby, J. C. (2019). Promoting self-regulation in young children: The role of parenting interventions. *Clinical Child and Family Psychology Review*. Advance online publication. doi:10.1007/s10567-019-00281-5

Morris, A. S., Silk, J. S., Steinberg, L., Myers, S. S., & Robinson, L. R. (2007). The role of the family context in the development of emotion regulation. *Social Development*, *16*, 361–388. doi:10.1111/j.1467-9507.2007.00389.x

Mughal, M. K., Giallo, R., Arnold, P., Benzies, K., Kehler, H., Bright, K., & Kingston, D. (2018). Trajectories of maternal stress and anxiety from pregnancy to three years and child development at 3 years of age: Findings from the All Our Families (AOF) pregnancy cohort. *Journal of Affective Disorders*, *234*, 318–326. doi:10.1016/j.jad.2018.02.095

Murray, A. D. (1979). Infant crying as an elicitor of parental behavior: Examination of two models. *Psychological Bulletin*, *86*, 191–215. doi:10.1037/0033-2909.86.1.191

Murray, L., Arteche, A., Fearon, P., Halligan, S., Goodyer, I., & Cooper, P. (2011). Maternal postnatal depression and the development of depression in offspring up to 16 years of age. *Journal of the American Academy of Child & Adolescent Psychiatry*, *50*, 460–470. doi:10.1016/j.jaac.2011.02.001

Neece, C. L., Green, S. A., & Baker, B. L. (2012). Parenting stress and child behavior problems: A transactional relationship across time. *American Journal of Intellectual Developmental Disability*, *117*, 48–66. doi:10.1352/1944-7558-117.1.48

Olino, T. M., Bufferd, S. J., Dougherty, L. R., Dyson, M. W., Carlson, G. A., & Klein, D. N. (2018). The development of latent dimensions of psychopathology across early childhood: Stability of dimensions and moderators of change. *Journal of Abnormal Child Psychology*, *46*, 1373–1383. doi:10.1007/s10802-018-0398-6

Panayiotou, M., & Humphrey, N. (2018). Mental health difficulties and academic attainment: Evidence for gender-specific developmental cascades in middle childhood. *Development and Psychopathology*, *30*, 523–538. doi:10.1017/S095457941700102X

Pandey, A., Hale, D., Das, S., Goddings, A. L., Blakemore, S. J., & Viner, R. M. (2018). Effectiveness of universal self-regulation-based interventions in children and adolescents: A systematic review and meta-analysis. *JAMA Pediatrics*, *172*, 566–575. doi:10.1001/jamapediatrics.2018.0232

Parade, S. H., & Leerkes, E. M. (2008). The reliability and validity of the Infant Behavior Questionnaire—Revised. *Infant Behavior and Development*, *31*, 637–646. doi:10.1016/j.infbeh.2008.07.009

Perry, R. E., Blair, C., & Sullivan, R. M. (2017). Neurobiology of infant attachment: Attachment despite adversity and parental programming of emotionality. *Current Opinion in Psychology*, *17*, 1–6. doi:10.1016/j.copsyc.2017.04.022

Pesonen, A. K., Räikkönen, K., Heinonen, K., Komsi, N., Järvenpää, A. L., & Strandberg, T. (2008). A transactional model of temperamental development: Evidence of a relationship between child temperament and maternal stress over five years. *Social Development*, *17*, 326–340. doi:10.1111/j.1467-9507.2007.00427.x

Pitzer, M., Esser, G., Schmidt, M. H., & Laucht, M. (2009). Temperamental predictors of externalizing problems among boys and girls: A longitudinal study in a high-risk sample from ages 3 months to 15 years. *European Archives of Psychiatry and Clinical Neuroscience*, *259*, 445–458. doi:10.1007/s00406-009-0009-1

Pruett, M. K., Cowan, P. A., Cowan, C. P., Gillette, P., & Pruett, K. D. (2019). Supporting father involvement: An intervention with community and child welfare–referred couples. *Family Relations*, *68*, 51–67. doi:10.1111/fare.12352

Putnam, S. P., Gartstein, M. A., & Rothbart, M. K. (2006). Measurement of fine-grained aspects of toddler temperament: The early childhood behavior questionnaire. *Infant Behavior and Development*, *29*, 386–401. doi:10.1016/j.infbeh.2006.01.004

Putnam, S. P., Rothbart, M. K., & Gartstein, M. A. (2008). Homotypic and heterotypic continuity of fine-grained temperament during infancy, toddlerhood, and early childhood. *Infant and Child Development*, *17*, 387–405. doi:10.1002/icd.582

Reck, C., Tietz, A., Muller, M., Seibold, K., & Tronick, E. (2018). The impact of maternal anxiety disorder on mother-infant interaction in the postpartum period. *PLOS ONE*, *13*, e0194763. doi:10.1371/journal.pone.0194763

Rhoades, B. L., Greenberg, M. T., & Domitrovich, C. E. (2009). The contribution of inhibitory control to preschoolers' social–emotional competence. *Journal of Applied Developmental Psychology*, *30*, 310–320. doi:10.1016/j.appdev.2008.12.012

Rhoades, B. L., Warren, H. K., Domitrovich, C. E., & Greenberg, M. T. (2011). Examining the link between preschool social–emotional competence and first grade academic achievement: The role of attention skills. *Early Childhood Research Quarterly*, *26*, 182–191. doi:10.1016/j.ecresq.2010.07.003

Rutherford, H. J. V., Wallace, N. S., Laurent, H. K., & Mayes, L. C. (2015). Emotion regulation in parenthood. *Developmental Review*, *36*, 1–14. doi:10.1016/j.dr.2014.12.008

Rutter, M. (2003). Commentary: Nature-nurture interplay in emotional disorders. *Journal of Child Psychology and Psychiatry*, *44*, 934–944. doi:10.1111/1469-7610.00178

Sameroff, A. J., & Mackenzie, M. J. (2003). Research strategies for capturing transactional models of development: The limits of the possible. *Development and Psychopathology*, *15*, 613–640.

Sanders, M. R., & Mazzucchelli, T. G. (2013). The promotion of self-regulation through parenting interventions. *Clinical Child and Family Psychology Review*, *16*, 1–17. doi:10.1007/s10567-013-0129-z

Sayal, K., Heron, J., Maughan, B., Rowe, R., & Ramchandani, P. (2014). Infant temperament and childhood psychiatric disorder: Longitudinal study. *Child: Care, Health and Development*, *40*, 292–297. doi:10.1111/cch.12054

Scheper, F. Y., Majdandzic, M., van de Ven, P. M., Jansen, L. M. C., Doreleijers, T. A. H., Schuengel, C., & de Vries, A. L. C. (2017). Temperament traits and psychopathology in young clinically referred children compared to a general population sample. *Child Psychiatry and Human Development*, *48*, 841–850. doi:10.1007/s10578-016-0708-6

Senehi, N., Brophy-Herb, H. E., & Vallotton, C. D. (2018). Effects of maternal mentalization-related parenting on toddlers' self-regulation. *Early Childhood Research Quarterly*, *44*, 1–14. doi:10.1016/j.ecresq.2018.02.001

Sherman, B. J., Vousoura, E., Wickramaratne, P., Warner, V., & Verdeli, H. (2016). Temperament and major depression: How does difficult temperament affect frequency, severity, and duration of major depressive episodes among offspring of parents with or without depression? 200, 82–88. doi:10.1016/j.jad.2016.04.033

Shiner, R. L., Buss, K. A., McClowry, S. G., Putnam, S. P., Saudino, K. J., & Zentner, M. (2012). What is temperament now? Assessing progress in temperament research on the twenty-fifth anniversary of Goldsmith et al. (1987). *Child Development Perspectives*, *6*, 436–444. doi:10.1111/j.1750-8606.2012.00254.x

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology*, *13*, 290–312. doi:10.2307/270723

Soltis, J. (2004). The signal functions of early infant crying. *Behavioral and Brain Sciences*, *27*, 443–458; discussion 459–490. doi:10.1017/S0140525X0400010X

Spielberger, C. D., Gorsuch, R. L., Lushene, R. E., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

Tronick, E. Z., Als, H., Adamson, L., Wise, S., & Brazelton, T. B. (1978). The infant's response to entrapment between contradictory messages in face-to-face interaction. *Journal of the American Acadamy of Child & Adolescent Psychiatry*, *17*, 1–13. doi:10.1016/S0002-7138(09)62273-1

Van den Bergh, B. R., Mulder, E. J., Mennes, M., & Glover, V. (2005). Antenatal maternal anxiety and stress and the neurobehavioural development of the fetus and child: Links and possible mechanisms. A review. *Neurosciience and Biobehavioral Reviews*, *29*, 237–258. doi:10.1016/j.neubiorev.2004.10.007

Wade, T. J., Cairney, J., & Pevalin, D. J. (2002). Emergence of gender differences in depression during adolescence: National panel results from three countries. *Journal of the American Academy of Child & Adolescent Psychiatry*, *41*, 190–198. doi:10.1097/00004583-200202000-00013

Wu, Y. C., Hsieh, W. S., Hsu, C. H., Chang, J. H., Chou, H. C., Hsu, H. C., … Jeng, S. F. (2016). Intervention effects on emotion regulation in preterm infants with very low birth weight: A randomized controlled trial. *Research in Developmental Disabilities*, *48*, 1–12. doi:10.1016/j.ridd.2015.10.016

Yuan, K. H., & Bentler, P. M. (2000). Three likelihood-based methods for mean and covariance structure analysis with nonnormal missing data. *Sociological Methodology*, *30*, 165–200. doi:10.1111/0081-1750.00078

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